Electronic Musical Sounds and Material Culture: Early Reception Histories of the Telharmonium, the Theremin, and the Hammond Organ

By

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Chapter 1

Introduction, Context, and Methods

Electronic musical sound has been part of American musical life for over a century. In the first decade of the twentieth century, thousands of restaurant- and concert-goers in New York City heard popular songs, Strauss waltzes, and familiar "classical" melodies played on the Telharmonium, an enormous early synthesizer that broadcast music over telephone wires. Logistical and technical problems prevented the Telharmonium from making a sustained or geographically broad impact on American musical life, as the Hammond organ and theremin would do three decades later. The concertizing of inventor Lev Termen and performers like Clara Rockmore brought the sound of the "touch-less" theremin to tens of thousands of listeners across the United States in the 1930s and 40s through concerts and radio broadcasts. Beginning in the mid 1930s, thousands of church organists played the Hammond organ in weekly services in Catholic, Protestant, and Evangelical churches across the country, even as supporters of the pipe organ decried what they called the new electronic organ's "dead" and "monotonous" sound as unsuitable for sacred music.[1]

Music historians frequently use these three instruments—the Telharmonium, theremin, and Hammond organ—as examples of early technology that presaged, but were not part of, electronic music history. The communities, traditions, practices, and meanings that coalesced

[1] Differences in commercial success and ongoing manufacturing among the three instruments account for discrepancies in capitalization. Single interests controlled the manufacturing of the two capitalized instruments, the Hammond organ and the Telharmonium. The Hammond remained the exclusive property of the Hammond Organ Company until its sale to Suzuki in 1978, while Thaddeus Cahill oversaw the construction of the only Telharmoniums ever produced. In contrast, RCA declined to renew the theremin's patent in 1931, and since then the instrument's relatively simple operating principles have allowed a variety of industrial and individual producers to design, build, and sell their own models of the instrument. Thus, "theremin" denotes an instrument rather than a brand whereas "Hammond" and "Telharmonium" (roughly) signify both.

around these instruments and their sounds are rarely mentioned in mainstream accounts of this history. Historians such as Nick Collins and Peter Manning tend to obscure the Telharmonium's use as a tool for performing and broadcasting popular music, instead emphasizing its qualities as a machine—its massive proportions and its complex and inventive design.[2] Meanwhile, the more familiar popular instrumental traditions of the Hammond and theremin appear in these histories only as foils to the ostensibly non-commercial pursuits of art-music composers whose music dominates the narratives. Collins, for example, claims that early electronic instruments like the theremin, "did nothing to change the nature of musical composition or performance," while Manning writes that the Hammond organ "contributed very little to an appreciation of the artistic potential of this new [electronic] medium of sound production."[3]

The devaluation of popular electronic instrumental practices in these narratives is a symptom of a set of aesthetic and social ideologies that dominate the mainstream version of electronic musical histories. These ideologies are grounded in traditional musicological biases about the physical labor of performance and the intellectual work of composition as well as the popular masculinization of technology and the concomitant feminization of consumption.[4]

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[2] Nick Collins and Julio d' Escrivan Rincón, eds., *The Cambridge Companion to Electronic Music* (Cambridge: Cambridge University Press, 2007); Peter Manning, *Electronic and Computer Music*, 4th ed. (Oxford: Oxford University Press, 2013); Christoph Cox and Daniel Warner, eds., *Audio Culture: Readings in Modern Music* (New York: Continuum, 2004). Also see: Peter Shapiro, ed., *Modulations: A History of Electronic Music: Throbbing Words on Sound* (New York: Caipirinha Productions, 2000); Mark J. Prendergast, *The Ambient Century: From Mahler to Trance: The Evolution of Sound in the Electronic Age* (New York: Bloomsbury, 2000); Thom Holmes, *Electronic and Experimental Music: Technology, Music, and Culture* (New York: Routledge, 2008); Simon Emmerson and Denis Smalley, "Electro-acoustic music," *Grove Music Online* (Oxford University Press, accessed December 12, 2012, http://www.oxfordmusiconline.com/subscriber/article/grove/music/08695).

[3] Collins, "Live Electronic Music," in *The Cambridge Companion*, eds. Collins and d' Escrivan Rincón, 39; Manning, *Electronic and Computer Music*, 5.

[4] On the masculinization of technology see: Cynthia Cockburn and Susan Ormrod, *Gender and Technology in the Making* (London: Sage, 1993); Ruth Oldenziel, *Making Technology Masculine: Men, Women and Modern Machines in America, 1870-1945* (Amsterdam: Amsterdam University Press, 1999); Zoë Sofia, "Container Technologies," *Hypatia* 15, no. 2 (Spring 2000): 181-201; Mary Frank Fox, Deborah G. Johnson, and Sue Vilhauer Rosser, eds., *Women, Gender, and Technology* (Urbana: University of Illinois Press, 2006). On gender and consumption see: Victoria de Grazia and Ellen Furlough, eds., *The Sex of Things: Gender and Consumption in Historical Perspective* (Berkeley: University of California Press, 1996); Roger Horowitz and Arwen Mohun, eds., *His and Hers: Gender, Consumption, and Technology* (Charlottesville: University Press of Virginia, 1998).

Authors of mainstream electronic music histories explicitly and implicitly value experimentation and compositional techniques coded as male over material culture, bodies in performance, and music's social and cultural meanings. Cordoned off from their histories are people, practices, and objects that they deem too commercial or popular. The result is a distorted view of musical life in which the most common practices—including the activities of many women and minorities—seem non-existent.[5] This truncated version of electronic music history remains the norm notwithstanding critical interventions beginning with Georgina Born's work on IRCAM in the 1990s and continuing through Tara Rodger's recent feminist critiques.[6]

Following in the footsteps of Born and Rodgers, I argue for an expanded electronic music history that includes this music's material culture and performance practices and that seeks to understand how electronic musical sound acquires meaning and value. My dissertation is an example of what a more open historiographical approach might entail. In it, I present three case studies, each taking as its subject a segment from the reception histories of the Telharmonium, theremin, and Hammond organ. Together, these studies illustrate the profound impact that performance practices and materiality had on the critical and popular reception of electronic musical sound. In each of these case studies I show how listeners and performers made sense of new electronic sounds not simply by hearing, but by looking at and playing instruments, by choosing and recognizing repertory, and by drawing associations with existing sounds and practices. The case studies also frequently illuminate attitudes about older instruments and technologies.

I focus specifically on electronic musical instruments as they were manufactured, sold,

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[5] Joel Chadabe's book, *Electric Sound: The Past and Promise of Electronic Music* (Upper Saddle River, NJ: Prentice Hall, 1997), is a notable exception.

[6] Georgina Born, *Rationalizing Culture: IRCAM, Boulez, and the Institutionalization of the Musical Avant-Garde* (Berkeley: University of California Press, 1995); Tara Rodgers, *Pink Noises: Women on Electronic Music and Sound* (Durham: Duke University Press, 2010).

and used in the United States for several reasons. Each of the three instruments studied here represents a first in terms of production and consumption. The Telharmonium became the first electronic synthesizer to enjoy a significant (if limited) amount of public exposure during its installation in New York City. An American company, RCA was the first to build and sell a mass-produced theremin. And the Hammond Organ, first manufactured in Chicago, was the first truly commercially successful electronic musical instrument. The nation's historical relationship with electronic technology is incredibly rich, encompassing national identity, social relations and mobility, and a broad range of public and private experiences. The U.S. was also the epicenter of what quickly became an international recording industry, whose reception and marketing practices intersected with the histories of the Telharmonium and the theremin traced in Chapters 2 and 3. As this dissertation demonstrates, electronic musical sound has played a significant role in American popular music, at first intermittently, from the early 1900s through the 1930s, and more consistently following the Hammond's commercial success beginning in the mid-1930s. Many other places across the world and electronic instruments like the ondes martenot are potential sources for yet-unwritten material culture studies that would undoubtedly enrich our understanding of electronic musical culture. I chose to focus on the United States because its technological history intersects in many fascinating ways with some of the earliest electronic musical instruments that significant numbers of people played and heard.

This dissertation's case studies show that there is much to be gained by taking popular electronic musical practices and instruments seriously. By attending closely to the complex encounters between human bodies and musical instruments, we can see, for example, that users of Hammonds and theremins were not, as many historians would have us believe, musical reactionaries who lacked the vision to explore new electronic sounds and forms, but rather were

pioneers of diverse electronic musical practices. By examining controversies over new musical sounds, we can understand more deeply how musicians' and critics' hearing was inflected not only by existing sounds and technologies, but also by other kinds of sensory inputs. Finally, by taking popular electronic music seriously, we drastically expand our understanding of who—and what—took part in electronic music history. In doing so, we begin to gain a more holistic appreciation of how electronic musical sound has mattered, and why.

A comprehensive history of the Telharmonium, theremin, or Hammond organ is far beyond the scope of this dissertation, and I make no attempt to craft such a narrative here. Rather, the case studies focus on key moments in the instruments' histories when their uses, contexts, and meanings coalesced. The early reception history of the Telharmonium in 1906 and 1907 reveals how tensions between celebrations of the democratic potential of technology, on the one hand, and elitist fears of an industrialized workforce, on the other, were articulated in hearings of the instrument's sound as (racially) "pure." Conflicting interpretations of the theremin's sound as both deeply expressive and cloyingly monotonous reveal how the sight of physical practices and gendered bodies inflected the hearings of critics and composers. Finally, a 1937-38 Federal Trade Commission hearing on Hammond organ advertising claims, precipitated by the pipe organ industry, explores the seemingly disparate factors from acoustic research to theater organ practices that participants used to define and evaluate the new organ's timbre. Each of these case studies shows not only that the perception and evaluation of the instruments' sounds were highly contingent—on ideology, other sensory experiences, and existing technologies, to name just a few factors—but also that electronic musical sound has, contrary to what we might expect, often been perceived as particularly emotive and even voice-like.

Relationships between bodies and machines were at the heart of the electronic music

instrumental reception histories studied here. Interactions between bodies and electronic instruments fueled both anxiety and excitement, as human listeners and performers interacted with, and were changed by, new sounding technologies. The history of human bodies in connection with technology is long and complex. In the decades leading up to the Telharmonium's debut in New York City in 1906, electric technologies became, simultaneously, sources of wonder, fear, cure, and disease. Massive lighting displays awed and the danger of electrocution frightened, while more intimate technologies like exercise machines and vibrators promised bodily improvements and cures.[7] Simple human/machine binaries do not map easily onto these histories; the same is true of the electronic instruments studied here. For example, in 1906 and 1907, the liberal and popular press associated the Telharmonium's mechanical means of sound production with its pure sound and its hyper expressivity. The nearly obsessive labeling of the Telharmonium's sound as "pure" clearly resonated with the eugenics-laden discourse of the music appreciation movement, associating the instrument with racially privileged bodies. Three decades later, the Hammond organ's critics in the pipe organ community used words like "dead" and "metallic" to unfavorably contrast the electronic instrument's sound with the ostensibly more natural tones of the pipe organ, an instrument that itself relied on electrification. While no stable human/machine formula for a desirable electronic music sound existed across these decades, praise and condemnation for machines frequently hung on associations with certain kinds of bodies, whether "pure" or otherwise.

The complex nature of these reception histories necessitates an interdisciplinary

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[7] See: David E. Nye, *American Technological Sublime* (Cambridge: MIT Press, 1994); Carolyn Thomas de la Peña, *The Body Electric: How Strange Machines Built the Modern American* (New York: New York University Press, 2003); Jürgen Martschukat, "The Art of Killing by Electricity: The Sublime and the Electric Chair," *The Journal of American History* 89, no. 3 (December 2003): 900-92; Lauren Rabinovitz, *Electric Dreamland: Amusement Parks, Movies, and American Modernity* (New York: Columbia University Press, 2012).

approach, and I engage broadly with ideas from the fields of material culture, science and technology studies (STS), and performance studies. This approach situates my dissertation within the discipline of sound studies as well as an emerging area labeled by some as "new" or "critical" organology. Scholars define both of these areas as interdisciplinary and particularly invested in understanding the role that materiality plays in cultural and social systems.[8] By engaging with these concerns, I contribute to ongoing conversations about the importance of opening up historical narratives to the objects and material practices of everyday life.[9] I also join a host of scholars who assert that musical experiences are always multi-sensorial and always caught up in historical, cultural, and social webs. My dissertation demonstrates that these interdisciplinary perspectives can expand our electronic music histories beyond the walls of academia and government-sponsored institutions to include popular music and performance practices.

The Case Studies

The first of this dissertation's three case studies, presented in Chapter 2, considers the Telharmonium's reception history in 1906 and 1907, when inventor Thaddeus Cahill's instrument was at the peak of its popularity. The instrument's design—its massive interior, its organ-like playing interface, and its means of making sound audible through telephone wires and

[8] On sound studies see: Jonathan Sterne, ed., *The Sound Studies Reader* (New York: Routledge, 2012); and Trevor Pinch and Karin Bijsterveld, eds., *The Oxford Handbook of Sound Studies* (New York: Oxford University Press, 2012). Calls for critical organologies are relatively recent. See Eliot Bates, "The Social Life of Musical Instruments," *Ethnomusicology* 56, no. 3 (Fall 2012): 363-95, in which Bates proposes "a paradigm that encompasses the full range of possible human-object-divine relations, as seen in instrument making, performance, musical healing, and numerous other domains," 371. The 2013 meeting of the American Musicological Society included a roundtable on "Critical Organology" organized by Emily I. Dolan with papers by Joseph Auner, Eliot Bates, Bonnie Gordon, Jonathan De Souza, Ellen Lockhart, Roger Moseley, James Davies, Deidre Loughridge, and Thomas Patteson. Also see: Emily I. Dolan and John Tresch, "Toward a New Organology," *Osiris* 28 (2013): 278-298.

[9] This conversation is taking place not only among the scholars of STS and gender cited above, but also among philosophers. See, for example, Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham: Duke University Press, 2010).

paper cone amplifiers—meant that the Telharmonium was viewable by audiences only in pieces. Diners might see the source of the instrument's sound only as a paper amplifier nestled in a potted plant, while audiences at "Telharmonium Hall" could watch two men play the instrument and view its massive machinery, but only separately. I explore how these visions of industrial machinery, male performance, and disembodied sound informed hearings of the instrument as particularly "pure" and expressive among music critics, science writers, and the mainstream press. Listeners made sense of the sights and sounds of the instrument against the backdrop of an ongoing music appreciation movement and contemporary acoustic theories, and in comparisons with the dominant music reproduction technology at the time, the phonograph. I show how reception of the Telharmonium—heard as free from the "scratch" of the talking machine and heralded as a bearer of "good" music to the masses—distilled ideologies about race, gender, class, and technology.

Chapter 3 traces the early reception history of the theremin in the United States, from the arrival of its inventor Lev Termen through the peak of Clara Rockmore's career in the late 1930s and early 1940s. The visual elements of theremin performance, in particular the sight of a player's raised arms moving through empty space, had a profound impact on how critics assessed the instrument's sound. Although Termen concertized on the instrument frequently in the years following his 1929 arrival in New York City, as female performers like Clara Rockmore rose to prominence critics increasingly heard the theremin's sound as feminine. Advertising strategies taken up by RCA Victor to market the instrument to female consumers during its brief and unsuccessful commercial run further cemented the theremin's links to the feminine. This chapter culminates in a discussion of Rockmore's national tours in the early 1940s with famous baritone Paul Robeson and the significant body of surviving reviews which

captured the attitudes of white middle-class music critics toward race, gender, and technology.

The final case study in Chapter 4 takes as its subject the 1937-38 Federal Trade Commission hearing on a series of advertising claims made by the Hammond Clock Company about the Hammond organ. A community of pipe organ builders, scholars, architects, and performers initiated the hearing, taking issue with claims that the Hammond could produce sounds equivalent to traditional and "natural" pipe organs. I explore the scientific and cultural contexts that the hearing's participants drew on as they evaluated the Hammond's new electronic musical sound. I trace how the pipe organ community's reception of the theater organ a decade earlier—which circled around debates over jazz, the perceived feminization of the theater organ profession, and the low socio-economic status of many theater-goers—echoed through testimony during the hearing. I also show how visual analyses of Hammond and pipe organ timbres made by a physicist to act as evidence for the FTC hearing influenced how participants heard and described the instruments' sounds. Although ostensibly fought over the sacred musical instrument market in the U.S., the hearing's testimony also demonstrates that classist definitions of "good" sacred organ music held by the most vocal elements of the pipe organ community had already shut off the small, non-mainstream church market from the reach of their industry. A final and fifth Chapter synthesizes major themes, draws conclusions across the case studies, and suggest paths for future study.

Each of the case studies in Chapters 2, 3, and 4 draws on a range of archival and print sources. My study of the Telharmonium's reception relies heavily on newspaper and magazine accounts of the instrument and benefits especially from collections of Holyoke newspapers (where the instrument was built) held in that town's public library. The George H. Clark Radioana Collection in the Archives Center at the National Museum of American History, which

contains many of RCA Victor's theremin-related materials from 1929-1931, and the Clara Rockmore collection at the University of Maryland are important sources for Chapter 3. The sixty-four boxes of Hammond Organ Company archives housed in the Research Center at the Chicago History Museum and additional Federal Trade Commission records at the National Archives contain records of the 1937-38 hearing on the Hammond organ. Popular, trade, and special-interest publications ranging from national presses and local newspapers to more specialized sources like *Etude, Modern Music,* and *The Diapason* further illuminate these reception histories. It is important to note that the source materials on which I rely throughout this dissertation are all "official" in some capacity. Many were publications in major newspapers, journals, and magazines; others are government or corporate records. For the most part, letters, diaries, and other personal first-hand accounts are beyond the scope of my current research. Thus, even as this dissertation expands current mainstream conceptions of electronic music history, it is limited in its own way to stories told by people and organizations in positions of power.

The years covered in these case studies, from the first decade of the twentieth century to the midst of the Great Depression, followed a period of sweeping technological change in the U.S. beginning around the 1840s and corresponded with the beginning of the modernization of American public spaces and homes. Before the Telharmonium began making music in New York, people across the country witnessed the advent of public lighting and heating utilities, recorded sound, the telegram and telephone, and the expansion of railroad transportation. The years and decades following the Telharmonium's debut saw the spread and semi-democratization of many of the technological developments of previous decades as well as the emergence of new technologies, with broadcast radio in the early 1920s being the most directly relevant to this

study. These technological changes shaped and were shaped by shifting cultural and social movements, from immigration trends and internal population movements like the Great Migration to the emergence of a national popular entertainment industry. Only within these broader contexts can we begin to understand the significance of the electronic musical instruments examined here.

We cannot, for example, understand the successes and failures of the Telharmonium, theremin, and Hammond organ—each designed in part as domestic music makers—without accounting for the gradual modernization of the American home during the first half of the twentieth century. At the beginning of the 1920s, a decade and a half after the Telharmonium's installment in New York City, 80 percent of American homes had either no electricity or minimal wiring that could accommodate only limited lighting. The percentage of homes with such limited resources shrank to 63 by the beginning of the 1930s. By the 1940s, following New Deal housing programs that regulated codes and other electrification initiatives, two thirds of American homes were wired to accommodate a range of moderate electrical appliances, including refrigerators.[10] In the late 1920s, the radio became nearly universally adopted in homes that could power it; its sales coincided with the first large rise in domestic electrical consumption around 1928.[11] Changes came more slowly to segregated and poor communities, and mass domestic electrification that could accommodate large heating appliances did not occur until after World War Two.[12]

As these statistics indicate, electronic musical instruments first entered the marketplace years before significant numbers of American homes could power them. While marketing of the

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[10] Ronald C. Tobey, *Technology As Freedom: The New Deal and the Electrical Modernization of the American Home* (Berkeley: University of California Press, 1996), 33.
[11] David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880-1940* (Cambridge, Mass: MIT Press, 1990), 21; *Technology as Freedom*, 159.
[12] *Technology as Freedom*, 8.

instruments, in particular the theremin and Hammond, targeted domestic consumers, their sounds were most widely heard in more public ways, through radio broadcasts and concerts, and in churches. The same was true for the Telharmonium, which many New Yorkers heard in concert halls and cafes. The entrance of electronic musical sounds into American life through public channels mirrored existing patterns of technological change. Electric lighting, for example, first emerged not in the home, but in the theater and in massive displays at international expositions, national celebrations, and local outdoor displays.[13] Existing modes of technological display and consumption contained their own social norms and cultural meanings, which in turn shaped how listeners, performers, and critics understood new electronic musical instruments. Throughout this dissertation, I strive to understand the early public consumption of and critical reaction to electronic musical sound by examining these early instruments within broader contexts of technological change.

In what remains of the current chapter, I situate this dissertation within existing historiographical and theoretical contexts. I begin by assessing the reception of popular instruments and music in mainstream electronic music historiography. I then turn to scholarship that offers alternative ways of doing electronic music history, highlighting both feminist critiques of traditional science and technology histories and studies of electronic music that incorporate concerns for material culture. Next, I lay out the methodological and theoretical framework for this dissertation, explaining in the process how this project both participates in and seeks to critique a growing interest among musicologists in sound studies. Finally, I summarize the main conclusions that I draw in this dissertation.

[13] *Electrifying America*, 29-36.

Electronic Music History: Mainstream Narratives

How do electronic music histories define the object of their study? To answer this question, let us turn to three of the most prestigious sources on the subject: Peter Manning's *Electronic and Computer Music*, in its fourth edition as of 2013, *The Cambridge Companion to Electronic Music*, published in 2007, and the entry for "Electro-acoustic Music" in *Grove Music Online* by Simon Emmerson and Denis Smalley. Smalley and Emmerson provide a broad definition for electronic music at the outset: "music in which electronic technology, now primarily computer-based, is used to access, generate, explore and configure sound materials, and in which loudspeakers are the prime medium of transmission." The authors soon narrow this definition to: "a body of art-music genres that evolved from compositional techniques and aesthetic approaches developed in Europe, Japan and the Americas in the 1950s."[14] This second, more specific, definition draws firm geographical, chronological, and aesthetic boundaries around the definition of electronic music. A similar contraction takes place in *The Cambridge Companion to Electronic Music.* In the collection's introduction, editors Nick Collins and Julio d' Escrivan Rincón write that, "electronic music is the mainstream."[15] Yet several pages later, Andrew Hugill, in his chapter on "The Origins of Electronic Music," tells us that, "the inclusion of electronic sounds in conventional music does not in itself amount to the origins of an electronic *music*, as distinct from any other kind of music."[16] The reader who goes in search of a definition of electronic music in these sources is thus met with contradictions. On the one hand, electronic music includes a wide array of practices and is seemingly ubiquitous; on the other, it describes only a particular body of art music. In the case of *The Cambridge Companion*, the

[14] "Electro-acoustic music."
[15] "Introduction," in *The Cambridge Companion*, 1.
[16] Andrew Hugill, "The Origins of Electronic Music," in *The Cambridge Companion*, eds. Collins and d' Escrivan Rincón, 18-19.

contradiction is chronologically contingent: electronic music may be mainstream today, but its origins are more strictly delimited.

Stepping back to examine the broader historical narrative that underpins these definitions, we find an origin story told in colonialist terms, of "pioneering" composers who dared to explore new musical "vistas" that might later be occupied by many (more conventional, less exploratory) others. Manning, for example, begins his history with "prophetic" and influential ideas about noise developed by Italian futurists like Luigi Russolo and Ferruccio Busoni. He then traces this influence through the tape-music compositions of composers working with *elektronische Musik* in Cologne and *musique concrète* in Paris, as well as those at the Columbia-Princeton Electronic Music Center and later at IRCAM. Works by composers like John Cage, Karlheinz Stockhausen, Pierre Boulez, and Milton Babbitt dominate Manning's history and the bulk of the *Grove* article from the 1950s through the 1970s.

Each of these three histories locates a significant, even revolutionary, shift to digital technologies in the 1980s. With this shift, the production of electronic music boomed with "the ubiquity of bedroom studios" and, at the same time, popular artists embraced electronic musical sounds as part of the "mainstream."[17] It was thus digitization, we learn, that heralded the democratization of electronic music and the taming of its once-uncharted "vistas." Now, *The Cambridge Companion* tells us, electronic music is everywhere: in television, podcasts, and cell phone ringtones. This ubiquity was not, however, the case at the outset of electronic music history. Rather, the recent proliferation of electronic music activity and technology rests on a "wonderful heritage" of art-music composers. As *The Cambridge Companion* editors put it, "a

[17] "Introduction," in *The Cambridge Companion*, 1.

rich history underlines electronic music, full of radical inventors, pioneering composers and daring innovators."[18]

In spite of the trajectory of this narrative arc, in which electronic music's widespread popularity is seemingly the current end point, popular music itself occupies a marginal space in these narratives, if it appears at all (the *Grove* entry never mentions it). Manning relegates the topic to a chapter on "Pop and Rock," in which he highlights the "experimentation by several leading artists" during the late 1960s and early 1970s. Although he acknowledges that "popular music has made use of electronic devices since the 1920s," it is not until the popularity of the electric guitar in the 1950s that Manning locates activity worthy of note. He focuses most of his attention, though, on "progressive rock" bands of the late 1960s and 1970s like Emerson, Lake and Palmer and Yes, which he follows with a list of additional important "popular" electronic musicians in Krautrock, hip-hop, rap, techno, and disco. In their introduction to *The Cambridge Companion*, Collins and d' Escrivan Rincón address head-on what they call the division between, "electroacoustic (caricatured as serious academic art music) and electronica (as popular electronic music, but also including many forms of experimental electronic music)." In reality, the authors tell us, a continuum of practices and music exists between these two poles. In a bid to "defuse some of the dangerous divisionism," *The Cambridge Companion* includes "some mingling of electronica and electroacoustic" and places an artist statement by experimental composer and performance artist Kevin Blechdom next to Stockhausen's statement.[19]

Yet these nods toward more inclusive historical records only recognize certain music and musical acts as fit to be appraised, namely music that reinforces existing definitions of "great" electronic music and its originators. Manning highlights the creativity and experimentation of

[18] "Introduction," in *The Cambridge Companion*, 2-3.
[19] "Introduction," in *The Cambridge Companion*, 3.

bands like Emerson, Lake, and Palmer with "classical" influences while dismissing other music, like disco and advertising jingles, as overly commercial, "contaminating," "debasing," and "mediocre."[20] Kevin Blechdom—*The Cambridge Companion's* example of a popular musician—is an artist whose work draws on popular song conventions but is fiercely experimental and hardly well-known.[21] These authors thus demonstrate little concern for music that is actually ubiquitous or for the types of non-attentive listening that Anahid Kassabian has argued dominate listening practices in our society.[22] Instead, the authors of mainstream electronic music histories choose to hold up as examples only those "popular" artists whose work can be evaluated according to the same standards applied to art-music composers. Rather than break down "dangerous divisions," these "popular" inclusions reinforce existing value structures and narratives.

The anathema toward music with widespread appeal is captured most succinctly in these narratives in an often-quoted passage from Cage's 1961 collection of essays, *Silence*. The excerpt includes Cage's famous observation: "Wherever we are, what we hear is mostly noise. When we ignore it, it disturbs us. When we listen to it, we find it fascinating."[23] In order to highlight the new importance of noise in composition, Cage proposes replacing the term "music" with "organized sound." He then goes on to contrast the electronic composer's commitment to noise with the performance practices of thereminists, who he says make the theremin, "sound like some old instrument, giving it a sickeningly sweet vibrato, and performing upon it, with difficulty, masterpieces from the past." The thereminists, according to Cage, "[give] the public those sounds they think the public will like." The project of mainstream electronic music

[20] *Electronic and Computer Music*, 168-180.
[21] "Introduction," in *The Cambridge Companion*, 2.
[22] Anahid Kassabian, *Ubiquitous Listening: Affect, Attention, and Distributed Subjectivity* (Berkerley: University of California Press, 2013).
[23] John Cage, *Silence: Lectures and Writings* (Middletown, CT: Wesleyan University Press, 1961), 3-4.

historiography in many ways stems from the ideology distilled in these remarks, in which likeable—i.e. popular—sounds do not merit inclusion because they are not properly new, experimental, or noisy.

Subsequent historians have consumed and regenerated Cage's words, either reproducing them or mirroring his use of the theremin as a foil to "true" electronic music. From *Grove*: "The earliest electric instruments, such as the theremin and ondes martenot, influenced subsequent synthesis and interface designs, but did not assist in establishing new musical genres. John Cage pioneered the use of electronic devices on the concert platform…"[24] Collins, in his *Cambridge Companion* chapter on "Live Electronic Music," more explicitly underlines Cage's point by contrasting the "likeable" sounds produced by thereminists with the composer's ambition to "give audiences the world and allow them to pick and chose."[25] The non-critical embrace of Cage's rhetoric by historians facilitates a larger historiographical agenda. While it is difficult for historians to deny the presence of electronic musical sounds in popular music today, it is easier to dismiss the labor of historic electronic music performers and position composers as the progenitors of all subsequent developments. Tara Rodgers' observation that Cage's centrality in electronic music narratives effectively silences other actors is particularly legible in these choices.[26]

Electronic Music History: Critiques and New Approaches

Cage's characterization of the theremin's sound as "sickeningly sweet" also points to ideologies of gender that are deeply embedded in electronic music histories. As Rodgers notes, scholarship on gender and STS raises important concerns about the complex intersections of

[24] "Electro-acoustic music."
[25] Collins, "Live Electronic Music," in *The Cambridge Companion*, eds. Collins and d' Escrivan Rincón, 40.
[26] *Pink Noises*, 11.

technology, identity, and power, issues that are central, if not always visible, to the history of electronic music and musical instruments. Scholars including Cynthia Cockburn, Susan Ormrod, Ruth Oldenziel, and Zoë Sofia have shown how historians have consistently gendered technology as masculine, in part by excluding technologies associated "both with traditional labors of woman and with metaphors for female organs of storage, transformation, and supply."[27] As Steven Lubar put it, historians recognize "trains but not eggbeaters; military consulting but not cooking instruction" as technology.[28] In the case of electronic music history, scholars have recognized tape composition but not performance technique and computers but not electronic organs as music technology proper.

It is important to recognize these omissions not only because they effectively erase white women and all people of color from the historical record but also because identity—whether gendered, raced, or classed—and technology are deeply intertwined. Deborah Johnson describes the creation of identity and technology as co-creative, arguing that gender shapes the development and use of technology and is simultaneously, "embedded and carried out in the design and meaning of technological artifacts" and their uses.[29] Johnson defines co-creation specifically in terms of gender and technology but acknowledges that race also interacts with technology in important but understudied ways; I would add class to the mix. As Johnson notes, "we encounter technology as we move physically and socially through our lives," and each of these elements—race, gender, and class—impacts where and how we move.[30]

This intertwining of technology and identity means that when electronic music scholars

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[27] The quote is from "Container Technologies," 185. Also see *Gender and Technology in the Making*, *Making Technology Masculine*, and *Women, Gender, and Technology*.
[28] Steven Lubar, "Men/Women/Production/Consumption," in *His and Hers*, eds. Horowitz and Mohun, 8.
[29] Deborah G. Johnson, "Introduction," in *Women, Gender, and Technology*, eds. Fox, Johnson, and Vilhauer Rosser, 3.
[30] "Introduction," in *Women, Gender, and Technology*, 2, 6.

"come to grips," as Johnson says, with "the materiality and the facilitating and constraining features of technology," they frequently uncover systems and ideologies of gender, race, and class at play.[31] For electronic music scholars, choosing to "come to grips with materiality" has the potential to upset the discipline's boundaries and values. A small but growing body of scholarship that deals explicitly with the material culture of electronic music has already begun to reconfigure the parameters of electronic music history. Early examples include Paul Théberge's work on the role of digital technologies in popular music production and Timothy Taylor's book *Strange Sounds*, which explores fascination with and fear of electronic musical sound.[32] The 2002 collection of essays, *Music and Technology in the Twentieth Century* challenged "artificial boundaries" between musicology and STS, as well as between popular and "art" music scholars.[33] In their book on the Moog Synthesizer, Trevor Pinch and Frank Trocco sought to understand the instrument by studying its use, a perspective that led the authors to take many kinds of music into account.[34] More recently, in 2013, the collection *Material Culture and Electronic Sound* featured an instrument in a museum collection in each chapter. In the introduction to this book, editors Tim Book and Frode Weium noted that the collection's broad subject material bears out the argument that, "close examinations of objects […] can pose new questions and encourage new perspectives."[35]

Among the topics taken up by scholars at the intersection of music, materiality, and technology are several areas of study that intersect with the histories of the Telharmonium,

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[31] "Introduction," in *Women, Gender, and Technology*, 2.
[32] Paul Théberge, *Any Sound You Can Imagine Making Music/Consuming Technology* (Hanover, NH: Wesleyan University Press, 1997); Timothy D. Taylor, *Strange Sounds: Music, Technology & Culture* (New York: Routledge, 2001).
[33] Hans-Joachim Braun, ed., *Music and Technology in the Twentieth Century* (Baltimore: Johns Hopkins University Press, 2002).
[34] Trevor Pinch, and Frank Trocco, *Analog Days: The Invention and Impact of the Moog Synthesizer* (Cambridge: Harvard University Press, 2002).
[35] Frode Weium and Tim Boon, eds., *Material Culture and Electronic Sound* (Washington, D.C.: Smithsonian Institution Scholarly Press, 2013), ix.

theremin, and Hammond. A range of scholarship from the last decade conducted under the umbrella of sound studies explores intersections between the field of acoustics and musical life. These include Emily Thompson's influential book on architecture and listening, Jonathan Sterne's work on musical media, and Tara Roger's dissertation on metaphors and musical synthesis.[36] Many of the observations in this dissertation would be impossible to make without this existing work. In addition, a growing body of work on music technologies and industries provides context for the industrial histories of the instruments, particularly in terms of marketing strategies. Holly Kruse, Marsha Siefert, and Susan C. Cook have shown how Victor—who, in a merger with RCA, became the first commercial manufacturer of theremins—capitalized on ideologies of class, race, and gender to sell phonographs and records to a white middle-class audience in the 1900s and 10s.[37] Their work is crucial to understanding advertising strategies used for the instruments in this book, which were often marketed to a similar demographic and relied on common narratives.

This dissertation also takes part in the sub-discipline of organology, the study of musical instruments. During the early twentieth century ethnomusicologists like Carl Sachs and Erich von Hornbostel dedicated their work in this area primarily to description and categorization. In recent decades, ethnomusicologists and sociologists have brought concerns about cultural

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[36] Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham: Duke University Press, 2003); Emily Ann Thompson, *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900-1933* (Cambridge, Mass: MIT Press, 2002); Tara Rodgers, "Synthesizing Sound: Metaphor in Audio-technical Discourse and Synthesis History," (PhD diss., McGill University, 2010).

[37] Holly Kruse, "Early Audio Technology and Domestic Space," *Stanford Humanities Review* 3, no. 2 (1993): 1-16; Marsha Siefert, "The Audience at Home: The Early Recording Industry and the Marketing of Musical Taste," in *Audiencemaking: How the Media Create the Audience*, ed. James S. Ettema and D. Charles Whitney (Thousand Oaks, MI: Sage Publications, 1994), 186-214; Siefert, "Aesthetics, Technology, and the Capitalization of Culture: How the Talking Machine Became a Musical Instrument," *Science in Context* 8, no. 2 (1995): 417-449; Susan C. Cook, "Talking Machines, Dancing Bodies: Marketing Recorded Dance Music before World War I," in *Bodies of Sound: Studies Across Popular Music and Dance*, ed. Sherril Dodds and Susan C. Cook (Burlington: Ashgate, 2013), 149-162. For another look at marketing strategies for music technology see Timothy D. Taylor, "Commodification of Music at the Dawn of the Era of 'Mechanical Music,'" *Ethnomusicology* 51, no. 2 (Spring/Summer, 2007): 281-305.

contexts, identity, and power to their studies of musical instruments. Steve Waksman's work on gendered and racial identities and the electric guitar, Marion Jacobson's cultural history of the accordion in the United States, and Ellen Koskoff's and Veronica Doubleday's analyses of gendered ideologies of instrumental performance are all exemplary of this new approach.[38]

Musicologists too have taken up the study of the industries, practices, meanings, and contexts of musical instruments. Heather Hadlock, for example, has demonstrated how nineteenth-century writers and audiences made the glass harmonica the focus of cultural fantasies about gender, music, and madness.[39] Richard Leppert has examined the ways in which the power dynamics of gender were literally embodied at the keyboards of Europe's bourgeoisie during the seventeenth and eighteenth centuries.[40] James Parakilas has shown how the piano, itself a product of industrialization, was at the center of the genesis of the modern entertainment industry.[41] And Sean Murray has argued that the ivory in nineteenth-century pianos not only depended on a violent colonial system but also signified racial whiteness to its Victorian owners.[42] These studies reflect an increasing emphasis on the human body in performance and a desire to understand the impact of industry and production on musical life. The advent of what scholars like Emily Dolan identify as a "critical organology" demonstrates a growing interest in this type of study, but also, as I will suggest below, indicates a refocusing of priorities toward theoretical concerns and away from questions of performance.

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[38] Steve Waksman, *Instruments of Desire: The Electric Guitar and the Shaping of Musical Experience* (Cambridge: Harvard University Press, 1999); Ellen Koskoff, "When Women Play: The Relationship Between Musical Instruments and Gender Style," *Canadian University Music Review* 16, no. 1 (1995): 114-127; Veronica Doubleday, "Sounds of Power: An Overview of Musical Instruments and Gender," *Ethnomusicology Forum* 17, no. 1 (June 2008): 3-39.

[39] Heather Hadlock, "Sonorous Bodies: Women and the Glass Harmonica," *Journal of the American Musicological Society* 53, no. 3 (Autumn, 2000): 507-542.

[40] Richard D. Leppert, *The Sight of Sound: Music, Representation, and the History of the Body* (Berkeley: University of California Press, 1993).

[41] James Parakilas, ed., *Piano Roles: Three Hundred Years of Life with the Piano* (New Haven: Yale University Press, 1999).

[42] Sean Murray, "Pianos, Ivory, and Empire," *American Music Review* 38, no. 2 (Spring 2009).

The uptick in organological study during the last two decades has included a limited number of studies on the instruments that populate this dissertation's case studies. Although none of the instruments featured here have received much sustained attention from musicologists, the Hammond organ—by far the most widely used of this group—has been most sorely neglected. With the exception of Frode Weium's recent essay on the reception of the Hammond Organ in Norway, histories of the instrument are currently limited to a handful of articles and trade publications, while brief discussions of its industrial and social contexts appear in a small number of dissertations and theses.[43] The theremin has fared significantly better. The most important sources are Albert Glinsky's meticulously documented 1992 dissertation and 2000 book, which provide detailed accounts of inventor Lev Termen's life as well as the instrument's early production and compositional settings.[44] Additional scholarship is almost entirely devoted to the theremin's roles in Hollywood as a sonic representation of neurosis in film noir of the late 1940s and as a monstrous alien "other" in science fiction of the 1950s.[45] Reynold Weidenaar's 1989 dissertation and 1995 book on the Telharmonium are invaluable and unique resources on inventor Thaddeus Cahill's work and the instrument's use and reception.[46]

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[43] Frode Weium, "Technology and Authenticity: The Reception of the Hammond Organ in Norway," *Material Culture and Electronic Sound*, eds. Frode Weium and Tim Boon, 67-93. Also see Henry B. Aldridge, "'Music's most Glorious Voice': The Hammond Organ," *The Journal of American Culture* 19, no. 3 (1996): 1-8.

[44] Albert Glinsky, "The Theremin in the Emergence of Electronic Music" (PhD diss., New York University, 1992); Glinsky, *Theremin: Ether Music and Espionage* (Urbana: University of Illinois Press, 2000).

[45] Philip Hayward, "Danger! Retro-affectivity!: The Cultural Career of the Theremin," *Convergence* 3, no. 4 (1997): 28-53; James Wierzbicki, "Weird Vibrations: How the Theremin Gave Musical Voice to Hollywood's Extraterrestrial 'Others,'" *Journal of Popular Film and Television* 30, no. 3 (Fall, 2002): 125-135; Rebecca Leydon, "Hooked on Aetherophonics: *The Day the Earth Stood Still*," in *Off the Planet: Music, Sound and Science Fiction Cinema*, ed. Philip Hayward, (Bloomington: Indiana University Press, 2004), 30-41; Lisa M. Schmidt, "A Popular Avant-Garde: The Paradoxical Tradition of Electronic and Atonal Sounds in Sci-Fi Music Scoring," in *Sounds of the Future: Essays on Music in Science Fiction Film*, ed. Mathew J. Bartkowiak (Jefferson, NC: McFarland & Co, 2010), 22-43; Nathan Platte, "Music for *Spellbound* (1945): A Contested Collaboration," *Journal of Musicology* 28, no. 4 (Fall 2011): 418-463.

[46] Reynold Henry Weidenaar, "The Telharmonium: A History of the First Music Synthesizer, 1893-1918" (PhD diss., New York University, 1989); Weidenaar, *Magic Music from the Telharmonium* (Metuchen, NJ: Scarecrow Press, 1995).

Methodology and Theoretical Framework

The defining feature of the new "critical" organology, as defined by its proponents, is the incorporation of methods and theories from the fields of STS and sound studies. During a panel on the subject at the 2013 American Musicological Society Meeting, Emily Dolan defined critical organology as:

> A subfield that blends the concerns of traditional organology—the history and classification of instruments and the exploration of their construction—with broader questions of the impact and implications of technology. A nascent field, critical organology offers new avenues for thinking about the relations between material history, aesthetics and philosophy as well as for connecting music studies with the histories of science and technology, STS, and sound studies.[47]

While I take part in and benefit from the emerging influence of this subfield, I am troubled by the lack of concern for performance or performance studies in this and other definitions of critical organology. I first became aware of this omission as I read two recently published collections, *Taking it to the Bridge: Music as Performance* and *The Oxford Handbook of Sound Studies*. As I read the collections in tandem, I was struck by how much it seemed the disciplines of performance and sound studies might have to say to one another, and how little—almost nothing—was actually said.[48] Along with a lack of perspective on performance, much musicological work conducted under the banners of sound studies and critical organology avoids asking questions about bodies, power, identity, and value.[49] As a scholar who has been mentored and trained by feminist musicologists, I find this trend troubling. This dissertation, then, and the methodological and theoretical framework that I outline here, explores a way of doing organology that is critical not only about technology, aesthetics, and philosophy, but also about

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[47] Dolan, "Critical Organology," roundtable at AMS Annual Meeting, Pittsburgh, November 7-10, 2013.
[48] *The Oxford Handbook of Sound Studies*; Nicholas Cook and Richard Pettengill, eds., *Taking It to the Bridge: Music As Performance* (Ann Arbor: University of Michigan Press, 2013).
[49] This point was by several speakers at another panel at the 2013 AMS meeting, "The Gendered Soundscape." Andra McCartney, for example, discussed how the term "soundscape," was coined by R. Murray Schafer with an explicitly nationalist and masculine sound environment in mind.

bodies, control, and power.

In order to understand how bodily encounters with the material world create musical meaning and value, I turn to several theoretical models from the fields of material culture, STS, and performance studies. I am particularly interested in scholarship that recognizes the agency of objects—in other words, the capacity of things to affect us and other objects—because this approach highlights the complex nature of encounters between human beings and musical instruments. Actor Network Theory (ANT), and in particular the writing of Bruno Latour, has been especially helpful in this regard.[50] Latour argues that both people and objects are actors, that, "*any thing* that [modifies] a state of affairs by making a difference is an actor." When determining whether an object or person is an actor, we simply ask, "does it make a difference in the course of some other agent's action or not?"[51] For Latour, societies are not purely human domains but rather complicated networks comprised of various types of actors and their impacts on one another, and only when we recognize the impacts of objects can we explain, "the over-arching powers of society, the huge asymmetries, the crushing exercise of power."[52] This conceptualization of society resonates with Gilles Deleuze and Félix Guattari's notion of the rhizome, a "system of multiplicities" that includes semiotics, organizations of power, and the arts and sciences and that is "perpetually in construction or collapsing."[53]

ANT is a methodology rather than a theory; it is a way of doing sociological and historical work that meticulously traces the connections among actors.[54] By approaching objects

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[50] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge: Harvard University Press, 1987); Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2005).
[51] *Reassembling the Social*, 71.
[52] *Reassembling the Social*, 72.
[53] Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis: University of Minnesota Press, 1987), 6, 20.
[54] For a cogent summary of ANT with respect to musicology see: Benjamin Piekut, "Actor-Networks in Music History: Clarifications and Critiques," *Twentieth-Century Music* 11 no. 2 (September 2014): 191-215.

as actors, my attention is drawn to the complex encounters among performers, listeners, builders, and instruments that together form the histories of the Hammond organ, theremin, and Telharmonium. The influence of this approach on my own work can, I hope, be seen most clearly in my attempt to always show who—or what—is causing something to happen. The process of tracing a network is demonstrated most clearly in Chapter 4's examination of the many human and non-human actors that played a role in the FTC's hearing on the Hammond organ.

While some scholars have accused ANT of failing to account for the role of power in society, others have argued that the method offers a clear way of examining how unequal power relationships are carried out and maintained. Susan Ormrod has suggested that ANT can most effectively act as a critique of power when combined with an analysis of discursive practices that Michel Foucault has described as regimes of truth that sanction certain practices and subjectivities and censure or disallow others.[55] This combinatorial approach is essentially the one that I take here, by tracing the relationships between human users and musical instruments and analyzing the discursive strategies of critics and performers. Further, this object-oriented approach need not, as some have suggested, turn our attention away from human activity nor diminish the importance of human actors.[56] To the contrary, I have found that paying attention to objects has sharpened my awareness of the physical human activity involved in building or playing a musical instrument.

Vivian Anette Lagesen has recently pointed out that ANT's emphasis on action already resonates with theories of performativity, like Judith Butler's notion of gender as a "reiterated

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[55] Susan Ormrod, "Feminist Sociology and Methodology: Leaky Black Boxes in Gender/Technology Relations," in *The Gender-Technology Relation: Contemporary Theory and Research*, ed. Keith Grint and Rosalind Gill (London: Taylor & Francis, 1995), 38-40; Michel Foucault, *Discipline and Punish: The Birth of the Prison* (New York: Pantheon Books, 1977).

[56] For one such critique see *Strange Sounds*, 31-34.

acting" that is both persistent and unstable.[57] One concept that is particularly helpful in drawing out the performative elements of encounters between humans and objects is the notion that objects possess a "script." This idea has been explored separately by STS scholar Madeleine Akrich within the framework of ANT and by cultural historian Robin Bernstein, who works from the perspectives of material culture and performance studies.[58] Akrich compares the script of a technological object to that of a film, noting that both, "define a framework of action together with the actors and the space in which they are supposed to act." Akrich emphasizes that users may or may not chose to fill roles scripted for them by inventors or designers of objects; users may also invent entirely new roles for themselves in relation to objects.[59] Similarly, Bernstein writes that "the term *script* denotes not a rigid dictation of performed action but, rather, a necessary openness to resistance, interpretation, and improvisation."[60] To say that objects script behavior is to propose, in Bernstein's words, that "agency, intention, and racial subjectivation co-emerge through everyday physical encounters with the material world."[61] Although Bernstein's focus is race, her conceptual framework applies equally well to performances of other aspects of identity including gender and sexuality. Both Bernstein and Akrich seek to understand how the use of objects—whether it adheres to or resists scripts—results in meanings, values, and moral judgments. My focus is on the complex give-and-take that occurs between performer and instrument as each acts on the other, and in turn how those encounters give rise to particular meanings and values in broader cultural and social networks. I rely most heavily on

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[57] Vivian Anette Lagesen, "Reassembling Gender: Actor-Network Theory (ANT) and the Making of the Technology in Gender," *Social Studies of Science* 42, no. 3 (2012): 442-448; Judith Butler, *Bodies That Matter: On the Discursive Limits of "Sex"* (New York: Routledge, 1993).
[58] Madeleine Akrich, "The De-Scription of Technical Objects," in *Shaping Technology/Building Society: Studies in Sociotechnical Change*, ed. Wiebe E. Bijker and John Law (Cambridge: MIT Press, 1992), 205-224; Robin Bernstein, "Dances with Things: Material Culture and the Performance of Race," *Social Text* 27, no. 4 (Winter 2009): 67-94.
[59] "The De-Scription of Technical Objects," 208.
[60] "Dances with Things," 68.
[61] "Dances with Things," 69.

this concept in my discussion of theremin performances in Chapter 3.

Conclusions

This dissertation contributes to conversations currently taking place in multiple disciplines. At a time when musicologists turn more and more to questions about the body in performance, this project demonstrates how such concerns can be incorporated into electronic music historiography, an area largely unexamined from performance perspectives. Similarly, my dissertation offers an approach to critical organology that is deeply engaged with questions about performativity by highlighting the role that the human body plays in the construction of musical meaning. More generally, the project adds to a growing body of scholarship on gender, race, and technology and addresses interdisciplinary concerns about the performance of identity, the agency of objects, and the multi-sensorial nature of cultural experiences.

In the chapters that follow, I reach several main conclusions. First, I demonstrate that the early reception history of electronic sound was far more complex than is generally understood. Rather than sounding strange, alien, or mechanical, the Telharmonium, theremin, and Hammond organ conjured many associations with human and acoustic sounds in the minds of listeners. In fact, many listeners experienced the sounds of these instruments as hyper-expressive and even human. My dissertation also indicates that women and people of color, communities often excluded from histories of electronic music and technology, actively shaped electronic music practices and traditions. I further argue for a nuanced approach to understanding the role of technology in our music histories, one that does not exclude or ignore human bodies and agencies. Finally, although many historians of electronic music tout the development of the home studio as the beginning of the democratization of the genre, my study of Hammond,

theremin, and Telharmonium practices demonstrates that electronic music was never solely the property of the academy and the government-sponsored studio but rather impacted musical life in the United States beginning in the early years of the twentieth century. Although this dissertation is limited to a fraction of electronic music's objects, it shows that the incorporation of material culture studies into electronic music historiography can yield bold insights into our understanding of this music's past and present.

Chapter 2

The Telharmonium: Sonic Purity and Social Control

> Please look at to-day's music," she said, handing me a card, "and tell me what you would prefer."
> The card bore the date of Sept. 12, 2000, and contained the longest program of music I had ever seen.
> It was as various as it was long, including a most extraordinary range of vocal and instrumental duets, quartets and various orchestral combinations.
> I remained bewildered at that prodigious list until Ethel's pink finger tip indicated a particular section of it, where several selections were bracketed, with the words "5 p.m." against them; then I observed that this prodigious program was an all-day one, divided into 24 sections answering to the hours.
> I indicated an organ piece as my selection. She, crossing the room, merely touched one or two little screws, and at once the room was filled with the music of a grand organ anthem; filled, not flooded, for by some means the volume of melody had been graduated to the size of the apartment.
> Such music, so perfectly rendered, I had never expected to hear.
> As she spoke the sound of violins filled the room with the witchery of a summer night.
> When this had ceased, she said: "There are a number of music rooms in the city, perfectly adapted acoustically to the different sorts of music. These halls are connected by telephone with all the homes of the city whose people care to pay the small fee, and there is none, you may be sure, that do not.
> The corps of musicians attached to each hall is so large that, although no individual performer, or group of performers, has more than a brief part, each day's program lasts through the 24 hours.
> There are on that card for to-day distinct programs of four of these concerts, each of a different order of music from the others, and any one of the four pieces now going on that you prefer you can hear by merely pressing the button which will connect your house wire with the hall where it is being rendered.
> All of our bedchambers have a telephone attachment at the head of the bed by which a person who may be sleepless can command music at pleasure, of the sort suited to the mood.
> Father will show you about the adjustment before you go to bed to-night and with the receiver at your ear I am quite sure that you will be able to snap your fingers at all sorts of uncanny feelings if they trouble you again."
> —Edward Bellamy, *Looking Backward, 2000-1887*

This chapter's lengthy epigraph is taken from Edward Bellamy's enormously popular utopian novel *Looking Backward* published in 1888. The book chronicles the experiences of its

protagonist, Julian West, who awakes in the year 2000 after over a century of undisturbed slumber. The passage above describes the radical new music technology West encounters; the same text appeared in a 1906 brochure for a new musical instrument about to be installed in New York City, the Telharmonium. The instrument produced musical sound electronically with the use of over a hundred large dynamos, or electric generators. Performers controlled its sound via a complex interface loosely resembling that of an organ. Telephone wires distributed music produced by the Telharmonium to homes and businesses in the city, much as Bellamy imagined might be done in the year 2000.

This chapter examines the Telharmonium's reception through the lens of surviving documents like *Looking Backwards* and the Telharmonium brochures and reviews that quoted it. These documents—most of them published in newspapers and magazines—are not only useful records for historians today, but also actively participated in the Telharmonium's history. Printed articles and essays became actors when they influenced others—according to Bruno Latour, when they made someone or something do something.[1] Bellamy's book, for example, spawned the formation of over a hundred "Bellamy Clubs" as well as the Nationalist political movement. On a less grand scale, descriptions of the Teharmonium and its sound printed in newspapers, magazines, and promotional material prompted New York City residents and journalists to attend performances and encouraged them to ascribe particular characteristics to the instrument and its sound.

In this chapter and the two that follow it, my main interest in the essays, reviews, and promotional material that accompanied and shaped the debut of new instruments like the Telharmonium is the role that these texts played in establishing meaning and value for the new

[1] See Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2005).

electronic sounds they described. By examining the rhetoric in these records, I seek to understand how contemporary listeners made sense of the new electronic musical sounds they heard. Like all actors, neither these records nor the journalists, publications, and marketers that produced them were neutral. As a result, the surviving reception histories I examine in this dissertation emphasize the roles of some actors in their respective instrument's networks and diminish the work of others. The concert-goers who heard the Telharmonium and the readers who learned about it in publications like *McClure's* were comprised primarily of middle- and upper-class white audiences, like the pink-fingered Ethel in Bellamy's *Looking Backwards*. The surviving reception history of the instrument's two seasons in New York City is thus one focused on the sensibilities of a specific and privileged body of American readers and listeners. As this chapter will show, the work of performers who played the instrument and laborers who built it largely fell out of the picture painted by the journalists and marketers who wrote about the instrument.

The surviving press accounts of the Telharmonium give the impression that the instrument was immensely popular, if only for a brief time. Tens of thousands of people attended concerts in Telharmonic Hall at Broadway and 39th Street, where the New York Electronic Music Co. housed the instrument and held public concerts. Wealthy New Yorkers heard the instrument in the city's most lavish restaurants, including the Café Martin and Sherry's, where Telharmonic service began early in its first season. The Plaza Hotel even wired every single guest room for Telharmonic service (and threatened to sue the New York Electrical Co. when its operations ceased).[2] Journalists who traveled to see and hear the instrument composed glowing reports about it. One of the earliest and most significant accounts of the Telharmonium was an often-quoted feature story in the leading muckraker journal *McClure's* by one of its most famous

[2] Reynold Weidenaar, *Magic Music from the Telharmonium* (Metuchen, NJ: Scarecrow Press, 1995), 223.

investigative journalists, Ray Stannard Baker.[3] Similarly laudatory accounts followed throughout the summer of 1906 in the *New York Times*, *Electrical World*, *Scientific American*, *Literary Digest*, *Gunter's Magazine*, and other outlets.[4] *The Outlook* called the new instrument a "marvel of ingenuity," while *Holyoke's Daily Transcript* pronounced it "the most marvelous invention of the age."[5] Celebrity endorsements were numerous. Mark Twain, who became one of the earliest individual Telharmonium subscribers, was widely quoted on his enthusiasm for instrument.[6] Several sources quoted Alfred Hertz, conductor of the Metropolitan Opera, saying, "it is wonderful, and I believe in telharmony as an art of music."[7] Another Met conductor, Arturo Vigna, reportedly predicted that the Telharmonium meant "the death of the present orchestral system," while famed tenor Enrico Caruso foresaw a musical "revolution."[8] Summing up the press coverage, a writer for *Electrical World* noted that "no other recent invention of merit has enjoyed such sustained and widespread publicity."[9]

Yet by the end of 1908, it was clear that the Telharmonium was a resounding failure. The inventor, Thaddeus Cahill, and his brothers pressed on and built a another model of the instrument which they briefly installed in the city a few years later, but it too failed.

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[3] Ray Stannard Baker, "New Music for an Old World," *McClure's Magazine* (July 1906). Baker covered a number of important labor stories before his tenure at *McClure's* including the Pullman strikes and riots in Chicago. His essay on the Telharmonium was his last at *McClure's*. See *Magic Music*, 77-78 .

[4] "The Generating and Distributing of Music by Means of Alternators," *Electrical World* (March 10, 1906); "Science and Invention: Electrical Music" *Literary Digest* (April 14, 1906); "Magic Music from the Telharmonium," *New York Times*, December 16, 1906; Charles Figaro, "The Telharmonium—An Apparatus for the Electrical Generation and Transmission of Music," *Scientific American* (March 9, 1907); A. B. Easterbrook, "The Wonderful Telharmonium," *Gunter's Magazine* (June 1907).

[5] "Century's Musical Wonder," *Holyoke's Daily Transcript*, March 21, 1906; "The Telharmonium" *The Outlook* (May 5, 1906).

[6] The following quote was particularly popular: "The trouble with these beautiful, novel things is that they interfere so with one's arrangements. Every time I see of hear a new wonder like this I have to postpone my death right off. I couldn't possibly leave the world until I have heard this again and again." Quoted in "Twain and the Telephone" *New York Times*, December 23, 1906. Also see, "Mark Twain and Twin Cheer New Year's Party," *New York Times* Jan 1, 1907.

[7] "Musical Comedy Week," *New-York Daily Tribune*, February 3, 1907.

[8] *Telharmonic Hall Program: Week of December 30th 1907*.

[9] "Telharmonium Concerts," *Electrical World* (January 19, 1907).

Unfortunately none of the (three total) Telahrmonium instruments survived. The machines' eventual ends are unknown, but given the strained finances of the Cahills and their business partners, historians assume that the instruments' parts were sold for scrap. No recordings of the instruments were made. The Telharmonium's rapid ascent and fall resembled the commercial trajectory of RCA's theremin, discussed in Chapter 3, but the Telharmonium's failure was far more definitive. Although RCA's theremin flopped, other builders and manufacturers adopted the instrument in subsequent decades, finding new uses and contexts for it; this never happed for the Telharmonium. The difference is in large part due to the instruments' respective technologies: the theremin was vastly smaller and cheaper to produce than the Telharmonium, in large part due to the development of the audion, a device that aided the conversion of electrical signals into audible sound. Before the development of the audion, only electrical signals of considerable strength could be converted into sound. The Telharmonium's resulting size and expense (and, by the 1920s, outdated technology) prohibited the kind of repurposing and renewal that mark the theremin's nearly hundred-year history. But, like the theremin, the Telharmonium's failure has much to teach us about the myriad actors and events behind a new instrument's success or downfall.

Although not immediately apparent from contemporary reports of the Telharmonium, the instrument's failure can be traced in part to the enormous amounts of human capital and labor, raw materials, and electrical power required for its construction and use. As Latour notes, new technologies require advocates who can convince others to support, adopt, or advocate for the new product; the Telharmonium's needs were particularly staggering.[10] Without powerful advocates—we will see that one industrialist in particular, Oscar T. Crosby, played a critical

[10] Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge: Harvard University Press, 1987), 104-132.

role—the instrument could not have been constructed, installed, or maintained. As its name implied ("tel" referring to the communication technology, "harmonium" to the keyboard instrument) the Telharmonium was not just a musical instrument, but also a system for the distribution of music, requiring an infrastructure of telephone wires and conduits to distribute its sound to homes and businesses. The network involved in the construction and installation of the instrument in New York City included industrialists, inventors, laborers, telephone company administrators, local government officials and lawmakers, raw materials, machines for making parts, telephone wire conduits, telephone wires, and modified telephone receivers in homes and businesses. Difficulties in maintaining this network played a major role in the instrument's demise.

The Telharmonium's fate, however, did not hang entirely on economic and logistical factors, but also on the network that established its reputation, including audience members, journalists, promotional materials, press, and the many buildings, objects, and people in New York City that came into contact with the instrument. It is clear that the instrument's reputation rested in large part on its timbre and, in particular, on the notion that its sound was especially pure. This quality of the Telharmonium's sound contributed to interpretations of the instrument as a technological wonder—and one in distinct contrast to the scratch of the "talking machine" or phonograph. Interpretations of the instrument's sound as pure also drew from existing rhetoric in the field of acoustics, in particular the well-known writing of Hermann von Helmholtz. Many journalists, writing for publications from the *New York Times* to *McClure's* to *Electrical World*, also believed that this quality of the instrument's timbre made it particularly well-suited to the "classical" melodies that made up much of its limited repertory; lyrical, moderately slow melodies like the oboe and flute obbligato from Rossini's *William Tell* Overture and Schumann's

Träumerei were staples. In contrast, many noted that the instrument could not satisfactorily render "lighter" more popular music like ragtime.

Perceptions of the Telharmonium's timbre as "pure" were intimately tangled up with racialized and gendered discourses. Both journalists and marketers invested meaning in the instrument by drawing on particular cultural and societal phenomena—including the so-called technological sublime, acoustical sciences, popular music, and notions about musical goodness—that were deeply embedded in racial, class, and gender hierarchies. To many journalists, the instrument's pure sound represented a technological and artistic achievement of a white civilized citizenship. In rhetoric about the timbre of sine waves, which Cahill designed the Telharmonium to generate, physicists like Helmholtz associated the quality of sonic purity with notions of whiteness and femininity. The Telharmonium's actual and projected use and impact as a musical instrument and distribution tool were caught up in the politics of racist anti-ragtime sentiments and notions about "good" music built in part on eugenicist beliefs. Each of these technological and musical aspects of the Telharmonium's reception intersected with one another and played out against the racially volatile backdrop of turn-of-the-century U.S.

At the time of the Telharmonium's installation in New York City, immigration, labor unrest, and the increasing popularity of African-American cultural forms were generating a host of changes in the U.S. population and life, challenging what it meant to be American and generating anxiety in the process.[11] Many looked to science to ease these anxieties. Darwin's theory of evolution especially dominated discourse about race, culture, and technology among

[11] On immigration and race see: Matthew Frye Jacobson, *Whiteness of a Different Color: European Immigrants and the Alchemy of Race* (Cambridge: Harvard University Press, 1998); Ali Behdad, *A Forgetful Nation: On Immigration and Cultural Identity in the United States* (Durham, NC: Duke University Press, 2005). On the Great Migration and music: Davarian L. Baldwin, "Our Newcomers to the City: The Great Migration and the Making of Modern Mass Culture," in *Beyond Blackface: African Americans and the Creation of American Popular Culture, 1890-1930*, ed. W. Fitzhugh Brundage (Chapel Hill, NC: University of North Carolina Press), 159-180.

conservatives and progressives alike, and acted as scientific "proof" for a range of beliefs and disciplines built on ideas of racial inequality.[12] Rhetoric about both music and technology frequently played on fears that the nation's civilized white citizenship was under threat from the growing presence of "backward" non-white races.[13] In the context of these fears, eugenicists offered an explanation for and solution to the country's perceived racial problems.[14] Given the prominence of these ideas in political, scientific, and popular discourse, it should be no surprise that eugenicist beliefs and racist spins on Darwinian theory shaped rhetoric about the Telharmonium in ways both subtle and explicit.

What emerges when we trace these ideologies in the context of the Telharmonium's reception is that the instrument's champions viewed it as a means of enhancement for white bodies and control over non-white ones. Commentators imagined that the instrument's pure sound could awe and silence the musical sounds of immigrant street musicians and even remove their bodies from an area. Some believed that the instrument could be an effective means of worker control by increasing productivity in factory and retail environments while decreasing the likelihood of labor unrest and strikes. While the Telharmonium's sound was thus potentially a tool for controlling the country's lower classes and racial "others," proponents simultaneously believed that Telharmonium music was palliative for white bodies. Many imagined that the pure sound of the Telharmonium could sooth the symptoms of neurasthenia—a distinctly white disease—and increase domestic serenity in white middle class homes. I will argue that the

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[12] See Peter J. Bowler, *Evolution, the History of an Idea* (Berkeley: University of California Press, 1984), especially Chapter 8.

[13] Sarah E. Chinn, *Technology and the Logic of American Racism: A Cultural History of the Body As Evidence* (London: Continuum, 2000); Ronald M. Radano, "Hot Fantasies: American Modernism and the Idea of Black Rhythm," in *Music and the Racial Imagination*, eds. Ronald Radano and Philip V. Bohlman, (Chicago: The University of Chicago Press, 2000), 459-480; Susan C. Cook, "Talking Machines, Dancing Bodies: Marketing Recorded Dance Music before World War I," in *Bodies of Sound: Studies Across Popular Music and Dance*, eds. Sherril Dodds and Susan C. Cook (Burlington: Ashgate, 2013), 149-162.

[14] Diane Paul, "Eugenics and the Left," *Journal of the History of Ideas* 45, no. 4 (October - December, 1984): 567-590.

instrument's brief popularity rested in large part on its imagined potential to shape bodies—whether by curing or controlling them.[15] At the same time, however, the instrument's apparent ineptitude with increasingly popular music with origins in non-white cultural traditions, like ragtime, limited its commercial usefulness.

Funding and Building the Telharmonium

Thaddeus Cahill conceived of and oversaw the construction of three Telharmoniums from around 1892 through 1911. Of the three models, the second, completed in 1906, was the most widely heard and discussed; it is the subject of this chapter.[16] Cahill began work on the Telharmonium while living in Washington D.C. and studying law. His family, including brothers Arthur and George, who would collaborate with Thaddeus on the Telharmonium for years, joined him in the city a few years later. In 1896, Cahill submitted his first patent application for the Telharmonium, although he continued to refine and expand the instrument's design.[17] At its most basic, Cahill's patent described an instrument with a playing interface similar to that of an organ that generated musical tones by electricity and distributed those tones from a central station to many locations via wire. None of these ideas was revolutionary. Telephone concerts had occurred as early as 1889 in the U.S. and became relatively common overseas in cities like Paris and Budapest in the years preceding Cahill's application.[18] Nor was the capacity to produce

[15] Of course, control has been a central concern of human society for as long as it has existed. See, for example, Jacques Attali's discussion of the musician's role in society in *Noise: The Political Economy of Music*, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1985), 26.
[16] Cahill was a serial inventor and many of his projects involved music. As a teenager in his hometown of Oberlin, Ohio, he invented a wind valve mechanism that would allow organists to control the volume of their instrument. *Magic Music*, 9-10
[17] Related patent applications stretched into the twentieth century. *Magic Music*, 18-19.
[18] See *Magic Music*, 17 for an overview of Budapest's Telefon Hírmondó, an extensive system of telephone broadcasting of news, concerts, and lectures, which began in 1893. Sarah Fuchs Sampson, "Cultivating the Connoisseur: Technologies of Listening and the Paris Opéra's Fin-de-siècle Audience," Paper read at the AMS Annual Meeting, Milwaukee, November 7, 2014.

musical tones by electrical impulses unknown. Rather, it was the grand scale of the Telharmonic system that made Cahill's invention remarkable and new.

To produce electric currents strong enough to be converted into sound, Cahill designed a system of dynamos, cylindrical electric generators, mounted on large rotating shafts with brushes or cogs arranged along their outer edges. The rotation of the shafts moved the dynamos, and as they spun their cogs made and broke electrical connections, producing a pulsating electric current. The rate of each current's pulses corresponded with the frequency of an audible pitch. Cahill designed the instrument to produce pitches in both equal and just temperaments, allowing players to blend justly-tuned harmonics to create various timbres but also to play melodies and harmonies in just intonation. The available pitches varied on each of the three Telharmonium models, although the basic scheme remained the same. An ideal Telharmonium, for Cahill, had twelve pitch shafts, one for each tone in an equally-tempered scale. Many dynamos were mounted on each of the twelve shafts, each producing a different pitch, some designated as fundamentals, some as harmonics or overtones. Lower fundamental pitches had five or six dynamos grouped together, with one dynamo for the fundamental and the remainder for pitches in its overtone series. Higher fundamental pitches had fewer dynamos—just two in the case of the highest.[19]

Players controlled the Telharmonium using an interface comprised of keyboards, switches, and pedals. When a player depressed a key on one of the instrument's pitch keyboards, electric current flowed from the corresponding dynamo (or dynamos, if additional pitches were acting as harmonics) through a tone mixer and eventually to the instrument's output. The electrical signals generated by the Telharmonium traveled along wires (somewhat thicker than those used for telephone technology) from the instrument to homes and businesses. The

[19] *Magic Music*, 29-31.

endpoints for the electrical signals were modified telephone receivers, inside which the electric signal caused a thin diaphragm to vibrate, thus transforming electricity into sound. A paper cone attachment provided moderate amplification.

Reynold Weidenaar, who has extensively researched the Telharmonium, has demonstrated that the work of one man in particular, Oscar T. Crosby, was critical to the Telharmonium's brief success. Crosby was a prominent businessman in the Washington area who had made a fortune through investments in electric railroads and utilities.[20] Cahill and his brothers caught Crosby's attention with a prototype Telharmonium that they built from 1898 to 1900 in their lab in Washington. Crosby had the wealth, knowledge, and motivation to navigate corporation and utility laws, identify and secure investors, and, ultimately, see the Telharmonium installed for two seasons in New York City.[21] He oversaw the formation of five corporations to handle the business of the Telharmonium, including the New England Electric Music Co., the Eastern Cahill Telharmonic Co., the Pacific Coast Telharmonic Co., and the New York Electric Music Co.[22] Perhaps most importantly, Crosby was adept at convincing others to commit financial resources to the Telharmonium; the New York Electric Co. alone sold just under $680,000 in stock by the spring of 1907. It was thus Crosby's fundraising acumen—his ability to enlist others in the Telharmonium's cause—that enabled the construction of the instrument and its installation in New York City.

Crosby arranged for construction to take place in Holyoke, Massachusetts, a town which

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[20] *Magic Music*, 35. For more by Weidenaar on the Telharmonium see his dissertation: "The Telharmonium: A History of the First Music Synthesizer, 1893-1918," (PhD diss., New York University, 1989). Weidenaar also maintains an online archive of source materials related to the instrument at http://magneticmusic.ws/Frame.htm (accessed March 18, 2015).

[21] Crosby's partner, Frederick C. Todd, also contributed to the project. *Magic Music*, 35.

[22] *Magic Music*, 57-58, 83, 85, 190, 209. Frederick C. Todd, incorporated a sixth corporation, the Telharmonic Securities Co., in 1907 when Crosby withdrew from the project.

had gone through several stages of industrialization and where space was available cheaply.[23] The Cahills moved there in 1902 and began work the next year in a leased section of the Cabot Street Mill where nearly all of the components of the Telharmonium would be produced and assembled by about 50 laborers.[24] Money that Crosby contributed to and helped raise for the New England and New York Electric Music Cos. paid the lease and financed the operation's payroll, power, and raw materials. The instrument that the Cahills and their employees built in Holyoke was massive, widely reported as weighing 200 tons and filling the leased factory space. Because of expense, the lab produced only eight pitch shafts—rather than the desired twelve—those corresponding to the notes C, D, E-flat, E, F, G, A, and B-flat.[25] Each shaft bore 18 dynamos, each of which could serve as the source for either harmonic or fundamental pitches. Although the instrument's total range was about seven octaves, because of the four missing shafts, not all equally-tempered pitches were available in each octave.[26]

The second Telharmonium interface, shown in Figure 1, resembled that of an organ, though one with exposed wires, many manuals, and a complex system for controlling dynamics. Because of the instrument's capacity for just intonation, this Telharmonium had 36 working keys to the octave, accessible on four separate manuals whose black keys were not grouped in twos and threes as on a piano, but alternated with each white key.[27] The multiple keyboards allowed for the performance of major and minor chords with justly tempered thirds and provided access

[23] *Magic Music*, 52.
[24] *Magic Music*, 80.
[25] *Magic Music*, 99.
[26] *Magic Music*, 99-104 for a complete description of the instrument's pitch layout, including Weidenaar's speculation that the instrument's lowest octave was achieved through the use of difference tones rather than being generated directly.
[27] Weidenaar estimates that each keyboard set contained a total of 336 keys, of which 153 were working while the instrument was installed at Telharmonic Hall. Conflicting accounts from Cahill, the press, and performers make this number difficult to verify, but Weidenaar's reasoning is seems sound. *Magic Music*, 105.

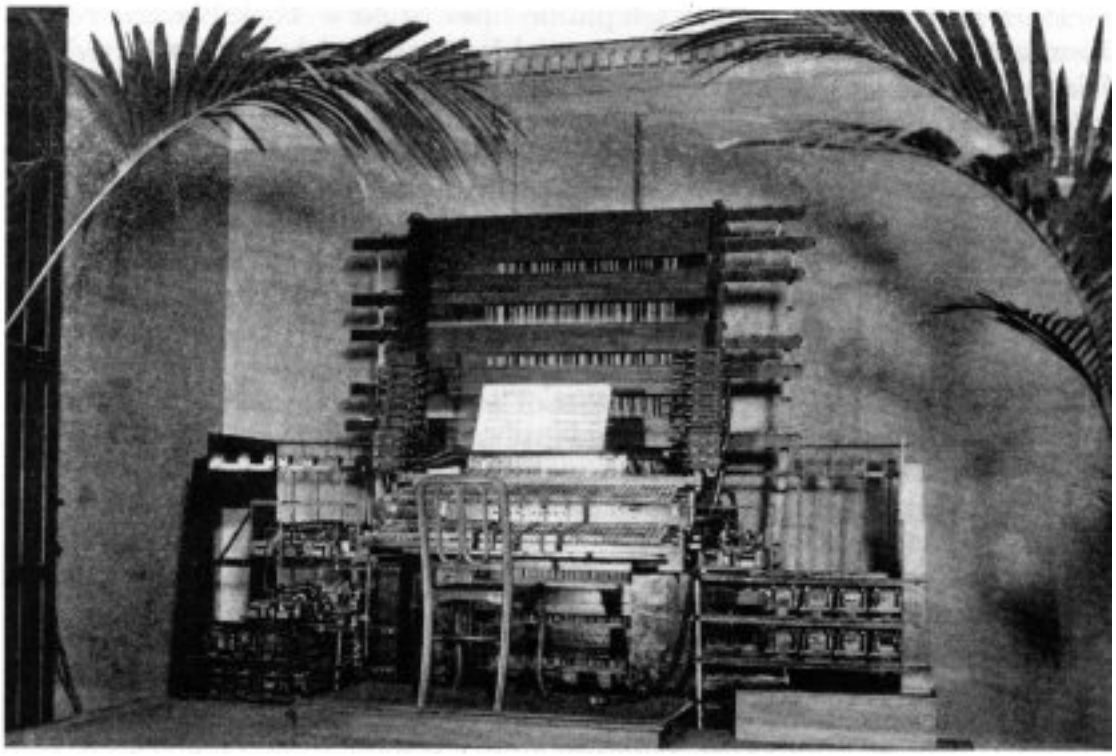

Figure 1. The Telharmonium Interface. New York Music Co., *Telharmony*, New York, December 1906.

to tones sounding at the seventh harmonic.[28] Players controlled timbre through a series of switches, which allowed them to select the harmonics to be included when they depressed the keys and set the strengths of those harmonics at various levels. Four electrical swell foot pedals allowed for gradual changes in the instrument's volume, while a "dynamic manual" gave performers control over more sudden volume changes and required that at least one of its keys was depressed for the instrument to sound.[29] At the time of its installation in New York City in Telharmonic Hall, described below, the Telharmonium included two full sets of these four-manual playing interfaces, and three by the time it was dismantled.[30] Each of these four-manual sets required two performers to properly operate; one to play the pitch manuals and the other to

[28] *Magic Music*, 65.
[29] *Magic Music*, 112-13.
[30] *Magic Music*, 105, 219.

control timbre and dynamics.[31] Telharmonium performers faced a steep learning curve, particularly given the instrument's multifaceted system for controlling dynamics and the continuously-rotating black and white keys on its manuals.

Cahill relied heavily on one performer, Edwin Hall Pierce, for input on the Telharmonium's interface and the development of a workable playing technique.[32] Pierce was a German-born violinist and pianist who had worked as a music teacher in the Midwest and New York state before moving to Holyoke. There, he held positions as organist at St. Paul's Church and director of the Holyoke College of Music. He helped Cahill determine that the Telharmonium's interface should facilitate the performance of justly tuned thirds above all other intervals, because these were the most audibly different from their equally-tuned counterparts.[33] Along with other musicians in Holyoke, Pierce experimented with the instrument during its construction to create timbres that mimicked existing instruments like the clarinet, cello, and trumpet, and explore new sounds unique to the Telharmonium. He also developed systems for notating and fingering that facilitated justly-tuned performances on the new instrument. According to his own account, written over two decades later, Pierce initially developed these systems by working with an unnamed chorale, marking the thirds of all major chords with grave accents to indicate they should be lowered. For minor chords, Pierce played lower fundamental and fifth pitches to put them in equal temperament with the third. He also discovered that the addition of the seventh harmonic to a major chord produced "such a *very* smooth-sounding chord of the seventh that it actually seemed to demand no resolution" and thus opted to add the harmonic to many final tonic chords.[34]

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[31] *Magic Music*, 117.
[32] *Magic Music*, 60.
[33] Edwin Hall Pierce, "A Colossal Experiment in Just Intonation," *Musical Quarterly* (January 1, 1924): 328.
[34] "A Colossal Experiment in Just Intonation," 329.

Although Pierce claimed that these justly-turned adjustments were possible to make "without undue difficulty," the instrument's complicated interface almost certainly limited the repertory available to performers. Perice's system required keyboardists to play single chords on separate keyboards already made difficult by their continuous alternation of black and white keys. One could not simply transfer piano or organ skills to the Telharmonium, but had to learn an entirely new fingering system. These difficulties undoubtedly made repertory with slow tempi more viable than fast pieces. Other aspects of the instrument further limited the Telharmonium's repertory. The construction of eight rather than twelve pitch shafts made it impossible to play in the four missing shafts' keys and their relative minors. And, for most of its existence, the instrument included just two sets of manuals, making it capable of producing just two different timbres at once, thus limiting its capacity to mimic even moderately-sized ensembles. One of Pierce's earliest and, he believed, most effective transcriptions for the Telharmonium was of Beethoven's Op. 87, Trio in C Major for two oboes and English horn (mostly likely the Adagio movement).[35] The Telharmonium could satisfactorily imitate the work's two woodwind timbres, and the slow tempo allowed performers to execute the justly tuned thirds notated by Pierce.

In the summer of 1906, the Cahill brothers and factory workers dismantled the second Telharmonium and shipped it to New York City. Crosby continued to raise funds through investments in the New York Electric Music Co., which covered the expenses of transporting and installing the instrument, as well as its operation and promotion in New York City. The company leased a building at Broadway and 39th Street, which housed "Telharmonic Hall," a performance space that sat directly above the massive instrument installed in the basement. Crosby himself coordinated the distribution of Telharmonium music.[36] He negotiated the use of

[35] "A Colossal Experiment in Just Intonation."
[36] See *Magic Music* for extensive details on Crosby's role.

conduits owned by the New York Electric Co. (part of the American Telephone and Telegraph Co., or AT&T, monopoly) to carry wires that would distribute Telharmonic music to homes and businesses in the city. This arrangement allowed Crosby, at least temporarily, to forgo the pursuit of an independent franchise for the New York Electric Music Co. from the city, a requirement for the installation of telephone wires. Crosby arranged for lines to be laid along Broadway from 47th to 23rd Street and up 5th Avenue running to 34th Street, providing service to several restaurants, hotels, theaters, and a few individual subscribers.[37] Eventually, he orchestrated the passage of a new state statute that would allow the New York Electric Music Co. to install its own lines.

By all accounts, the first season at Telharmonic Hall, which opened in the winter of 1907, was an enormous success, one greeted by generous and warm press coverage and enthusiastic attendance. The second season, however, suffered from both the public's lagging interest and a financial panic beginning in October of 1907 that settled into a depression in subsequent months. That season, Telharmonic Hall operated under a limited schedule. Despite the promise of the first season, the enterprise's success depended on far more than attendance at Telharmonic Hall; Crosby's business plan hinged on the procurement of paid subscriptions. Here was where the real difficulty lay. Crosby's dependence on New York Telephone Co.'s lines and the steep cost of installation and fees prevented the expansion of the Telarhmonic system beyond its original confines in New York's theater district, and thus the procurement of new subscribers.[38]

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[37] *Magic Music*, 138.

[38] By 1908, the New York Telephone Co. was eager to end its contract with the New York Electric Music Co. in the wake of complaints about music "leaking" from Telharmonic wires into regular telephone wires. "Music on Wires," *New York Globe and Commercial Advertiser*, January 31, 1907; also see *Magic Music*, 136. No legal foundation existed for a company distributing music to procure a telephone franchise from New York City, forcing Crosby to lobby for a new state statute before he could even consider applying for a franchise from the city's Board of Estimate. Although he eventually succeeded on both counts, the New York Electric Music Co. never laid any of its own telephone wires, in part because of large fees required by the Board of Estimate. See *Magic Music*, 165, 182-195, for a detailed account of these negotiations.

Eventually, the New York Electric Music Co. ran out of money. By the end of Telharmonic Hall's second season its affairs were in "chaos," and Crosby extracted himself from the project.[39] The Hall closed its doors in the spring of 1908 and did not reopen. The various companies founded by Crosby to support the business of the Telharmonium ceased to operate one by one.

In the end, expectations for the Telharmonium far outstretched reality. Despite initial success with New York City audiences and enthusiastic coverage in national magazines, the instrument's massive costs outpaced Crosby's ability to turn a profit.[40] After the failure of the multiple corporations established by Crosby, the Cahill brothers remained dedicated to the project for a number of years. In 1908 they dismantled the Telharmonium in New York, shipped it back to Holyoke, and began working on a new, even larger, instrument. They leased another building in New York City and began to install the massive new instrument, but persistent engineering troubles and an eventual lack of funds prevented more than the production of a few concerts in Holyoke in 1910 and New York City in 1912.[41]

Audience and Place: The Telharmonium in New York City

As Weidenaar has demonstrated in detail, the instrument's location in New York City was critical to its brief success there. Telharmonic Hall was just blocks away from "The Great White Way," the portion of the city's theater district on Broadway from 23rd to 34th Streets recently transformed by the illumination of electric lights. The Hall was also near a portion of 5th Avenue that was home to the city's most prestigious and lavish restaurants and hotels including Sherry's, the Café Martin, the Hotel Imperial, the Waldorf Astoria, and the Normandie Hotel, all of which became Telharmonium subscribers. Weidenaar notes that in the early years of the

[39] See *Magic Music*, 222, for more details.
[40] *Magic Music*, 223.
[41] *Magic Music*, 323-55.

twentieth century, restaurants, including those in hotels, were among the largest employers of musicians in the city, and that many hired major stars in addition to regular ensembles (Enrico Caruso, for example, sang at the Waldorf Astoria). Musical programs at upscale cafés like Sherry's generally included a mix of popular tunes and familiar western art music melodies.[42] The addition of Telharmonic music augmented standard musical offerings in establishments that were early adopters of new domestic technologies like indoor electric lighting and air conditioning. A Telharmonic subscription offered yet another amenity to the businesses' elite clientele while simultaneously introducing them to the latest in domestic technologies.

As technology enhanced the dining rooms of 5th Avenue and bright lights transformed Broadway into a nighttime spectacle, the city as a whole was undergoing radical changes. Driven in part by the cheap labor required by the nation's growing industrialization and by political and economic upheavals overseas, European immigration rose rapidly beginning around the 1840s, bringing hundreds of thousands of people to the United States. Cahill's own parents were Irish immigrants who came to the U.S. during the mid-nineteenth century.[43] Many of the newcomers settled in northeastern cities like New York, where they were often confined to large urban ghettos. The population of New York City, where Ellis Island became the main point of entry for immigrants beginning in 1892, grew from around 3.4 million to over 4.7 million from 1900 to 1910, with much of the growth attributable to new immigrants.[44] During the Telharmonium's years in the city, Italian and Eastern European immigrants made up the majority of newcomers to

[42] *Magic Music*, 128-35.
[43] *Magic Music*, 4-5.
[44] Ali Behdad, *A Forgetful Nation: On Immigration and Cultural Identity in the United States* (Durham, NC: Duke University Press, 2005), 3.

both New York City and the nation. Italian and (largely Jewish) Russian immigration both peaked in 1907 at over 285,00 and 258,000 respectively.[45]

These groups were able to come to the U.S. because of a 1790 naturalization law that allowed entrance to "free white men"—a category that excluded Asians and African Americans—but it is important to recognize that most Americans, and often the immigrants themselves, viewed the newcomers as racially distinct from Anglo-Saxons. As Matthew Frye Jacobson has argued, whiteness was far from monolithic in the period of intense European immigration from around the 1840s to the 1920s, but rather was fractured, contested, and mutable.[46] In response to the growing numbers of immigrants, seen by many as undesirable, a hierarchy of whiteness emerged, spanning politics, science, and popular culture. Scientific, political, and cultural authorities based a particular group's racial status on its imagined "fitness for self-government," an American political ideal that dated to the revolution.[47] In other words, whiteness determined whether or not a particular group was fit to be part of the national citizenship, and vice versa. Jacobson notes that racial categorizations varied by geographic location; while immigrant groups on the western frontier and coast were often seen as more Caucasian, the opposite was generally true in northeastern cities like New York.[48] Cahill and his siblings, for example, by all accounts lived as fully assimilated "white" Americans, the result of their Midwestern upbringing in Oberlin, Ohio and their father's solidly middle-class profession as a doctor.[49]

Understanding the fraught nature of whiteness in early-twentieth-century New York City is critical to recognizing the Telharmonium's sonic significance. Indeed, we will see throughout

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[45] *Whiteness of a Different Color*, 43.
[46] *Whiteness of a Different Color*, 4-5.
[47] *Whiteness of a Different Color*, 40-42
[48] *Whiteness of a Different Color*, 47, 56-57.
[49] *Magic Music*, 4-6.

this dissertation that the U.S.'s complex and troubled racial history shaped the use and reception of the early electronic instruments discussed here. The Telharmonium's location in New York City impacted its reception not only by its proximity to some of the country's most elite cultural and social gathering places, but also by placing it in the midst of a city increasingly defined by its immigrant population. Even as Telharmonium performances took place in spaces largely off-limits to most of the city's new immigrants, the growing visibility and audibility of those immigrants on the city's streets and in public discourse played a critical role in how the mainstream press evaluated and represented the instrument's sound. Prominent accounts of the Telharmonium defined the instrument and its sound by positioning them in opposition to the presence and activities of non-white bodies. The location and nature of Telharmonium events effectively restricted attendance to New York's privileged white residents, although, as I will discuss later in this chapter, less privileged groups like industrial workers also came into contact with the instrument. The network of actors required to create and maintain the Telharmonium registered unevenly in contemporary accounts of the instrument, which celebrated some bodies and ignored others.

Most of the information that survives about the instrument deals with the responses of white listeners and audience members, many of them wealthy and socially prestigious. In the months leading up to Telharmonic Hall's January 1907 opening, the New York Electric Music Co. arranged a number of elaborate private receptions and events featuring the instrument. In September, over nine hundred members of the New York Electrical Society arrived at the Hall for a tour and concert as part of the organization's annual meeting.[50] The trustees of the American Museum of Natural History and the New York Academy of Science enjoyed a

[50] "The First Public Telharmonic Concert," *Electrical World* (October 6, 1906): 637; "Arc Lights Shed Electrical Music," *New York World*, November 10, 1906; "Music is on Tap Now over New York 'Phones," *New York Times*, November 10, 1906.

Telharmonium demonstration at a December meeting.[51] Just days before the hall's opening, the instrument's music filled the lobby of the Casino Theatre (directly across the street from Telharmonic Hall) in the hour preceding a production of the popular musical *Princess Beggar*.[52] Receptions for professional organizations and other special events continued after the public opening of the hall and tended to generate at least a moderate amount of press for the Telharmonium.[53] Many New York papers, for example, took an interest in the instrument's use to accompany a Lenten service led by the Rev. Henry M. Warren—a prominent Baptist clergyman known for his hotel services—in the Hotel Imperial in February 1907. Attendance for the service, during which the congregation of hotel patrons sang hymns "following the lead" of the Telharmonium, was reportedly large and enthusiastic.[54]

A gala reception on Friday January 11, 1907 marked the opening of Telharmonic Hall. The night's festivities featured a dinner party at Sherry's for guests—including George Foster Peabody, Victor Herbert, and Henry Herman Westinghouse—music at the Café Martin and Hotel Imperial, and a concert at the Hall itself.[55] The following day, the Hall opened for public admission, charging entry fees for the first time. Until that point, most audience members at Telharmonium events were New Yorkers prestigious or wealthy enough to merit an invitation to a private event or those affiliated with an organization holding an event in the Hall. The opening of Telharmonic Hall made the instrument's new electronic music available to a wider swath of the public. For 25 cents to a dollar, depending on the quality of the seat, New Yorkers could attend one of several daily concerts and view the instrument's working parts. As Weidenaar

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[51] "Telharmonium Demonstration," *Electrical World* (January 5, 1907).
[52] "Telharmonium Contract," *Electrical World* (January 12, 1907).
[53] "Worcester Polytechnic Dinner," *Electrical World* (February 9, 1907). Telharmonic music accompanied a reception for an Italian ambassador at the Waldorf-Astoria in January 1907. *Magic Music*, 171.
[54] "Hymns by Electricity," *New York Herald*, February 18, 1907.
[55] See *Magic Music* for a list of attendees at this event beginning on page 154.

notes, 25 cents was equivalent to the cost of a vaudeville show at the time, putting a Telharmonic demonstration well within the grasp of New York's middle class and some of the working class as well.[56] Nonetheless, even the lowest admission price was beyond the means of many New York laborers who earned just a few dollars a day.[57] For Italian and Russian immigrants, concentrated in neighborhoods like Little Italy in the Lower East Side, a trip to the theater district also involved a miles-long walk or fare for a trolley car.

The many differences among the city's population was a major factor in the increasing scrutiny under which public noise came around the turn of the century in an increasingly cacophonous urban environment. Concerns about noise raised by public officials and residents focused not only on the machinery of industrialization (like street cars and automobiles) but also on the sights and sounds of new populations of people, often unwelcome to their white neighbors.[58] As Jaques Attali and many scholars following him have pointed out, noise was and is not an inherently sonic quality but rather one that only exists "in the relation to the system within which it is inscribed."[59] Noise, in other words, is a social construct, and one, according to Attali, which is "experienced as destruction, disorder, dirt, pollution." To designate a sound as noisy is thus to identify it as an "aggression against the code-structuring messages" that uphold a society's structure.[60] As this chapter will show, definitions of noise in early-twentieth-century New York City shaped many listeners' perceptions of the Telharmonium's timbre.

The Telharmonium debuted in a city defined not only by the diversity of its population, but by its increasing control of entertainment and media industries previously dominated by

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[56] *Magic Music*, 182.
[57] See, for example statistics in United States Bureau of Labor Statistics, *History of Wages In the United States From Colonial Times to 1928* (Washington: United States Government Printing Office, 1934).
[58] Emily Ann Thompson, *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900-1933* (Cambridge: MIT Press, 2002).
[59] *Noise: The Political Economy of Music*, 26.
[60] *Noise: The Political Economy of Music*, 27.

firms and activities in Boston. In the mid nineteenth century, Boston was the epicenter of American literature and publishing as well as the so-called "Second New England School" of composers.[61] By the early decades of the twentieth century, however, New York music and literary publishing firms far eclipsed those based in Boston, and New York writers, musicians, and artists dominated national conversations and the entertainment industry. As literary historian Ann Douglas notes, whereas Boston's artists were largely "homegrown," New York's notable figures—among them Scott Fitzgerald, Katherine Anne Porter, Sinclair Lewis, Duke Ellington and Zora Neal Hurston—were, for the most part, "outsiders and émigrés."[62] Douglas describes Boston as the homogenous foil to New York's "mongrel" population.

Despite its location in New York's theater district, marketers, audiences, and journalists heard Bostonian ideals—homogeneity and "purity"—in the Telharmonium's sound that seem at odds with the "mongrel" population and entertainment industry in New York. It is no coincidence that Bellamy situated his utopian fiction *Looking Backwards*, and within it the musical system said to prophecy the Telharmonium, in Boston. In the following section, I explore the similarities between the cultural politics that shaped the reception of the new electronic instrument and Bellamy's utopian musical system. Even as the Telharmonium's marketing and reception resonate with Bellamy's fictional future Boston as well as the city's actual reputation, the differences that defined New York and its transplants played a critical role in the reception of the instrument's sound.

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[61] Notable authors associated with Boston included Ralph Waldo Emerson, Catharine Maria Sedgwick, and Nathaniel Hawthorne. The Second New England School, also known as the "Boston Six," included John Knowles Pain, Arthur Foote, George Chadwick, Amy Beach, Edward MacDowell, and Horatio Parker.

[62] Ann Douglas, *Terrible Honesty: Mongrel Manhattan in the 1920s* (New York: Farrar, Straus and Giroux, 1995), 14.

Looking Backward *and the Telharmonium*

Although the musical system described in Bellamy's *Looking Backward* did not involve the electrical generation of musical sound, the fictional system's method of distribution closely resembled that of the Telharmonium. Most importantly, both systems involved the production of musical performances at a central location and the consumption of those performances at many different public and private locations. In both, telephone wires carried the centrally-produced electrical signals to homes and businesses where receivers transformed the signals into audible sound. This distribution system suggested certain uses to both Bellamy and proponents of the Telharmonium. The centralized production model allowed for the generation of music by professionals, while the distribution and delivery methods encouraged passive listening. Even the repertory imagined by Bellamy—western art music and, perhaps, a popular waltz tune played by an orchestra—closely resembled Telharmonium programming.

The connection to Bellamy in Telharmonium advertising caught on quickly with journalists.[63] George H. Picard wrote that no one in the nineteenth century took Bellamy's prediction about future musical systems seriously, but that to the country's amazement, his "prophecy has been fulfilled almost literally."[64] A writer for the *Boston Post* declared the instrument, "the most marvelous invention of the age" and "the completest instrument of Bellamy's dream."[65] The comparison served, in part, to demonstrate that the Telharmonium was an instrument far ahead of its time, a notion that survives in many current electronic music histories. Thom Holmes, for example, called the instrument "the most ambitious electronic music project ever conceived," while Peter Manning wrote that it "offered sound-production features

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[63] The comparison appeared in print as early as April 3, 1904 in an article in the *Springfield Republican* entitled, "A Bellamy Dream Realized." It is unclear whether the comparison was one fed to the press by the instrument's promotors, or whether they lifted the idea from this or another early report.
[64] George H. Picard, "Music for the Million," *Desert Evening News*, July 13, 1907.
[65] "Wonder Musical Machine Invented by Holyoke Men," *Boston Post*, March 18, 1906.

that were entirely new and flexible to a degree not equaled by subsequent designs for some considerable time."[66] Yet both the Telharmonium and the book so many used to explain and describe the instrument were very much products of their particular times and places. Understanding the book's popularity can, in turn, provide insight into the Telharmonium's own brief success.

Bellamy's book was so popular that reporters writing nearly two decades after its initial publication in 1888 referred to it fully expecting their readers to be familiar with the novel. In the first year of its publication, *Looking Backward* sold 200,000 copies; only *Uncle Tom's Cabin* sold better during the nineteenth century.[67] Bellamy's book, like Harriet Beecher Stowe's, generated so much commentary that many who had never read it were undoubtedly familiar with its plot and main ideas. The book spawned Bellamy Clubs and eventually the Nationalist political movement, complete with an official periodical, that advocated for national control of industry.[68] Nationalists clubs existed in 27 states by 1890.[69] Although the movement dissolved before the end of the century, Bellamy's book remained part of popular memory well into the next, inspiring a new generation of utopian novels.[70]

At heart, the novel is a lengthy description of Bellamy's utopian fantasy framed by a love story. When the story begins, the protagonist Julian West, a bourgeois Bostonian of the late nineteenth century**,** is frustrated that he must once again postpone marriage to his betrothed,

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[66] Thom Holmes, *Electronic and Experimental Music: Technology, Music, and Culture* (New York: Routledge, 2008), 49; Peter Manning, *Electronic and Computer Music*, 4th ed. (Oxford: Oxford University Press, 2013), 3.
[67] Arthur Lipow, *Authoritarian Socialism in America: Edward Bellamy and the Nationalist Movement* (Berkeley: University of California Press, 1982), 27.
[68] In 1888 a group of retired army officers formed the first "Bellamy Club" in Boston; the "First Nationalist Club" of Boston formed shortly thereafter. *The Nationalist* was the movement's first official periodical. *Authoritarian Socialism in America*, 158.
[69] Nationalist clubs existed in 27 states by 1890 (with 65 clubs in California and 16 in New York City). The number of clubs peaked at 165 in 1891. By 1894 most had disappeared and Nationaliss was absorbed into other political movements. *Authoritarian Socialism in America*, 30.
[70] Dohra Ahmad, *Landscapes of Hope: Anti-Colonial Utopianism in America* (New York: Oxford University Press, 2009), 20.

Edith Bartlett, because labor unrest has delayed the construction of his new home. One evening, West retires to his secret underground bedroom, insulated from light and sound in order to accommodate his acute (neurasthenic) insomnia. He summons a mesmerist to put him to sleep and, shockingly, wakes a century later in the year 2000, apparently left undisturbed after his house was destroyed in a fire. The Leete family—a doctor, his unnamed wife, and daughter Edith—discover West, take him in as a guest, and acclimate him to the twenty-first century. Edith Leete turns out to be the great granddaughter of Julian's now long-dead fiancé, and the novel ends with his engagement to the "new" Edith.

The vast majority of the novel is taken up by Dr. Leete's lengthy explanations of the political and economic systems which govern the nation, whose population has been transformed into an industrial army that cares for the wants and needs of all citizens. These changes, Leete tells West, came by means of a bloodless revolution rather unbelievably led by industrialists. In the new national system, each citizen is paid exactly the same wages and has access to the same goods and services through distribution centers. The extremely efficient management of the national industrial army has resulted in an abundance of wealth, and every citizen has all they need and more. For decades after the book's publications, and certainly during the Telharmonium's hey day, critics understood the economic equity and national wealth in Bellamy's novel as a vision of democracy and equality. More recently, though, scholars have offered numerous reassessments of the work and its popularity.[71] Indeed, a close reading of the book reveals that Bellamy's future U.S. was neither democratic nor egalitarian. To the contrary, the novel presents a future in which universal suffrage has been abolished and society is strictly controlled by a highly regulated and centralized hierarchical authority. Historian Arthur Lipow

[71] See: *Authoritarian Socialism in America*; Daphne Patai, ed., *Looking Backward, 1988-1888: Essays On Edward Bellamy* (Amherst: University of Massachusetts Press, 1988); Jonathan Auerbach, "The Nation Organized": Utopian Impotence in Edward Bellamy's Looking Backward," *American Literary History* 6, no. 1 (Spring, 1994): 24-47.

argues that, in *Looking Backward*, Bellamy represents liberty not by freedom from control, but rather as the right and access to consume the goods of one's choice.[72]

Looking Backward, like so much utopian fiction in subsequent years, also reflected the growing popularity of eugenics at the end of the nineteenth century.[73] As early as the 1850s, Arthur de Gobineau proposed the notion of race purity in his book *Essai sur l'inégalité des races humaines* that would appear in English translation in 1915 as *The Inequality of Human Races*.[74] Francis Galton began to publicize his ideas about eugenics in the United Kingdom in the 1860s. In the U.S., rising immigration from Eastern and Southern Europe and the growing popularity of African-American cultural forms fueled eugenicist fervor.[75] The first state sterilizations laws, designed to restrict reproduction among the poor, disabled, and non-white, passed in 1907.[76] Although today eugenics is often remembered as the product of oppressive fascist regimes, before World Was II both conservatives and liberal progressives embraced the discipline as a scientific way to understand racial difference.[77] The formation of the social sciences was intimately bound up with eugenics in both Europe and the U.S.[78] Many of the professionals who shaped emerging academic disciplines like sociology rooted their work in eugenicist principles.[79]

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[72] *Authoritarian Socialism in America*, 29.
[73] Patrick Parrinder, "Eugenics and Utopia: Sexual Selection from Galton to Morris," *Utopian Studies* 8, no. 2 (1997): 1-12.
[74] Arthur de Gobineau, *The Inequality of Human Races*, trans. Adrian Collins (London: William Heinemann, 1915).
[75] Angelique Richardson, "The Birth of National Hygiene and Efficiency: Women and Eugenics in Britain and America 1865-1915," in *New Women Hybridities: Femininity, Feminism and International Consumer Culture, 1880-1930*, eds. Ann Heilmann and Margaret Beetham (London: Routledge, 2004), 240-62.
[76] Between 1907 and 1917, 16 states legalized sterilization practices. "The Birth of National Hygiene and Efficiency," 248.
[77] Diane Paul and others have noted, "beliefs in socialism, inequality, and eugenics were widely shared on the left" in the decades surrounding the turn of the twentieth century. "Eugenics and the Left," 567.
[78] See: Stephen Jay Gould, *The Mismeasure of Man* (New York: Norton, 1981) and John P. Jackson and Nadine M. Weidman, *Race, Racism, and Science Social Impact and Interaction* (New Brunswick, NJ: Rutgers University Press, 2010).
[79] See, for example the work of influential sociologist Edward Alsworth Ross who taught at Harvard and the University of Wisconsin-Madison, especially *Social Control; A Survey of the Foundations of Order* (New York: The Macmillan Company, 1901).

In *Looking Backward*, Bellamy portrayed a future shaped by eugenicist ideas about race improvement, where developed (white) nations have formed a civilized union, while the nation states of the "more backward races" are being gradually assimilated into the system of their supposed superiors.[80] The bodies of the characters in *Looking Backward* represent a eugenicist triumph; they are healthy, vibrant, and beautiful. They are also entirely white and clearly middle class. No people of color or working class characters are visible in Bellamy's future Boston. While during his own day, Julian employed an African-American servant named Sawyer, when the protagonist awakens a century later, non-white bodies have simply vanished, replaced by a homogenous population of apparently genetically superior human beings. Dr. Leete explains to West that the "race purification" the protagonist witnesses was the result of several generations of "untrammeled sexual selection" during which women were no longer forced to marry for security, but could now do so for love. In this world, not even the possibility of miscegenation seems to exist. In the new system, Dr. Leete explains, women, "sit aloft as judges of the race and reserve themselves to reward the winners."[81] He makes clear that women's reproductive role remains their most important contribution to society.

Indeed, despite drastic changes to economic systems, West finds Boston's culture and society nearly an exact mirror of his nineteenth-century upper-middle-class life. He encounters no strange new art forms, no radical changes in modes of dress (although women's clothing is looser and, apparently, corset-free), and no mystifying social customs or niceties. While the female half of the population is allowed to work and is paid the same as their male counterparts, their tasks are restricted based on suitability for their sex, and their segregated workforce has

[80] *Landscapes of Hope*, 28.
[81] Edward Bellamy, *Looking Backward*, 1888 (New York: Dover Publications, 1996), 129, 130.

limited political power.[82] West's experiences with the arts and culture in the utopian Boston constantly reinforce the racial and sexual hierarchies that underpin the society. Edith Leete's one professed interest (she does not seem to work), shopping, parallels the activities associated with bourgeois women of West's day. It is she who introduces Julian to music and literature, taking on the traditional role of cultural authority in her domestic space. In contrast, her father's far lengthier and plentiful speeches deal primarily with politics and economics.

It is through Edith that the reader learns of Boston's new musical system. Throughout her explanation, she emphasizes the superiority of contemporary music to that of the "old-fashioned system" that existed in Julian's day. She sympathizes that music "really worth hearing" must have been available only to a small and wealthy fraction of the population and speculates that amateur music making must have been tedious to witness. According to Edith, amateur musical activity has all but died out in the year 2000, and only the "really fine singers and players" perform. The benefits of this new system are significant. Constant access to music of the highest quality provides comfort to the sleepless, sick, and dying and inspires citizens to their day's work. Edith is sure that having access to this music in his bedroom will cure Julian of any "uncanny feelings" brought on by his sudden time travel.[83] In short, Edith describes a system in which the vast majority of musical practices are centralized and professionalized to the exclusion of all other activities, and she implies that the end product of this consolidation is music with healing qualities.

The morning after his introduction to this new musical system, West experiences its benefits via the telephone attachment on his bed in spectacular fashion. Just before waking, Julian dreams that he is the leader of a Moorish army. In the dream, he is seated at the throne of a

[82] Women withdraw from work to become mothers, and only those who have chosen to become mothers and wives may hold positions of authority in the segregated female workforce. *Looking Backward*, 127.
[83] *Looking Backward*, 55-56.

banquet hall, feasting his "lords and generals" who are preparing for battle against Christian crusaders. Before him, "a band of Nautch girls, round-limbed and luscious-lipped, danced with voluptuous grace to the music of brazen and stringed instruments." The dream culminates:

> Louder and louder clashed the cymbals, wilder and wilder grew the strain, till the blood of the desert race could no longer resist the martial delirium, and the swart nobles leaped to their feet; a thousand scimitars were bared, and the cry, 'Allah il Allah!' shook the hall and awoke me, to find it broad daylight, and the room tingling with the electric music of the 'Turkish Reveille.'[84]

When West recounts his dream and waking to the Leetes over breakfast, they inform him that music of an inspiring type is always played in the morning to help prepare citizens for a productive day. The occupants of Bellamy's future Boston, it appears, become healthy, productive members of their (exclusively white middle-class) society at least in part via musically-induced dreams of racial others. This moment is a turning point in the book, when West begins to fully acclimate to his new surroundings, throwing off the "uncanny feelings" brought on by time travel and recovering from his insomnia. West's cure comes not simply through visions of racialized bodies, but through his imagined control over them. Bellamy's text implies that the "Nautch girls," who represent hyper-sexualized stereotypes of African women, belong to West. The "swart nobles," too, are clearly under his command. Music, in West's dream, thus acts as a catalyst for western imperialist fantasies.

Although the music that West hears inspires dreams of racial others, it seems to be free from the dangers that many located in ragtime just a decade or so after the publication of *Looking Backward*, placing him in a position of power, not submission. The "Turkish Reveille" that West hears was a popular march first published in 1879 that mimicked the "advance and

[84] *Looking Backward*, 67.

passing of the Turkish patrol."[85] The tune, with its duple meter, ornamented melody in the upper register, and use of percussion instruments, played loosely on the same Janissary musical tropes used by composers including Haydn and Beethoven that signaled both military aggression and exoticism.[86] In late-nineteenth-century America, such musical signifiers evoked visions of racial others but did not inspire dance or contact with other bodies, allowing for a safe listening experience. The music allows West to experience a fantasy of "savage" passion that, rather than expose him to "savage" bodies or compel him to act savagely himself, inspires him to act as an ideal (white) citizen.

At the turn of the twentieth century, many Americans believed that "savage" experiences like West's might also act as cures for neurasthenia, a disease that manifested in the protagonist as insomnia. American physician George Beard first named and described the disease in 1869.[87] According to Beard, neurasthenia was a reaction to modern life by bodies and minds unused to the changes wrought by electricity and industrialism. Its symptoms ranged from anxiety, weariness, and despondency to insomnia, limb atrophy, and sexual dysfunction. Beard and others defined neurasthenia as an exclusively white condition, one that new Southern and Eastern European immigrants and African Americans were incapable of experiencing, as they were supposedly immune to the "over-civilization" that plagued white bodies. Because neurasthenia frequently manifested as sexual dysfunction—sex was, in fact, central to Beard's understanding

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[85] Several versions of "Turkish Reveille," also known as the "Turkish Patrol," are indexed at the Discography of American Historical Recordings, University of California, Santa Barbara and the Packard Humanities Institute, including Victor releases B-858 and C-858 in 1903, and B-8083 and B-8325 in 1909, http://adp.library.ucsb.edu/index.php (accessed February 1, 2015).

[86] For examples of this trope, see: the second movement of Haydn's "Military" Symphony No. 100, the rondo "Alla Turca" from Mozart's Piano Sonata in A, K. 331, and the final movement of Beethoven's Ninth Symphony. For a discussion, see: Ralph P. Locke, *Musical Exoticism: Images and Reflections* (Cambridge: Cambridge University Press, 2009).

[87] See George M. Beard, *A Practical Treatise on Nervous Exhaustion (Neurasthenia), Its Symptoms, Nature, Sequences, Treatment*, 3rd ed. (New York: Wood, 1880); Beard, *American Nervousness, Its Causes and Consequences; A Supplement to Nervous Exhaustion (Neurasthenia)* (New York: G.P. Putnam's Sons, 1881); Beard, *Sexual Neurasthenia (Nervous Exhaustion), Its Hygiene, Causes, Symptoms, and Treatment, With a Chapter on Diet for the Nervous* (New York: Arno Press, 1898).

of the disease—many imagined that the disease would lead to what Theodore Roosevelt famously articulated as "race suicide."[88] Neurasthenic cures were popular, in part, because they responded to these fears and promised to create a "physically sound" nation by ensuring that the white population would continue to breed effectively.[89]

Cures for neurasthenia varied by gender: fresh air and exercise for men, and rest for women, as famously depicted in Charlotte Perkins Gillman's short story "The Yellow Wallpaper."[90] Some, like psychologist G. Stanley Hall, believed that neurasthenic cures for men lay in the proper channeling of "primitive" impulses in children and adolescents. This solution addressed a central paradox of neurasthenia: it could only be experienced by civilized people, but civilization itself caused the disease.[91] As Gail Bederman has noted, concerns about civilization's effects intersected with changing conceptions of manliness around the turn of the century, which no longer emphasized restraint but rather physical vitality and power, features long associated with working-class and racial others.[92] The ideal man therefore came to be an embodiment of both civilized and savage qualities. West's musical experience in *Looking Backward* reflects these new ideas. In his dream, West is able to access primitive passions thereby banishing the neurasthenic nervousness he experienced upon waking in the future and allowing him to fully join the ultra-civilized twenty-first century as a healthy white man.

Just as Bellamy anticipated a musical system that would contribute to the nation's health, journalists predicted that the Telharmonium would provide an antidote to one of neurasthenia's

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[88] Carolyn Thomas de la Peña, *The Body Electric: How Strange Machines Built the Modern American* (New York: New York University Press, 2003), 28-29. The Roosevelt quote comes from a speech the president made on March 13, 1905 before the National Congress of Mothers.
[89] *The Body Electric*, 18.
[90] Charlotte Perkins Gilman, "The Yellow Wall-paper, A Story," *The New England Magazine* 11, no. 5 (January 1892).
[91] Gail Bederman, *Manliness & Civilization: A Cultural History of Gender and Race in the United States, 1880-1917* (Chicago: University of Chicago Press, 1995), 77-110.
[92] *Manliness & Civilization*, 11-28.

most common symptoms: insomnia. George Beard identified insomnia as a frequent complication of neurasthenia, one that, along with symptoms like sexual dysfunction and spinal irritation, was the result of an "impoverishment of nerve-force."[93] Ray Stannard Baker, writing for *McClure's*, noted that the instrument was "peculiarly adapted to the sweet, soft strains of sleep-music."[94] Another journalist noted that, generally, "good music played softly" had a "sedative influence."[95] Others imagined that the Telharmonium's curative powers extended far beyond insomnia. A. B. Easterbrook claimed, with no apparent evidence, that the Telharmonium's music "can be heard and appreciated by persons who are comparatively deaf to ordinary melody." This was, Easterbrook explained, due to, "the great penetrating power of the sound waves of the Telharmonium, as well as its long sustained, perfect tones."[96] When the New York Electric Music Co. applied to New York's Board of Estimate for the privilege to lay telephone wires in the city, Harry P. Nichols, the board's engineer, surmised that, "music in free wards of hospitals would no doubt be of benefit to convalescent patients under the city's care." He therefore suggested that the company provide free Telharmonic service in the Bellevue and Allied Hospitals as part of any future contract with the city.[97]

While expectations about the curative powers of the Telharmonium and West's musical experience illustrate the imagined palliative effects of "good" music on white bodies, both *Looking Backward* and the Telharmonium's reception also evidence a desire to control the bodies of the less privileged. These lines of thinking were in part a response to ongoing labor unrest in the U.S. punctuated by violent struggles like the railroad strikes of 1877 and the Haymarket Riot in 1886. In Bellamy's novel, Julian West is nearly consumed by his agitation

[93] See *A Practical Treatise on Nervous Exhaustion*, 98, 102.
[94] "New Music for an Old World."
[95] "Music for the Million."
[96] "The Wonderful Telharmonium."
[97] A Puzzle for the Board of Estimate," *New York Sun*, June 22, 1907.

over the labor situation in his own day. The issue recurs frequently in conversations with his host, who considers it the central problem of the old society. In Bellamy's future, labor problems have been solved by administration: the industrial army enjoys no suffrage, and the justice system has no juries.

In the non-fictional world, labor problems persisted into the Telharmonium's day, and some journalists imagined that the new instrument would provide a solution. Baker speculated that with the Telharmonium furnishing "really good music" at rates cheaper than those of a small orchestra, there would be little danger of strikes by musicians.[98] When the Cahill brothers attempted to resurrect the Telharmonium in 1910 with a new installation in New York City, part of their publicity gambit played on fears of labor unrest. In a conversation with *Chicago Daily Tribune* reporter Charles Macloon, George Cahill claimed that the instrument would be "the saving clause" in labor disruptions in large factories. According to Cahill, the brothers were currently in talks with Chicago businessmen about introducing Telharmonium music to the city's "great industrial plants." Cahill argued that, "good music of any kind would tend, by pleasing the workers, to relieve their tasks and to diminish the discontent which tired muscles and nerves so easily create." Macloon agreed, asking his readers, "Would garment workers have organized a walkout if they could have stitched to the music of 'Tannhauser,' 'Faust,' 'The Merry Widow,' or 'The Sweetest Girl in Paris'"? George Cahill's proposition to use music as a control to ease labor unrest and increase worker efficiency would eventually be practiced, but not by the Telharmonium.[99]

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[98] "New Music for an Old World." For an overview of the history of music labor and organization see Sandy R. Mazzola, "When Music Is Labor: Chicago Bands and Orchestras and the Origin of the Chicago Federation of Musicians, 1880-1902," (PhD diss., Northern Illinois University, 1985).

[99] Although Frederick Taylor began to develop his ideas about scientific management to increase the efficiency of industrial workers in the 1890s, and his ideas gained further currency in the 1910s with Ford's famous assembly lines, music would not be formally studied or used in factory work for some time. Christina Baade has documented the BBC's *Music While You Work* program in World War II factories in Great Britain, but scare scholarship exists

Others imagined different ways in which the Telharmonium might control bodily movements. Mark Twain, speaking to a reporter for *Scientific American*, speculated that in the future the instrument would be used to synchronize the movements of soldiers. With the Telharmonium's sound flowing through arc lamps along the path of some "future parade," he imagined that soldiers "will all raise their left feet at exactly the same instant, just as if they were but one company."[100] Twain thus joined those who speculated about the Telharmonium as a means of labor control in imagining the instrument could instill order by literally moving people. Such fantasies were not unique to the Telharmonium; the talking machine industry, for example, also promoted the phonograph as a tool for imposing order.[101] In both cases, "order" existed within hierarchical systems that classified practices associated with racialized and working class bodies as disorderly and therefore subject to control.

Although the Cahill brothers failed to sell any of Chicago's industry men on the Telharmonium, their new sales tactic represented a culmination of the potential for control that many saw in the instrument. This potential lay in part in the Telharmonium's central production method, which allowed for the expert regulation and execution of performance and repertory, much as with Bellamy's imagined musical system in *Looking Backward.* Indeed, many expectations about the Telharmonium in 1907 mirrored West's fictional encounters with music in Bellamy's imagined utopia. Both the real instrument and fictional music system represented an advanced and revolutionary technological achievement of a civilized white nation. Both simultaneously acted as proof of their audience's evolutionary superiority and provided further enhancements to the white race by curing their neurasthenic ills and inspiring them for the day's

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on similar practices in the U.S. Christina L. Baade, *Victory Through Harmony: The BBC and Popular Music in World War II* (Oxford: Oxford University Press, 2012). For one exception Joseph Lanza, *Elevator Music: A Surreal History of Muzak, Easy-Listening, and Other Moodsong* (New York: St. Martin's Press, 1994).

[100] "The Telharmonium—An Apparatus for the Electrical Generation and Transmission of Music."

[101] See "Talking Machines, Dancing Bodies," 162.

work. Both depended on the existence of other, supposedly inferior, musics and people for their value. The section that follows will further explore how rhetoric about social control and difference impacted the Telharmonium's reception as a new and wondrous piece of American technology.

America and Technology

Although for some cultural commentators, the Telharmonium's capacity to distribute music far from its source was central to its potential as a revolutionary new tool for music distribution, many others were most impressed by the instrument's technological means of producing musical sound. Americans had recently witnessed and experienced the invention and adoption of the incandescent light bulb, recorded sound, motion pictures. Most journalists reporting on the Telharmonium ranked the new instrument among these other recent inventions, and Cahill among the hero-inventors of the age, including Thomas Edison and Alexander Graham Bell.[102] *Electrical World*, reporting on the instrument, declared the "birth of a new electrical art," a claim repeated by many other publications.[103] The *Boston Post* compared the Telharmonium favorably "with the electric light, telephone and the trolley."[104]

Perhaps one of the most remarkable aspects of the commentary on the Telharmonium's technology is that so little of it was negative. Compared to the many criticisms leveled at the talking machine—another recent audio technology, although a mechanical, not electrical, one—the Telharmonium's reception was remarkably positive. When criticism of the new instrument

[102] "A Wonderful Musical Instrument."
[103] "The Art of Telharmony," *Electrical World* (March 10, 1906): 509; "Wonder Musical Machine Invented by Holyoke Men," *Boston Post*, March 18, 1906; E. E. Higgins, "A Wonderful Musical Instrument," *Success Magazine* (May 1906): 344.
[104] "Wonder Musical Machine Invented by Holyoke Men."

did appear, it was usually couched in otherwise laudatory reviews.[105] Such unfettered enthusiasm makes sense, however, when considered in the context of technological upheaval that was transforming American life at the time. Electric lighting, indoor plumbing, telephones, sound recording, and electric rail travel upended the public's notion of what was possible and promised to change the way that they lived. Although urban upper-class whites were the first group of individuals to enjoy new technologies in their homes, much of the nation's population interacted with newly-invented technologies in public spaces.[106] The production, consumption, and celebration of new technologies was critical not only to the U.S. economy but also its national identity.

The so-called modernization of the American home was a young phenomenon even to the wealthy in 1906, and one yet to be experienced by the vast majority of the country's population. While most major manufacturers in the U.S. converted to electrical power between 1890 and 1910, by the latter date only ten percent of U.S. homes consumed electricity.[107] Electric lights on Broadway and Niagara Falls may have "transformed the appearance of the world," as David Nye writes, but they had not yet changed life in most American homes.[108] The telephone was somewhat more widely used in domestic spaces, about twenty percent of which included one by 1910.[109] Talking machines and player pianos were more popular still and more accessible across

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[105] The *Music Trade Review*, for example, reported that to "the musically informed" only organ tones were perceptible on the Telharmonium in an otherwise positive review of the instrument: "The Telharmonium Concerts" April 13, 1907. The *New York Evening Post* described Telharmonic music as "rather crude and lacking in variety" but anticipated that time would undoubtedly "remedy these defects": "Electric Music, January 15, 1907.

[106] Many working-class people experienced new technologies in their workplaces, most would not experience dramatic technological changes in their own homes until the 1930s and 40s. Ronald C. Tobey, *Technology As Freedom: The New Deal and the Electrical Modernization of the American Home* (Berkeley: University of California Press, 1996).

[107] David E. Nye, *Electrifying America: Social Meanings of a New Technology*, *1880-1940* (Cambridge: MIT Press, 1990), 21.

[108] David E. Nye, *American Technological Sublime* (Cambridge: MIT Press, 1994),142.

[109] Again, the wealthier and more urban a family was, the more likely they were to own a telephone, although many more Americans had access to phones in drugstores and other public spaces. Claude S. Fischer, *America Calling: A Social History of the Telephone to 1940* (Berkeley: University of California Press, 1992), 22, 110-112.

classes. Cheap phonograph models were available for as little as $10 by 1897, a sum within the grasp of, if still a considerable investment for, many in the working class.[110] As talking machine historian William Howland Kenney notes, the machines were popular with groups outside the bounds of the late Victorian bourgeoisie, with the record industry estimating that nonnative English speakers—i.e. new immigrants—made up approximately a third of their market.[111]

Public encounters with new technologies preceded their domestic adoption for most Americans.[112] American cities began installing electric street lighting in the years around 1880, with public celebrations frequently commemorating the first time that the bright glare of arc lamps lit streets and squares in places like Cleveland and New York City.[113] By the mid 1880s, arc lamps were common in larger U.S. cities, at least in those cities' most prestigious and trafficked spaces. By 1905, Broadway was brilliantly lit not just by arc lamps but by a proliferation of electric signs that advertised everything from shoes to cigarettes.[114] Even earlier, hundreds of thousands of Americans witnessed massive electric lighting displays at world fairs and expositions. The 1884 International Electrical Exhibition in Philadelphia featured a thirty-foot-high Edison exhibit with over a thousand light bulbs. Ninety thousand light bulbs and five thousand arc lamps lit the fairgrounds at the 1893 World's Columbian Exposition in Chicago. The source of power for this light, the largest station in the world at the time, was also on display in the expo's machinery hall.[115] David Nye has observed that, "no one could visit a world's fair

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[110] In 1896 Edison introduced a model costing $20. One year later Columbia introduced a $10 cylinder model. William Howland Kenney, *Recorded Music in American Life: The Phonograph and Popular Memory, 1890-1945* (New York: Oxford University Press, 1999), 28.
[111] *Recorded Music in American Life*, 67.
[112] David Nye claims that before 1910 electrification was, "almost exclusively a public, urban experience." *Electrifying America*, 382.
[113] Harry J. Eisenman, "The Brush Double-Arc Lamp," *Technology and Culture* 7, no. 4 (Autumn, 1966): 511-512.
[114] *American Technological Sublime*, 174- 187.
[115] *American Technological Sublime*, 147-149.

between 1883 and 1915 without seeing spectacular lighting displays and ingenious electrical devices."[116]

As new electrical lighting became increasingly visible and spectacular, new developments in travel, communication, and entertainment also captured attention in public spaces. Crowds crammed into spectator seating in the first telegraph offices, where they could witness seemingly instantaneous communication by wire beginning in 1838.[117] In the late years of the nineteenth century, Americans could witness moving pictures in Kinetoscope "peep shows" or, eventually, projected for crowds. Around 1905, small storefront theaters, which would become known as nickelodeons, began to show moving pictures using technology like biographs, kinodromes, and vitascopes in cities across the county.[118] Before the talking machine became a household commodity in the early years of the twentieth century, thousands of spectators saw and heard the device in action at regional demonstrations sponsored by the Edison Speaking Phonograph Company and in nickel talking machines installed in public places like train stations and cafes.[119] Amusement parks, which first sprang up in the wake of the 1893 Exposition, combined many of these new electrical wonders, featuring films, lighting displays, and talking machines in addition to mechanical rides.[120]

David Nye and other historians of technology explain the extreme popularity of public displays of technology as a manifestation of the "technological sublime," a quasi-religious

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[116] *American Technological Sublime*, 151.
[117] *American Technological Sublime*, 62.
[118] Lauren Rabinovitz, *Electric Dreamland: Amusement Parks, Movies, and American Modernity* (New York: Columbia University Press, 2012), 6.
[119] For more on the early public history of the phonograph see: Lisa Gitelman, A*lways Already New: Media, History, and the Data of Culture* (Cambridge: MIT Press, 2006), 25-58.
[120] These parks, almost always located just outside metropolitan areas at the end of railroad lines, were incredibly popular with urbanites and rural Americans, native-born citizens and recent immigrants. The first of Coney Island's three parks opened just a year after the Columbian Expo; by 1909 combined attendance at the park totaled half a million each day. *Electric Dreamland*, 2-3, 9.

experience of awe in the face of man-made wonders.[121] The technological sublime, Nye writes, was, "about the social construction of certain powerful experiences in industrial society, which is to say it is about the politics of perception."[122] Whereas eighteenth-century philosophers defined the sublime experience as one of wonder in the face of nature, the technological sublime inspired awe through the conquest and domination of natural forces. Central to this new awe was the belief that technological progress aided and manifested "the alleged perfection of civilization."[123] In the U.S., the belief in technology as a sign of the advance of civilization was inextricably linked to discourses about national greatness and "a social Darwinist ideology of racial superiority."[124] Americans might respond to the technological sublime not only with feelings of wonder but also with a sense of their nation's, and thus their own, greatness.

Gender also played a critical role in the perception of the technological sublime. Within the discourse of technology as a triumph of American greatness, male inventors like Edison and Bell served as heroes of the new industrial age. In this respect, Nye notes that the technological sublime, "manifests a split between those who understand and control machines and those who do not."[125] Those who understood were invariably white and male. And yet prominent American women and men repeatedly equated female bodies with electricity. Dancers like Loie Fuller displayed their bodies illuminated and adorned by electrical lights. Socialites like Mrs. Cornelius Vanderbilt II wore dresses festooned with the technology.[126] Electricity adorned allegorical

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[121] *American Technological Sublime*; Jürgen Martschukat, "The Art of Killing by Electricity: The Sublime and the Electric Chair," *The Journal of American History* 89, no. 3 (December 2003): 900-921.
[122] *American Technological Sublime*, xvi.
[123] *American Technological Sublime*, 152; "The Art of Killing by Electricity," 904.
[124] *Electrifying America*, 36.
[125] *American Technological Sublime*, 60.
[126] Vanderbilt's dress is viewable online via the Museum of the City of New York, http://collections.mcny.org/C.aspx?VP3=CMS3&VF=MNYO28_4 (accessed February 5, 2015). Museum of the City of New York. For costume ball

female figures like the Statue of Liberty and her electrically-lit torch.[127] In these representations women were akin to the wild, natural, and mysterious force of electricity—something little understood but dominated and controlled all the same by its white masters.[128]

The experience of technological wonder as a sublime manifestation of white American civilization was perhaps nowhere more clearly marked than in international fairs like the 1893 Columbian Expo. There, technological displays in the central White City stood in contrast to, and physically apart from, "authentic" displays of "primitive" cultures on the Midway, a space located outside the official Expo grounds and arranged chronologically with white American and European civilization at the most recent and lofty end of the spectrum.[129] Lavish displays of electricity that invoked the sublime within official fair grounds offered evidence of the nation's advanced civilized state, one purged of non-white bodies. Similarly, historian Lauren Rabinovitz notes that amusement parks and moving pictures also offered spaces for imagining an American national identity forged through technological progress.[130] Such imaginings took place in spaces that "spatially and structurally maintain[ed] social divisions of race and class."[131] Rabinovitz

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[127] Shelley Wood Cordulack, "A Franco-American Battle of Beams: Electricity and the Selling of Modernity," *Journal of Design History* 18, no. 2 (Summer 2005): 146-166.

[128] Much like female sexuality in western ideology and myth, electricity was a potentially dangerous, even deadly, force. When brought under (patriarchal) control, both women and electricity served a purpose. For example, Virginia Meredith, who served on the Board of Lady Managers for the Columbian Expo, in a bid for the respectability of the often-maligned "new woman" compared the figured with electricity, arguing that both were "new" and "useful" forces. The historian Henry Adams in his 1907 *Education of Henry Adams* compared the dynamos that generated electricity with a mythical American virgin that was neither New Woman nor the more traditional "true woman" but some strange amalgamation of the two, an impossible source of power without sexuality, and therefore without danger. "A Franco-American Battle of Beams," 158; Cindy Weinstein, "From True Woman to New Woman to Virgin," in *Henry Adams and the Need to Know*, eds. William Merrill Decker and Earl N. Harbert (Charlottesville: University of Virginia Press, 2005), 300-314.

[129] "The Art of Killing by Electricity," 908.

[130] *Electric Dreamland*, 22.

[131] Spaces like fairs and amusement parks were rigidly segregated; organizers permitted African American attendance only on select "Jim Crow" or "Colored" days. African-American-only parks existed in both the north and south. Parks also upheld class divisions, often through the use of music, with orchestras and military bands performing for an additional charge while brass bands and ragtime ensembles catered to working classes. *Electric Dreamland*, 28, 64.

argues that amusements parks' popularity depended in large part on these divisions, which upheld and reinforced the dominant social order in the country.[132]

While public sublime experiences with new technologies like electric lighting are well-known, Carolyn Thomas de la Peña cautions that, "it is incorrect to posit that Americans worshiped new sources of power only because of their ability to perform work and inspire awe. In reality, many Americans imagined a cooperative relationship between such 'dynamos' and their own bodies."[133] Some of the most intimate relationships between American bodies and electricity occurred during the so-called "Golden Age of Electrotherapy" chronicled by De la Peña**,** which lasted from around 1880 to 1920. The boom in electrotherapy devices beginning around 1880 was a direct response to the perception that neurasthenic conditions were widespread among America's white citizens. Exercise machines served to strengthen atrophied muscles while electric belts promised men a cure for sexual dysfunction, both common neurasthenic symptoms.[134] De la Peña argues that these intimate consumer experiences with electricity soothed fears about "an encroaching electric modernity," bringing users into "an odd kinship with the telephone, telegraph, and streetcar."[135] Just as public experiences of the technological sublime were a form of nation-building, so too did more intimate experiences with electricity work in part to shape and support notions of ideal, i.e. white, national bodies. De la Peña observes that the popularity of electric cures would not have existed without fears of non-

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[132] *Electric Dreamland*, 41-42.

[133] *The Body Electric*, 2. Rabinovitz also notes that even in public spaces like nickelodeons and amusement parks, Americans interacted with technology in intimate, personal, and physical ways. Rides manipulated bodies, challenging Victorian mores in the process, for example by revealing women's petticoats as they slid down slides or by seating bodies in intimate physical proximity to one another. Intimate and entertaining interactions with new electric technologies, Rabinovtiz argues, tamed fears of new technologies, reinforced industrial divisions between work and labor, and even taught the public how to cope with women's increasing autonomy. *Electric Dreamland*, 37-38, 64.

[134] Although historians have characterized the disease as one suffered primarily by the middle and upper classes, de la Peña's study shows that neurasthenic conditions and cures cut across class lines, if not racial ones. Many of the devices detailed in de la Peña's study were marketed to working class consumers. *The Body Electric*, 26, 31-32, 137-138.

[135] *The Body Electric*, 99.

white bodies, brought on in part by speculation about the "race suicide" that could result as neurasthenia precipitated the degeneration of white male sexuality.[136]

The Telharmonium as Sublime and Intimate Technology

Telharmonic Hall drew crowds by offering physical and visual experiences of the new technology that were both intimate and sublime. The building's layout drew a stark contrast between areas where music was heard and areas where it was produced. Upstairs, in Telharmonic Hall, plush seating, potted ferns and rosebushes, and a stage greeted audiences, as seen in Figure 2. Weidenaar describes the space as resembling an "indoor arbor" far more than a concert hall; its easy chairs and greenery mimicked an upper-class domestic space rather than a public one.[137] A reporter for the *New York Times* noted that, "the vases, urns, and flora were grouped as a housewife might have directed her servant to place them."[138] Plants and decorations hid the instrument's cone-covered receivers throughout the room so that the only visual evidence of the Telharmonium was the organ-like interface of the instrument located on a stage, framed by palm leaves. Wooden panels above the playing interface partially covered the instrument's wires, while familiar-looking keyboards and the presence of sheet music visually communicated the machine's status as a musical instrument to concert-goers.

An entirely different scene greeted visitors when they walked down the stairs from Telharmonic Hall's performance space and into the basement, where Machinery Hall was

[136] *The Body Electric*, 12.
[137] *Magic Music*, 138.
[138] "An Invisible Rival for the Hurdy Gurdy."

Figure 2. Telharmonic Hall. New York Music Co., *Telharmony*, New York, December 1906.

located. There, behind railings, the Telharmonium's working parts were on display for all paying audience members to see. A New York Electric Music Co. promotional brochure described the space as "half an acre of dynamos and tone mixing and tone building electric mechanism."[139] Photographs from the brochure depict the area as orderly and shining, with straight lines of railings enclosing the massive gleaming dynamos and hulking switchboards.

Both upstairs and downstairs spaces presented visitors with carefully planned auditory and visual impressions. Telharmonic Hall, where audiences heard musical programs, provided an atmosphere of bourgeois domesticity. Machinery Hall, in contrast, supplied visitors with the sights and sounds of industry and technology, the implied source of the domestic comforts

[139] "Telharmonic Hall Program: Week of December 30th 1907," Magnetic Music Publishing Co. Website, http://magneticmusic.ws/mmTelHallProgDec30.pdf (accessed February 2, 2015).

located above. Much as manufacturers, journalists, performers and historians designated the production and products of electronic technologies as male and female, respectively, the New York Electronic Music Co. clearly gendered Telharmonic and Machinery Halls. Journalists too routinely used masculine descriptors when writing about Machinery Hall, whether highlighting its hard materials and edges or its "grimy" industrial atmosphere. In contrast, soft materials and rounded lines adorned the objects in Telharmonic Hall, designating it as a space fit to be occupied by a respectable bourgeois housewife.

The programs that audiences witnessed in the upstairs hall highlighted the Telarhmonium's role as new invention and fascinating piece of technology alongside its identity as a musical instrument. Programs mixed musical performance, lectures, and demonstrations, entertaining the audience with music while educating them about the scientific principals that governed the working of the instrument. A lecturer, unidentified in surviving programs, explained to audiences how the instrument produced electronic musical sound, how it created different timbral qualities, and how the receivers hidden in the hall's plants transformed electrical signals into sound. The audience also heard brief explanations of the overtone series, the Telharmonium's expression devices, and the instrument's potential impact on music as both art and commodity. Interspersed throughout the demonstrations and lectures were musical numbers, discussed at length later in this chapter.

We can begin to glean insights into what the Telharmonium's sound signified to its hearers by placing its reception against the larger backdrop of American's public and private interactions with technology outlined above. The instrument was at once a massive and awe-inspiring machine and the source of sounds that penetrated listeners' bodies. Audiences and critics understood the Telharmonium as a potentially revolutionary technology on par with the

telegraph or telephone and, at the same time, as a sophisticated musical instrument. The Telharmonium signified at many different technological and musical levels, but all aspects of the instrument's significance relied on the specter of non-white bodies and sounds associated with them. Even as these "other" bodies were physically excluded from spaces like Telharmonic Hall and the glittering restaurants of 5th Avenue, their presence in New York City and the nation fueled the new instrument's popularity as both machine and musical instrument.

The Telharmonium captured the imagination of press and public alike in large part because of its massive size. The spectacle of the instrument's working parts in Machinery Hall was an integral part of a visit to Telharmonic Hall, and its description was practically a requirement for press reports on the instrument. A promotional brochure for the Hall urged potential viewers to arrive in time to view the machinery before scheduled concerts so that they could properly "realize the magnitude of the process."[140] Stories about the instrument in newspapers and magazines invariably featured detailed descriptions of the machinery, emphasizing its dimensions and cost. Journalists repeatedly listed staggering figures associated with the instrument, including its 200-ton weight, its 150 dynamos, and its $200,000 construction cost. Illustrations and photographs of the instrument's working parts accompanied most lengthy stories; the dynamos, tone mixer, and switchboards were particularly popular visual subjects.[141]

The sublime experiences that many journalists reported having with the instrument hinged on the apparent disconnect between their experience with the industrial technology in Machinery Hall and the music they heard above it. For many, it was the fact that no music could be heard in Machinery Hall that provoked wonder. An unidentified reporter writing for the *New*

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[140] *Telharmonic Hall Program: Week of December 30th 1907.*

[141] See: "Electrical Music," *Scientific American* (March 31, 1906); "The Generating and Distributing of Music by Means of Alternators"; Thomas Commerford Martin, "The Telharmonium: Electricity's Alliance with Music," *American Monthly Review of Reviews* (April 1906); "Science and Invention: Electrical Music" *Literary Digest* (April 14, 1906); "New Music for an Old World."

York Times provided a long, almost poetic description of the machine room in minute detail, pausing frequently to remark, "But how far a cry is this from music!" The lengthy passage culminates in the author's arrival at the room containing the Telharmonium's dynamos. Although the revolving shafts on which the dynamos were mounted produced only a "low rumbling" and "there is still no music," the author declares he has arrived at the source: "here at last is music made."[142] In this and many other similar accounts, it was not simply the massive proportions of the Telharmonium that evoked wonder, but the seeming incongruity between the spectacle of the machinery and its ontological status as a musical instrument. After all, sights of elaborate machinery were not new; rather, it was the use of such machinery to produce music that witnesses experienced as sublime.

The quality of the Telharmonium's musical sound sharpened the seeming incongruity between industry and music. E. E. Higgins, for example, defined the Telharmonium as, "no less wonderful a thing than the production by a grimy, oily, and more or less noisy dynamoelectric machine of sweeter, purer, truer, more beautiful *music* than has ever been produced by any other known musical instrument or combination of instruments on this hemisphere."[143] In this description, we see evidence that the Telharmonium reformulated David Nye's description of the electric sublime as a dissolution of "the distinction between natural and artificial sites."[144] The Telharmonium registered as sublime by erasing the imagined division between industry and culture rather than the boundary between the "natural and artificial." While the physical source of Telharmonium music was industrial, its auditory effects met the highest western artistic standards. The instrument's presentation in Telharmonic Hall and the restaurants of 5th Avenue—including its repertory and the potted plants and urns that hid its receivers—further

[142] "Magic Music from the Telharmonium."
[143] "A Wonderful Musical Instrument."
[144] *American Technological Sublime*, 152.

cemented its status as culturally refined. The strains of music that the foliage emitted called to mind not the industrial sounds of the machine but the tones of existing instruments, or, to some, tones of even greater beauty and sweetness than those available via the flute, oboe, or violin. In this way, the Telharmonium's music was akin to feminized depictions of electricity like the Statue of Liberty's torch or Lois Fuller's dance. Telharmonic music reminded listeners that electricity could not be understood through science alone, even as it was controlled and produced by masculine technology.

The instrument's means of distribution emphasized the incongruity between machine and music not only by creating physical separation between points of generation and sound production, but also by masking its sound sources. The diaphragm receivers and cone amplifiers that transformed the instrument's electricity into sound and projected that sound into space had clear ties to existing technology. The receiver was a modified version of a telephone; the cone resembled the amplifiers of taking machines. Yet when hidden in ferns, rosebushes, and urns, the devices created an audio-visual effect for audiences that bordered on the magical. In Telharmonic Hall, music seemed to come from everywhere and nowhere at once. A reporter for the *New York Times* wrote that "there was no locating any one tone anywhere," and that the music "steeped the air."[145]

This experience sometimes bordered on the frightening, or even the uncanny. The anonymous *New York Times* reporter quoted above went on to describe the source of the "great wonderment" felt by an audience in Telharmonic Hall. "It was so practical and yet so strange that women sat closer to each other, and the men looked about for a tangible clue to the course of the music." The instrument, to this journalist, joined together "practical" technology and the strangely ephemeral sounds heard in Telharmonic Hall. Women, apparently more susceptible to

[145] "An Invisible Rival for the Hurdy Gurdy," *New York Times*, January 12, 1907.

the mysterious aspects of the performance, responded with mild fear; the presumably more "scientific" men reacted with curiosity. This report mirrors other accounts of American encounters with sublime technology wherein electricity produced seemingly magical effects, or what Nye describes as a "synthetic environment infused with mystery."[146] By masking the sources of the Telharmonium's sounds, Telharmonic Hall facilitated a sublime and mysterious technological experience for audiences.

In the excitement about the Telharmonium's machinery and its disembodied sound, the instrument's performers receded into the background. Although Telharmonic Hall featured a stage on which audiences viewed performers during concerts, the men who appeared on it merited little notice in the press. Visual depictions of the instrument in print focused on the machinery itself, with the bodies of the young and middle-aged white male performers, many of them born in western Europe, appearing only occasionally in photographs and illustrations.[147] Few accounts of the performers' movements, personas, or musicality exist in the mass of writing published about the instrument, perhaps no surprise given the high rate of turnover in New York, where performers often played five or six concerts each day.[148] Even the Telharmonium's interface merited little notice; journalists generally limited descriptions to brief comparisons with organs. Reporters tended to diminish the labor of performers, characterizing the instrument as nearly beyond human control and noting the failure of any current performer to master it.[149] In

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[146] *American Technological Sublime*, 152.

[147] In New York, performers included the Viennese violinist Otto Scheda and the Norwegian pianist Christian Schiott. Schiott was a 24-year-old Norwegian who began giving piano recitals in Oslo at age 8. Scheda was a 43-year-old Viennese violinist with an act called "Paganini's Ghost" who also dyed his skin and eyes to tour London as the "World's Only [American] Indian Violinist." Elliot Schenk, a composer and conductor of some stature at the time, took over as the Telharmonium's music director, replacing Pierce sometime after the move to New York. See *Magic Music*, 168-170.

[148] Performers often played as many as five or six concerts in a single day, leaving little time for practice or experimentation on the complex instrument. Pierce left the enterprise not long after the Telharmonium's New York installation.

[149] "New Music for an Old World."

the shadow of the new instrument's technical achievement, the actual labor of human bodies seemed to disappear entirely for audiences, not only those in nearby restaurants and hotels who could not see the performers, but even for witnesses at Telharmonic Hall.

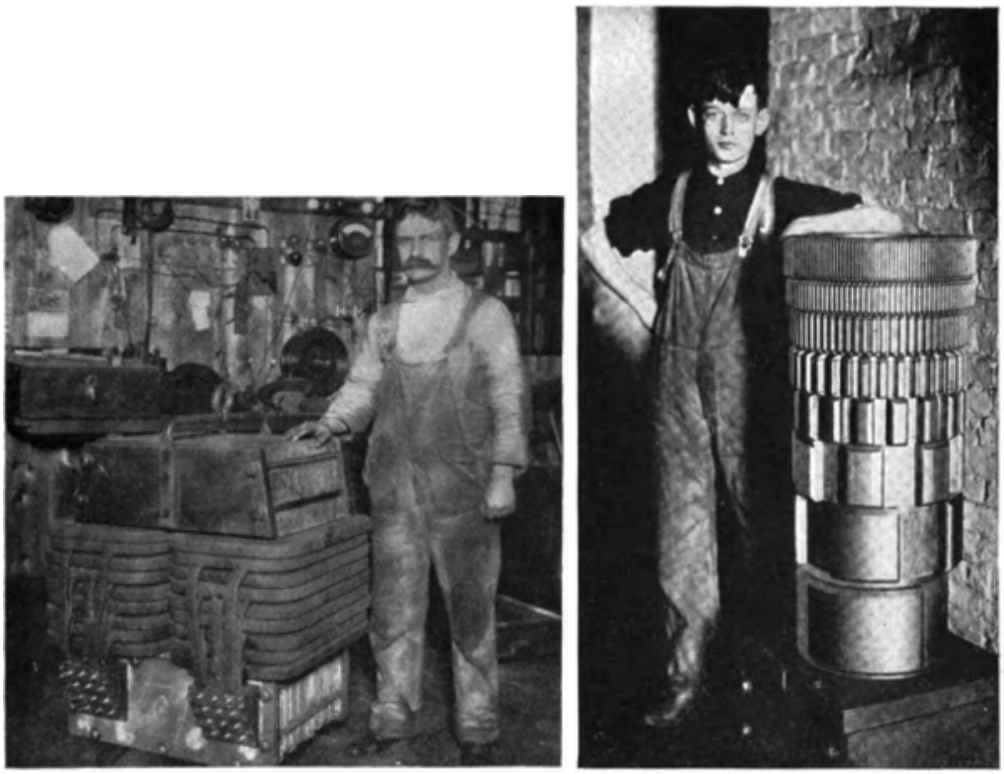

Figure 3. Telharmonium Workers. Printed in "The Generating and Distributing of Music by Means of Alternators" (left) and "New Music for an Old World" (right).

In contrast to the lack of attention afforded to performers, press coverage of the Telharmonium prominently featured images of the bodies of workers. Figure 3 shows photographs of workers taken at the Cahill lab in Holyoke and printed by *Electrical World*, *American Monthly Review of Reviews*, *Literary Digest*, and *McClure's*.[150] Although Weidenaar reports that the Cahills employed skilled workers, the second image shows what appears to be an extremely young man, possibly even a boy of no more than twelve or thirteen, posing with one

[150] "The Generating and Distributing of Music by Means of Alternators"; "The Telharmonium: Electricity's Alliance with Music"; "New Music for an Old World."; "Science and Invention: Electrical Music."

of the instrument's dynamos. Both of the workers pictured wear soiled overalls and stare evenly at the camera. Neither are named. We do not know whether these workers travelled with the Cahills and corps of engineers to help with the installation and maintenance of the machine in New York City, or whether they were left jobless after the summer of 1906. Their images in reports about the Telharmonium functioned not to communicate information about the workers themselves but rather to confirm the industrial status of the machine and, perhaps, by way of contrast, the cultured nature of its product. The image of factory workers in soiled clothing next to machinery attested to the gritty nature of the instrument's means of production and situated the Telharmonium among a range of other industrial achievements from the railroad to the utility station. The images further heightened the distinction between the masculine industry on display in Machinery Hall and the ornate domestic femininity above it in Telharmonic Hall.

In both the Telharmonium's marketing and reception, the bodies of those in the most intimate and regular contact with the instrument—the performers and laborers who built and maintained it—either fail to merit notice or seem to become part of the instrument itself. Journalists, following the lead of the New York Electric Music Co.'s promotional messages, were far more interested in the instrument's potential relationship with the bodies of listeners. They understood the Telharmonium as a newcomer to a growing pantheon of revolutionary technologies that promised to enhance and even fundamentally alter the patterns of daily life for the nation's citizens. The Telharmonium even went a step further than technologies like the incandescent light bulb and the telephone, utilizing electricity not only as "a tool of industry" but now as "a worthy medium for the purest of the fine arts—music."[151] Among new technologies, the Telharmonium invoked admiration by bridging industry and culture, extending electricity's

[151] "The Telharmonium," *The Outlook* 83, no. 1 (May 5, 1906).

utility into the world of arts. By joining these two realms, the instrument attested to the nation's civilized nature twice over—once as an electrical invention and again as a cultural tool.

The Telharmonium's promoters cultivated the instrument's connections to existing inventions and placed it in the context of a new electrical industrial entertainment complex by incorporating other recent technologies into the Telharmonic Hall show. Beginning in the spring of 1907, management at Telharmonic Hall featured the display of biographs during concerts. One of many moving picture technologies available at the time, biograph films generally depicted brief scenes from every day life or visual tricks. Biographs first appeared in Telharmonium performances during a reception for Worcester Polytechnic Institute alumni in February 1907 at the Normandie Hotel. *Electrical World* reported that the brief film featuring Telharmonium performers in action several blocks away at Telharmonic Hall "literally brought down the house."[152] The next month the feature became part of select Telharmonic Hall performances, with biographs inside the Hall depicting audiences outside it at nearby cafes and hotels. Another film showed the future process of ordering Telharmonium music from the comfort of one's home.[153] The films simultaneously emphasized the dispersed nature of the instrument's production and consumption and collapsed the distance between performer and audience and between audiences at different locations. In the films, the bodies of performers registered as significant to witnesses, because their visual representation emphasized the technical achievement of the Telharmonium. The biographs offered a form of proof to witnesses that the Telharmonium was, indeed, the marvel of human ingenuity that its proprietors claimed.

In addition to the biograph, the use of an arc light to transmit the instrument's music was one of Telharmonic Hall's most popular features. The arc light's capacity to produce sound was

[152] "Before the Footlights," *New-York Daily Tribune*, March 10, 1907.
[153] "The music of the future…" *New York Press*, February 17, 1907.

well known at the time. Arc lamps created light by passing electricity between two carbon electrodes, a process that often produced audible tones as a byproduct, something many New Yorkers would have heard on the city's streets around the turn of the century. In the last year of the nineteenth century a British physicist, William Du Bois Duddell, modified a lamp so that he could control the frequency of the sound emitted and wired the new contraption to a keyboard. The result was the "singing arc," a device that became particularly popular in physics classes.[154] The *New York Times* reported that the Telharmonium was first connected to an arc light in Telharmonic Hall at the spontaneous suggestion of a young electrician who worked there (identified only as "Electrician Morgan") during the venue's opening night.[155] The resulting demonstration reportedly delighted the audience and remained a feature in subsequent Telharmonic Hall concerts. This aspect of the performances proved to be one of the most popular and remarkable elements of the show.[156]

Although the arc light and its capacity for sound production were not cutting-edge technology, the abundance of electric lighting in places like the theater district still inspired awe in the city's residents and visitors; clearly, its use in Telharmonic Hall did the same.[157] The pairing of the Telharmonium's musical output with the arc lamp's glowing light captivated audiences in part by its hybrid nature, joining the visual with the aural, the utilitarian with the artistic. Perhaps most importantly, the production of Telharmonic music through the arc lamp

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[154] Roland Wittje, "The Electrical Imagination: Sound Analogies, Equivalent Circuits, and the Rise of Electroacoustics, 1863-1939," *Osiris* 28, no. 1 (January 2013): 52.

[155] There is little question that the "spontaneous" suggestion was in reality a pre-planned publicity stunt, given that an unmodified arc lamp would not have been capable of transforming the Telharmonium's electric currents into sound. Nor were arc lamps generally installed indoors; their harsh bright light was better suited to outdoor spaces.

[156] Announcements for upcoming performances in the *New York Sun* and *New York Globe and Commercial Advertiser* often led with a note about the captivating arc lamp performances. A writer from *Electrical World* called the singing arc "one of the most interesting features of the demonstrations." "Singing Arc," *Electrical World* (April 6, 1907).

[157] The arc light itself was declining in popularity as Edison's incandescent bulbs gained ground. Nye claims that "spectacular lighting" like that on Broadway "dematerialized the city and promised personal transformation." *American Technological Sublime*, 192.

awed because it emphasized the Telharmonium's difference from existing sound technologies. While mechanical phonographs and player pianos laid bare their working parts, the arc lamp, along with the flowers and urns in Telharmonic Hall, obscured the complex machinery that produced the Telharmonium's sound. The simple glowing bulb suggested a musical future that was aurally pleasing and visually refined, free from the maligned horn of the mechanical talking machine or the familiar form of the player piano.

The Telharmonium and the Talking Machine

The use of biographs and arc lights during Telharmonic Hall performances situated the new instrument firmly in the context of modern electrified life and entertainment, but the existing technology that most shaped public perception of the Telharmonium was one the new instrument was most frequently compared against: the talking machine.[158] Phonographs were an increasingly popular part of American domestic and public life during the years that the Telharmonium was installed in New York City. The talking machine was not, however, without its detractors. The most common target of criticism was the phonograph's "scratch," the surface noise that could be heard as the instrument's needle traveled through the grooves of a record. The scratch was especially acute in cheaper models and before enhancements like electric motors that came after the Telharmonium's time. Complaints about the phonograph's bulky and unsightly horns, necessary to amplify the machine's volume, were also common.[159] In general, consumers found talking machines to be far less awe-inspiring than other new technologies

[158] Frederic Thompson, the manager of the wildly popular Luna Park at Coney Island, wanted—but never got—to hold hourly Telharmonium concerts in a special theater there with four spaces, each dedicated to a difference type of music: grand opera, comic opera, orchestral, and popular. *Magic Music*, 177.

[159] Even a cursory glance at articles and advertisements in the pages of the industry's leading trade publication, *Talking Machine World*, demonstrates that these drawbacks dominated dealers' and manufacturers' concerns about increasing the popularity of the phonograph.

entering the home at the time. Kenney postulates that the phonograph's inability to inspire wonder was due to the fact that models in the early years of the twentieth century were mechanical rather than electric.[160] Unlike the Telharmonium's massive (and masculine) dynamos, the source of the talking machine's power, a hand crank, was easily grasped, both mentally and physically. Further, the talking machine's means of sound production was clearly visible and audible to consumers. Listeners could see how the phonograph produced its sound while they listened to it; more, they could hear the means of production in the device's notorious scratch.

Journalists often confessed that upon first learning about the Telharmonium they immediately wondered whether the new instrument was "only another device, like the phonograph, or the much advertised piano-player, for producing mechanical music."[161] For these commentators, "mechanical music" bore aural traces of its means of production in its musical output. These listeners expected to hear evidence of the Telharmonium's mechanical nature, just as they did in the case of the phonograph's surface noise. And yet they found "none of the rasp and harshness of the phonograph about [the Telharmonium]."[162] Journalists made this point again and again, assuring readers that despite the resemblance of Telharmonium receivers to the phonograph's horn, the sounds produced by the two technologies were nothing alike.

Reporters frequently underscored the contrast between talking machine and Telharmonium by drawing analogies between the new technologies and older musical instruments. Baker wrote for *McClure's* that upon first learning about the Telharmonium, one imagined an instrument that produced "mechanical music"; "in other words, we imagine a sort of

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[160] *Recorded Music in American Life*, xii.
[161] "New Music for an Old World."
[162] Marion Melius, "Music by Electricity," *World's Work* (June 1906).

overgrown, hurdy-gurdy."[163] Another claimed that the Telharmonium's music was in no way like the characteristic sound of the phonograph, but rather produced, "pure, clear notes and chords, as loud as if an orchestra were on the spot."[164] Such comparisons consistently equated the Telharmonium with instruments from the western art music tradition, and the talking machine with instruments outside it. The hurdy-gurdy to which Baker referred was almost certainly not the droning stringed instrument associated with European folk music, but the barrel organ (the name substitution was common at the time). The barrel organ—Baker's hurdy-gurdy—consisted of a bellows and pipes, and it "read" music from cylinders, much in the manner of a player piano, while its operator turned a crank. The instrument was widely used and identified as a street instrument, and one almost always associated with Italian immigrants whom middle-class writers consistently stereotyped as poor and uneducated.[165] Somewhat ironically, just a few years after the Telharmonium's heyday, industrialists and journalists alike blamed the barrel organ's decline in part on the increasing popularity of the phonograph.[166]

In the increasingly urbanized United States of the early twentieth century, music made by instruments like the barrel organ was apt to be classified as noise by the country's middle-class and elite cultural critics. As public noise became an object of growing concern, street musicians were frequent targets of scorn, identified by the mainstream press as problematic racial "others" who posed a menace to white bourgeois society.[167] To authorities like the manager at Telharmonic Hall or the anonymous *New York Times* reporter, the sounds of street musicians registered not as music, but as noise. It was not, however, the sounds themselves of organ

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[163] "New Music for an Old World."
[164] "Electrical Music."
[165] For an analysis of representations of the organ grinder figure in the city see: Michael David Accinno, "'Organ Grinder's Swing': Representations of Street Music in New York City, 1850-1937," (master's thesis, University of Iowa, 2010).
[166] "Organ Grinder's Swing," 61, 85.
[167] "Organ Grinder's Swing."

grinders that offended middle classes listeners, but rather the threat that such sounds posed to a dominant white American citizenship.

To equate the talking machine with the hurdy-gurdy was thus to characterize the new technology as noisy. Such characterizations grew as the phonograph became a mass commodity in the years preceding the Telharmonium's New York installation. While Edison's 1907 claim that "there is no family so poor that it cannot buy a talking machine" was undoubtedly an overstatement, it is true that many working-class people and non-native English speakers owned talking machines at the time. Karin Bijsterveld has traced how phonographs came to be categorized as noisy in Dutch cities, and thus increasingly subject to attempted legislation, as they became known as musical instruments of the poor.[168] At the same time, while phonographs could not reproduce all sounds equally well, they were adept at producing sounds that communicated racial difference to listeners. Minstrel sketches and "coon songs" made up a significant portion of records at the time, as did "ethnic" recordings aimed at both white listeners and the talking machine's significant consumer base of recent immigrants.[169]

The phonograph also played a critical role in the growing popularity of ragtime with white audiences. White anxieties about ragtime were emerging as the Telharmonium was installed in New York.[170] Cultural critics often cast ragtime as a disease that could infect white listeners, analogies that scholars like Ron Radano have pointed out explicitly linked such discourse to fears about miscegenation.[171] The so-called "hot rhythms" of music with origins in African-American cultural traditions became "a metonym of the black male body and,

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[168] Karin Bijsterveld, *Mechanical Sound Technology, Culture, and Public Problems of Noise in the Twentieth Century* (Cambridge, Mass: MIT Press, 2008).
[169] See "Talking Machines, Dancing Bodies," 156-57, for an overview of record catalogs in the early years of the twentieth century.
[170] See "Talking Machines Dancing Bodies," 150, for early negative reactions to ragtime in the first years of the twentieth century.
[171] "Hot Fantasies," 474.

specifically, Negro semen or blood."[172] Talking machine companies like Columbia and Victor took advantage of ragtime's popularity but simultaneously sought to distinguish their products as ones of cultural distinction suitable for consumption by even the most prestigious white audiences. Advertising campaigns like that for Victor's Red Seal records lavished media attention on these "classical" recordings even as the company turned most of its profit on the sale of popular music.[173] Such advertising strategies reflected what Radano identifies as the "double logic" of white responses to black music, simultaneously defined by fascination and fear.

Cultural critics of the talking machine, like those of ragtime, frequently framed their fears in terms of national health. John Philips Sousa, a vocal critic of the phonograph, worried that that talking machine would precipitate the end of "good" amateur music-making, fretted, "Then what of the national throat? Will it not weaken? What of the national chest? Will it not shrink?"[174] The Telharmonium inspired no such fear because it was, for its early twentieth-century audiences, very clearly an instrument that made music suitable for the nation's white middle classes. When critics equated the Telharmonium with the orchestra and the talking machine with the hurdy-gurdy, the comparison was by no means a purely sonic one. The point was not to communicate that the Telharmonium sounded like violins or oboes but that it sounded civilized. This meant, for turn-of-the-century American readers, that the instrument sounded racially white and economically upper class. The sounds, moreover, were the product of an industrial machine marked as masculine. The Telharmonium's timbre, in other words, came to represent the dominant social order of its time and place. The flip side of this analogy marked the talking

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[172] "Hot Fantasies," 474.
[173] "Hot Fantasies,"; Holly Kruse, "Early Audio Technology and Domestic Space," *Stanford Humanities Review* 3, no. 2 (1993): 1-16; Marsha Siefert, "The Audience at Home: The Early Recording Industry and the Marketing of Musical Taste," in *Audiencemaking: How the Media Create the Audience*, ed. James S. Ettema and D. Charles Whitney (Thousand Oaks, MI: Sage Publications, 1994), 186-214; Siefert, "Aesthetics, Technology, and the Capitalization of Culture: How the Talking Machine Became a Musical Instrument," *Science in Context* 8, no. 2 (1995): 417-449. "Talking Machines, Dancing Bodies."
[174] John Philip Sousa, "The Menace of Mechanical Music," *Appleton's Magazine* 8 (1906): 278-284.

machine as a less desirable racial "other," one that lacked the masculine technology of the Telharmonium and that might just as commonly be found among the working classes as the bourgeoisie. Again and again in the Telharmonium's reception, the new instrument appeared to hold curative powers for its privileged audiences, a point frequently made by comparing it to other, more "noisy" musical sounds that represented an infectious threat to the dominant social order.

To begin with, the press frequently predicted that the Telharmonium would, like electric light, transform American home life for the better. The instrument promised an abundance of music: "music with breakfast and dinner, light music for the children, for afternoon teas or for poker parties, and slumber songs at bedtime."[175] Writers imagined being soothed to sleep by "some sweet, old-time lullaby" and being "made ambitious" for the day's labor by "the soul stirring strains of a military march," much like Bellamy's utopian musical system.[176] A picture in *Gunter's Magazine*, which imagined a future filled with Telharmonium music, showed a small white upper-class family seated at a table for a meal (see Figure 4).[177] A young woman occupies the photo's center, flanked by two men. Dutiful servants hover just behind those seated at the table. Above the young woman hangs a glowing arc lamp, the source of music that the photo's viewers cannot hear. We see evidence, though, of this music in the visage of the woman, who is obviously transfixed. She gazes past the camera, her head slightly raised toward the musical lamp. Her position indicates to viewers that the music, whatever it is, has inspired a physical state that is at once serene and regal, attentive and dreamy. As this nameless woman's pose demonstrates, the Telharmonium would not simply change the rhythms of home life—it would alter the human bodies of listeners. The lullabies at night and marches in the morning were not

[175] "To Manufacture Music by Electrical Device," *New York Times*, March 11, 1906.
[176] "The Wonderful Telharmonium."
[177] "The Wonderful Telharmonium."

simply entertainment: they inspired healthy emotions and conditioned bodies for tasks ahead, instilling vigor or calm as the situation required. Even in Telharmonic Hall, audiences interacted with the instrument and its sound in intimate ways. Reports of Telharmonium concerts often described the music as "washing over" or "entering" those in the hall.[178]

Figure 4. "The Dinner From the Future." In "The Wonderful Telharmonium."

It was not just Telharmonium music that penetrated the bodies of audience members, though. Early in Telharmonic Hall's second season, in the fall of 1907, the *Tribune* reported that during a public concert, "a waltz, from 'The Merry Widow,' is performed by the electrical current: music by wire, from a human body."[179] The *New York Times* reported that the effect was achieved with the help of a hidden sound board beneath an unidentified man's coat, and only

[178] "An Invisible Rival for the Hurdy Gurdy."
[179] "Telharmonic Hall," *New-York Daily Tribune*, November 20, 1907.

seemed to come from his body.[180] But weeks later, the *New York Sun* reported "a new phase of demonstrating the curious possibilities" of Telharmonium music, namely, "its production through a human subject by the application of electrodes to the arms."[181] The *Music-Trade Review* noted that "all" could be musical now.[182] Although few details about the mechanics of this new element of Telharmonic demonstrations survive, it seems reasonable to surmise that the electrodes provided enough current to produce tingling sensations, but not pain, in audience members. It is unclear exactly how music was then produced through the body—perhaps hidden sound boards, as the *Times* supposed. It is clear, however, that during these demonstrations audiences were expected to perceive sound as the end product of electricity traveling through human bodies. The experience provided Telharmonium audiences with a mix of danger and new physical sensations, while obliquely promising some sort of bodily transformation. Taking in electric currents directly through their skin allowed participants to experience the Telharmonium on an intimate level, perhaps making them feel that they themselves were part of the instrument. The experience briefly transformed their bodies into musical instruments, and thoroughly modern ones at that.

The application of electricity produced in the Telahrmonium's Machinery Hall to human bodies perhaps called to mind the electric belts and devices that promised neurasthenic cures to their users. Might the Telharmonium's electric currents hold similar curative powers? Given widespread claims about the healing potential of the instrument's music, it seems quite possible that this was the case for many visitors to Telharmonic Hall. Like the electric technologies documented by de la Peña, the Telharmonium was widely anticipated to provide an antidote to neurasthenic insomnia. Electric cures were supposed to alleviate such ailments by restoring the

[180] "Theatrical Notes," *New York Times*, November 19, 1907.
[181] "New Play by Austin Strong," *New York Sun*, November 24, 1907.
[182] "All Can Now be Musical," *Music-Trade Review* (November 30, 1907).

body's finite reserves of energy, but it was less clear how the Telharmonium might effect neurasthenic cures. The belief in the Telharmonium's healing powers was inspired in part by the instrument's advertised convenience and a longstanding belief in the curative powers of music. It is also clear, however, that the perceived quality of the Telharmonium's sound was critical to its imagined health benefits. The talking machine, for example, offered a similar level of convenience and availability, but did not seem to possess the health benefits of the Telharmonium. In fact, as we saw above, many believed the opposite to be true of the phonograph. The Telharmonium's status as potential cure was intimately bound up in hearings of its timbre as particularly "pure," a characterization I explore at length in the following segment of this chapter. As we will see, it is impossible to separate this notion of sonic purity (and as neurasthenic cure) from racial characterizations of the instrument's sound.

Pure Timbre, Pure Tuning

Descriptions of the Telharmonium's sound as pure dominated discussions of the instrument's sound. It is difficult to find a review of the Telharmonium from 1906 or 1907 that does not use some form of the word to describe the electronic timbre. Even the few critics and writers who raised concerns about the sound's potential to become monotonous tended to concur with the majority about this aspect of the instrument's sound.[183] Descriptions of the Telharmonium's sonority as pure can be traced to Cahill's rhetoric and promotional language but also resonated with existing rhetoric about tuning systems and acoustic timbre.[184] Although the

[183] Baker, for example, wrote in "New Music for an Old World" that, "[The Telharmonium's] own peculiar and beautiful tones may in their very sweetness and perfection fail to please every one."
[184] "New York Electrical Music Company Stock Prospectus," August 1906, Magnetic Music Publishing Co. Website, http://magneticmusic.ws/mmNYEMCpros.pdf (accessed February 3, 2015). This document claimed: "The notes and tones produced by the Telharmonium are as pure and beautiful as those produced by any musical instrument." The "Telharmonic Hall Program: Week of December 30th 1907" declared, "This is the first musical instrument in history upon which a pure fundamental tone may be produced, making the elements of tone, as

Telharmonium's sound was new to early-twentieth-century listeners, they easily situated its timbre within preexisting matrixes of musical meaning and value. Indeed, it was through associations to existing cultural constructs that the Telharmonium's sound became meaningful.

For some, the Telharmonium's timbral purity resulted in part from the instrument's use of just temperament. The instrument's tuning was critically important to Cahill. Weidenaar describes the Telharmonium as Cahill's, "zealous quest for combining the perfection of just intonation—with its pure thirds and fifths—with the practicality of equal temperament."[185] Weindenaar traces Cahill's preoccupation with just temperament to the inventor's reading of Hermann von Helmholtz's famous acoustical text, *On the Sensations of Tone*, first translated into English in 1875.[186] Although Helmholtz's definition of timbre was widely accepted in Cahill's time, his proselytizing for just intonation in *On the Sensations* is less well known, although the physicist expounded on the subject at some length. For Helmholtz, the growing dominance of equally-tempered instruments marked the beginning of western art music's decline in the early years of the nineteenth century. Mozart and Beethoven, Helmholtz believed, were among the last to compose with just intonation in mind; as equal temperament became increasingly dominant, later nineteenth-century composers relied too heavily on dissonance for effect.[187] Equally-tuned instruments, Helmholtz believed, "threaten[ed] to lord it over the natural requirements of the ear," while justly-tuned performances represented an aesthetic ideal and the "first requirement of beauty" in singing.[188]

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elements, separately available to the musician." Also see Thaddeus Cahill, "The Electrical Music as a Vehicle of Expression," Papers and Proceedings of the Music Teachers' National Association at its Twenty-Ninth Annual Meeting (lecture, Columbia University, New York City, December 29-31, 1907).

[185] *Magic Music*, 62.

[186] *Magic Music*, 8-9; Hermann L. F. von Helmholtz, *On the Sensations of Tone as a Physiological Basis for the Theory of Music*, trans. Alexander J. Ellis (London: Longmans, Green, and Co. 1875).

[187] *On the Sensations of Tone*, 327.

[188] Helmholtz argued that just temperament should be available in all keys on keyboard instruments like the organ and harmonium, much as the Telharmonium made possible decades later. He proposed as a solution a system which

What for Helmholtz signaled "naturalness" in the mid nineteenth century amounted to "purity" for the journalists and music critics writing several decades later about the Telharmonium's capacity for playing in just intonation. E. E. Higgens, writing for *Success Magazine*, noted that the instrument made pure music in part because "brutal compromises in tone vibrations" (i.e. equal temperament) were unnecessary. Unlike other modern instruments, which suffered from the imperfection of equal temperament, the Telharmonium could produce notes and chords that were "absolutely pure."[189] Daniel Gregory Mason, composer, writer, and a leading proponent of music appreciation (discussed below), spoke of the Telharmonium's tuning capacity in similar terms. In two essays on the instrument in *The Outlook* and *The New Music and Church Music Review*, Mason characterized equal temperament as "impure " and a sacrifice in which quality of sound was exchanged for harmonic flexibility.[190] In contrast, the Telharmonium, "introduced a purity of harmony unfamiliar to musical ears since the days of Palestrina, while not sacrificing the all-important innovations of Bach."[191] For Mason, the Telharmonium offered a way forward without compromise, making both just temperament's purity of sound and equal temperament's harmonic flexibility available to composers and performers.

Although neither Cahill's surviving written works about the Telharmonium nor Helmholtz's *On the Sensations* explicitly characterized justly tuned intervals as pure, the

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used enharmonic substitutions and 53 divisions of the octave in order to retain just intonation within modern harmonic frameworks. *On the Sensations of Tone*, 325-328. Alexandra Hui has traced how this aspect of Helmholtz's work was part of his larger commitment to classicism, the nineteenth-century musical outlook associated with Eduard Hanslick and traditional compositional ideals. Alexandra Hui, *The Psychophysical Ear: Musical Experiments, Experimental Sounds, 1840-1910* (Cambridge, Mass.: MIT Press, 2013).

[189] "A Wonderful Musical Instrument."

[190] Daniel Gregory Mason, "The Telharmonium: Its Musical Basis," *The Outlook* (February 9, 1907) and "Electrically Generated Music," *The New Music and Church Music Review* 6, no. 64 (March 1907).

[191] "The Telharmonium: Its Musical Basis."

association was and remains common.[192] The word "pure" is often used in place of "just" in reference to this type of tuning, as in the *Grove Online* entry on just temperament, which refers to "impurely" tuned intervals as "distasteful" and "defective."[193] In this context, the use of the adjective "pure" may have roots in both the number systems used to describe musical intervals and the phenomenon of beats. Justly-tuned intervals can be described in whole number ratios between a pitch and a fixed tonic, so that fifths, for example, can be represented by the ratio 3:2, and major thirds by 5:4. These types of intervals are free from beats, the periodic pulses formed by equally-tuned intervals (which cannot be represented in whole-number ratios) and which are particularly noticeable in intervals considered dissonant, like major sevenths. The origins of the rhetoric of purity within the context of temperament are multifaceted and centuries old; tracing this history is beyond the scope of this dissertation.[194] Within the context of the Telharmonium's reception, however, it is clear that for at least some listeners, like Mason and Higgins, the instrument's capacity for just temperament enhanced its overall sonic purity.

While commentators like Mason believed that the Telharmonium's just tuning had potentially profound implications for the future of music, in reality the performance of just intervals fell out of practice with the Telharmonists in New York. Years later, Edwin Hall Pierce recalled that both he and the younger players he taught to play the instrument realized that, "there is a spirit in modern music which not only does not demand just intonation, but actually would suffer from its use." He admitted that, "consequently they relapsed more and more into the modern tempered scale" during Telharmonium performances.[195] This was not laziness on the

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[192] See Benjamin Steege, *Helmholtz and the Modern Listener* (Cambridge: Cambridge University Press, 2012), 206-214, on Helmholtz's fascination with just intonation in the context of nineteenth-century British colonial practices and class politics.
[193] Mark Lindley, "Just Intonation," *Grove Music Online*, Oxford University Press, http://www.oxfordmusiconline.com/subscriber/article/grove/music/14564 (accessed December 16, 2014).
[194] The bibliography to the *Grove* entry on "Just Intonation" cited above would be an excellent starting place.
[195] "A Colossal Experiment in Just Intonation." The rhetoric of intonation also frequently uses terms that imply

part of the players, Pierce wrote, but an "artistic necessity," born out of the realization that, "just intonation is wonderfully beautiful for music of a calm and sustained character which does not contain any remote modulations, but music of a spirited character becomes tame and uninteresting."[196] Indeed, Pierce believed that the Telharmonium was proof that it was entirely possible to build a usable keyboard instrument that could play in both just and equal temperament, but that it was futile to do so.[197]

Pierce's account leaves us wondering just how much, if any, of the Telharmonium music that audiences in New York City heard included the justly-tuned thirds for which the author had so painstakingly developed a technique and notation. His references to "remote modulations" and "spirited" music suggest that he found just intonation inappropriate, if not impossible, for music with generous amounts of chromaticism or works meant to be played at fast tempi. This is what one might expect: Pierce's arrangements incorporated just temperament mostly into triads, and their execution involved playing two of the instrument's difficult manuals simultaneously. Pierce was not specific about when performers dropped the use of just intonation, and he implied that they did so only for portions of their repertory. It is possible that performers in New York continued to play at least some "calm" selections—perhaps Schumann's *Träumerei*, for example—with justly-tuned thirds, although it is impossible to know the extent to which such performances occurred, if at all. What is certain, however, is that very few reviews and accounts of the instrument mention tuning systems at all. Nor do discussions of tuning appear in the

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social relations or actions like "just" and "equal," and musical commentators over the years have discussed musical systems in these terms. Perhaps most famously, Arnold Schoenberg referred to the "emancipation of dissonance." Helmholtz, years earlier, took the opposite stance in *On the Sensations of Tone*, 331, writing that "dissonances are allowable only as transitions between consonances. They have no independent right of existence…"

196 "A Colossal Experiment in Just Intonation," 330.

197 "A Colossal Experiment in Just Intonation," 331.

surviving programs for Telharmonic Hall demonstrations and concerts. The Telharmonium's tuning seems to have mattered only to a very few.

Acoustics and the Politics of Sonic Purity

Far more widely discussed in regard to the quality of the Telharmonium's sonority was its means of "tone building," that is, the process through which performers created various timbres. The instrument's ability to imitate the timbres of existing instruments was widely recognized by the press and trumpeted in promotional materials.[198] The widespread celebration of the Telharmonium's capacity for timbral variety played an important role in shaping perceptions of its overall sound as pure. Reporters frequently explained how the instrument produced different timbres, and demonstrations of tone building were regular parts of Telharmonic Hall programs. These explanations invariably began with descriptions of the sine waves that were the source of the instrument's timbral palette and, so many claimed, the foundation of its pure sound.

According to Weidenaar, Cahill's guiding vision for the Telharmonium was to create "a machine that could produce scientifically perfect tones, and absolute control of these tones of a mathematical certainty by mechanical means."[199] This emphasis on "scientifically perfect tones" was one that resonated with both professional and popular discourse about acoustics, technology, and music. For Cahill, this meant designing an instrument that produced individual tones with few or no harmonics whose waveforms were as close as possible to sine waves. Cahill and

[198] Mason claimed that Telharmonium players were able to produce near-perfect imitations of flute, clarinet, and oboe timbres, while the violin and cello sounds had not yet been achieved, a claim echoed by other reports. Others went farther, claiming the Telharmonium could imitate any existing instrument. Some even claimed that the new electronic instrument perfected existing instrumental timbres, surpassing the tone qualities of the various members of the western orchestra. See: "Electrically Generated Music"; "New Music for an Old World"; "Magic Music from the Telharmonium"; and Addams Sratton McAllister, "Some Electrical Features of the Cahill Telharmonic System" *Electrical World* (January 5, 1907).
[199] *Magic Music*, 14-15.

physicists like Hermann von Helmholtz viewed sine waves as the equivalent of timbral blank slates. Their production by the Telharmonium would allow performers to freely manipulate the instrument's timbre by blending several sine waves of frequencies equivalent to those in a given fundamental pitch's overtone series.[200]

For Cahill, an audible sine wave's purity derived from its a lack of harmonics; it was pure "in the physical sense" of being "as nearly as possible free from harmonics."[201] He believed that the purity of the Telharmonium's individual sine waves created timbres of exceptional quality when combined. He told the Music Teachers' National Association that the instrument's electrical tones were, in some cases, thought to be "purer and better than those of the orchestral instruments."[202] Helmholtz also characterized sine waves as "simple tones of great purity."[203] Tara Rodgers, in a discussion of Helmholtz's work, has traced how rhetoric about waveforms combined discourses about science, musical aesthetics, and identity, with the sine wave acting as "a mathematical and technological ideal" defined by its ostensible lack of timbre.[204] Rodgers notes that timbre has long been associated with the "devalued materiality of the body," a notion that for Helmholtz had roots in classical aesthetics. Helmholtz and acousticians who came after him, Rodgers argues, equated "notions of the sine wave as 'pure' and 'lacking body' with

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[200] In Cahill's first instrument, the electrically-generated tones were harsh at the point of production, forcing Cahill to design a series of coils that would remove as many additional frequencies as possible from the electric current as it moved through them. Later models also used precision machining to craft dynamos that produced waveforms nearly devoid of harmonics.
[201] "The Electrical Music as a Vehicle of Expression."
[202] Cahill claimed, for example, that the Telharmonium could create brass timbres that were free from the "harshness" usually found on trombones and cornets and replicate woodwind sounds with consistent timbres across volume and pitch levels. "The Electrical Music as a Vehicle of Expression."
[203] *On the Sensations of Tone*, 120.
[204] Tara S. Rodgers, "Synthesizing Sound Metaphor in Audio-Technical Discourse and Synthesis History," (PhD diss., McGill University Library, 2010), 117.

whiteness and scientific objectivity, and associated timbral variation with marked forms of material embodiment (e.g. raced, gendered, classed) and transgressive pleasures."[205]

Musicologists have recently begun to investigate the extent to which Helmholtz and others invested timbral qualities with social and political meaning. While Emily Dolan has recently asserted in her study of eighteenth- and nineteenth-century symphonic music that timbre did *have* meaning, she does not discuss in detail what these meanings—or their origins and impacts—were.[206] Although Dolan notes that the timbral character of an instrument, "was less a thing that could be clearly identified and more an ontological state," she nevertheless offers tantalizing examples of listeners ascribing human characteristics and emotions to timbre.[207] She quotes musical essayists, for example, on the feminine qualities of the flute, the military connotations of the trumpet and drums, and the sacred authority of the trombone.[208] Similar characterizations of instrumental timbre appear in *On the Sensations.* There, Helmholtz described brass tones as possessing an "extremely penetrating" quality (a descriptor used elsewhere for the Telharmonium) that "give[s] the impression of great power."[209] In contrast to the masculine qualities of the brass instruments, the flute, for Helmholtz, was, "extraordinarily pleasant and attractive" due to the softness of its tone. Yet the simple tones of the flute were not, he believed, well suited to the expressive demands of modern music. Thus, he writes, "the earnest friends of music […] contended for the harsher tones of stringed instruments in opposition to the effeminate flute."[210]

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[205] "Synthesizing Sound Metaphor," 118.
[206] Emily I. Dolan, *The Orchestral Revolution: Haydn and the Technologies of Timbre* (Cambridge: Cambridge University Press, 2013).
[207] *The Orchestral Revolution*, 164.
[208] *The Orchestral Revolution*, 154-157.
[209] *On the Sensations of Tone*, 119.
[210] *On the Sensations of Tone*, 206.

Helmholtz grouped the flute with other instruments that produced "simple tones" with few harmonics, including wide-stopped organ pipes and tuning forks. The waveforms produced by these instruments resembled sine waves more closely than any others. While for Helmholtz, this resemblance imbued flute and similar timbres with a classical ideal of "pure beauty," at the same time, their sine-wave-like nature registered as a lack. The absence of "roughness" in the timbre of these instruments, for example, made them sound pleasant but also robbed them of (masculine) power.[211] The flute was not simply feminine, but effeminate, defined by the absence of masculine qualities the like penetration and power that characterized the sounds of brass instruments.[212] It should come as no surprise that, historically, musical commentators have heard timbral purity as a feminine quality given the longstanding link in western culture between ideal womanhood and virginal purity. Yet for the journalists who characterized the Telharmonium's sound as pure, the feminine connotations of this quality receded into the background, tempered, perhaps, by the visual evidence in Machinery Hall of the instrument's status as masculine industrial technology. By characterizing the Telharmonium's sound as pure, audiences and journalists in early-twentieth-century New York did not exactly "feminize" the instrument, but balanced its masculine power with refinement. In a way, the Telharmonium seemed to be an ideal masculine instrument, one that drew from the raw industrial power associated with the

[211] The tuning fork's sound, for example, while lovely, was wanting in power at low pitches. *On the Sensations of Tone*, 118.

[212] Helmholtz's characterizations of timbre persisted into and beyond the Telharmonium's time and had existed long before *On the Sensations of Tone* was published. Gendered definitions and characterizations of timbre have been remarkably persistent in the history of the instruments of the western symphony. Studies in recent decades have found that school-age children and students in the U.S. associate the timbre of the flute with women and femininity. See: Rebecca B. MacLeod, "A Comparison of Aural and Visual Instrument Preferences of Third and Fifth-Grade Students," *Bulletin of the Council for Research in Music Education*, no. 179 (Winter, 2009): 33-43; Philip A. Griswold and Denise A. Chroback, "Sex-Role Associations of Music Instruments and Occupations by Gender and Major," *Journal of Research in Music Education* 29, no. 1 (Spring, 1981): 57-62; Colleen Conway, "Gender and Musical Instrument Choice: A Phenomenological Investigation," *Bulletin of the Council for Research in Music Education*, no. 146 (Fall, 2000): 1-17; Naomi Ziv, "Instrument Timbre and Trait Attribution," *Psychomusicology* 23, no. 3 (2013): 168-76.

working classes and the refined purity of femininity while maintaining its privileged status as a superior piece of technology.

Descriptions of the Telharmonium's timbre as pure also reflected contemporary racialized discourse. Ideas and anxieties about racial purity permeated all aspects of culture, and music, of course, was no exception. Discourse about racially pure musical aesthetics and sound were decades old by the twentieth century.[213] Scott Carter has recently documented a "voice culture movement" that thrived in the U.S. from around 1880 to 1920 and that sought to define and nourish "an ideal singing aesthetic capable of representing the U.S. nation-state."[214] Carter argues that, "of all the descriptions used to portray the ideal national voice, none resonated more with the anxieties over immigrant bodies than the idea of singing with a pure tone."[215] This emphasis on pure singing tone was grounded in racial ideology, in particular the belief that evolutionary advantages granted western Europeans particularly clear and pure voices. To the pedagogues who led the voice culture movement, poor vocal quality, "revealed not just poor training but hinted towards racial degeneracy."[216]

Just as Carter demonstrates that pure tone signaled racial purity within the voice culture movement, so too did the Telharmonium's timbral purity act as a sign of the instrument's racial and gendered identity in contemporary reports. One *New York Times* story in particular made clear that listeners heard the instrument's sound as racially pure, in other words, as white. The article, "An Invisible Rival for the Hurdy Gurdy," once again pitted the Telharmonium against

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[213] Nor was such discourse confined to the U.S. As Jann Pasler has demonstrated, musical scholars in France's Third Republic regularly drew on evolutionary theory to locate what they identified as a pure and essential Frenchness. Jann Pasler, *Composing the Citizen: Music As Public Utility in Third Republic France* (Berkeley: University of California Press, 2009), 267.
[214] Scott A. Carter, "Vox Americana: Voice, Race, and Nation in U.S. Music, 1890-1924" (PhD diss., University of Wisconsin-Madison, 2014), 74.
[215] "Vox Americana," 102.
[216] "Vox Americana," 103.

the barrel organ, here also described as a "hand piano."[217] The anonymous author of this article reported that during a concert at Telharmonic Hall a pair of street musicians set up their barrel organ on 39th Street just outside the building. The article's first words mark the pair as racial others: "Two swart Italians, man and wife." Their poverty is signaled by the husband's corduroys, their lack of education by the wife's exaggerated dialect. The music they make is most likely ragtime, identified only as "a syncopated air." In the story, as the husband begins to crank the instrument, "the wife's keener ears caught a rival sound." The narrative continues:

> 'Cut it out!' she said to her husband, placing her hand on his well-muscled arm and using the fair English one picks up after mixing with a polyglot population. 'Somebody in dis-a place ees playing da bigga org.' She pointed to the building at the northeast corner. It sounded like the music of a great cathedral organ, and the Sicilians were awed. They realized that against the massive tones that came from the building their instrument offered a thin and hopelessly unentertaining substitute for such rival music—although theirs had the merit of being real.

Although both sources of music in this story are "mechanical"—the barrel organ with its player-piano-like mechanism and the Telharmonium with its dynamos—the journalist categorizes only the street music as "real." Yet this ontological parsing is in no way a criticism of the Telharmonium. Rather, by portraying its sound as "unreal," the author emphasizes the ephemerality of the music emitted by hidden sources in Telharmonic Hall and its distance from the industrial source of its production. The unreal status assigned to Telharmonium music by this reporter thus signals a freedom from materiality. The lack of physicality in the Telharmonium's "massive tones" mirrors the lack of body that Helmholtz and others located in the timbre of sine waves. In contrast, the physicality of the street music is almost excessive. Its means of production, the barrel organ and its player, are not only visible but conspicuous, marked as outsiders by their clothing and speech.

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[217] "An Invisible Rival for the Hurdy-Gurdy." All quotes in this and the following four paragraphs are drawn from this article.

This *New York Times* article about the Telharmonium raised questions about what constituted "real" music even while emphasizing music's power over listeners and its ability to penetrate physical barriers. The Telharmonium music appears in the story as a powerful agent, one that can move listeners to silence and awe, but that is, paradoxically, ephemeral to the point of being unreal. The Italian musicians, in contrast, are defined by the physicality of their bodies and dress but appear cowed in the face of the new instrument's sounds. The musicians are not powerless, however: armed with their own instrument, they pose a threat to the order within Telharmonic Hall, where the music of the barrel organ disrupts the concert in progress. The musicians may not have access to the hall, but no walls or admission fees can keep the sound of their music out. This was where the real danger of the street musicians' disorderly sound lay. The narrative's white authorities must turn to the music of the Telharmonium itself to silence the outsiders: "Manager Carl Herbert, who was directing the demonstration within, pointed to an arc light in the room; it flashed and quivered at his order, and began emitting in fine measure and tone Schumann's 'Träumerei.' 'That will about put an end to the hand organ, I guess,' said Mr. Herbert." And, apparently, it did. From this point on in the article, the journalist turns to a detailed description of Telharmonic Hall's graceful interior and the bodies within it.

Like the street musicians, the audience in Telharmonic Hall, which included "many society folk and prominent New Yorkers," is awed by the instrument's music, but they engage with the sound on a far more intimate level. Rather than being made to feel inferior and cowed into silent submission, the audience inside, "had the peculiar sensation of being bathed in the music. It was round about and all over them, in their ears, against their lips, and, it seemed at times, in their very hearts." To the Hall's insiders, Telharmonic music did not exert a threatening or controlling influence but rather was a substance that the audience consumed and communed

with in an intimate physical way. This type of interaction with the new electronic music is impossible for the outsiders on the street. They are only able to experience the Telharmonium's sound as a blunt force, one that silences rather than inspires. While the instrument's strains affect the audience members inside the hall from within their bodies, it controls the street musicians from the outside.

Every aspect of this *New York Times* story carefully designates the Telharmonium as an instrument fit for white bourgeois society. Its location inside, rather than out, its management by racially unmarked bodies (coding them as white), and its favorable comparison with the pipe organ, another instrument of the western art music tradition, all signify the Telharmonium's superior status to the barrel organ on the street. Yet in the story, it is not simply the Telharmonium's "great massive tones" that communicate the Telharmonium's superiority to the music of the street musicians: it is also the repertory that the newer instrument plays. It seems that not just any music will silence the syncopated air outside; rather, Schumann's *Träumerei* is required. Similarly, earlier in the narrative when the two instruments first battled for sonic ground, the article reported that the Telharmonium was playing "The Rosary," (presumably the Bach/Gounod arrangement of "Ave Maria") while the music from the street musicians was simply "annoying." In the final section of this chapter, we will see that the Telharmonium's relationships with various types of music intersected with rhetoric about its sonority.

"Good" Music

During the Telharmonium's first season, the musical selections listed in surviving programs consisted almost entirely of western art music. Diners at the Café Martin and Sherry's, which both acquired regular Telharmonic subscription services for twice-daily concerts during

the first season, heard much the same musical repertory as guests at the Hall during regularly scheduled subscription concerts. Works of moderate or slow tempo with prominent and familiar melodies dominated the programs. These included art songs by Edward McDowell, Chopin's Nocturne in E-flat and Prelude in E minor (both among the composer's most famous works), and the well-known Intermezzo from Pietro Mascagni's opera *Cavalleria rusticana.* During the second season, in the fall and winter of 1907 and 1908, the number of marches, waltzes, and operetta melodies by Victor Herbert and Franz Lehár—what we might term "popular" music—increased. Both the first and second seasons featured the oboe and flute obbligato from Rossini's *William Tell* Overture, the Bach-Gounod "Ave Maria," and Schumann's *Träumerei*.

Outside Music Concert, daily 2 shows, 1:30 and 7:30:	
Program A	Program B
American Patrol, Meacham	Italian Royal March, Galetti
Evening Star, Wagner	Entr'acte, Gavotte, Thomas
Schatz Waltz, Strauss	Cocoanut Dance, Herman
Intermezzo Russe, Franke	Intermezzo, 'Dew Drops,' Armstrong
Dearie, Witt	Sextet from 'Lucia,' Donizetti
Serenade, Herbert	Waltz 'Faust', Gounod
Jolly Widow Waltz, Lehár	March Militaire, Schubert

Figure 5. Telharmonium Daily Program. Telharmonic Times, Week Ending Saturday, November 23, 1907.

Figure 5 replicates a program published on November 23, 1907 for concerts transmitted to Telharmonic subscribers like Café Martin, Sherry's, the Hotel Imperial, and the Waldorf Astoria. Many of these selections appeared elsewhere on programs for concerts in Telharmonic Hall, and it is highly likely that all of the pieces were performed for concerts at the Hall.[218] The

[218] "Telharmonic Times, Week Ending Saturday, November 23, 1907," Magnetic Music Publishing Co. Website, http://magneticmusic.ws/mmTelhTimes.pdf (accessed February 3, 2015). The Telharmonic Hall program printed in

two programs, for daily concerts at 1:30 and 7:30, reflect the increasing presence of marches and operetta tunes in the Telharmonium's second season. "Program A," for example, includes the by-then dated "American Patrol" march by F. W. Meacham, from 1885, as well as more contemporary tunes like Lehár's "Jolly Widow Waltz" (from the operetta premiered in Europe just two years earlier) and the sentimental song "Dearie," from a recent (but now obscure) musical production, *Jumping Jupiter*.[219] These "popular" numbers are freely mixed with more "serious" western art music, like a melody from Wagner's *Tannhäuser*, suggesting that at Telharmonic Hall, these categories were unstable at best.

Nearly all of the selections listed in Figure 5 were lyrical and of moderate tempo, the type of music that the Telharmonium reportedly rendered most effectively. Stylistically, the music was quite similar to the theremin's repertory, which I will discuss in Chapter 3. In both cases, the instrument's designs, and the difficulties they presented to performers, necessitated the monotonous programming. Although press reports and promotional material often claimed that the Telharmonium could provide all types of music, from symphonic to popular, the instrument's actual repertory was clearly limited. Assertions that the instrument would eventually feature four simultaneous sources of music from the central station, each with a different type of music, were widely repeated but never realized. These four channels would simultaneously feature "rag-time ditties, classical compositions, operatic, [and] sacred music," so that one might select music according to individual taste.[220] Yet journalists and critics tended to associate the Telharmonium

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the same brochure provided specific descriptions for demonstrations in the hall but noted that musical selections would be announced from the stage. Taking into consideration the inexperience of the performers and lack of available practice time, it seems likely that musical content overlapped between programs inside and outside the Hall.

[219] "Dearie" appears in the Frances G. Spencer Collection of American Popular Sheet Music at Baylor University, http://digitalcollections.baylor.edu/cdm/ref/collection/fa-spnc/id/49005 (accessed January 30, 2015). Today, Lehár's *Die lustige Witwe* is usually translated as *The Merry Widow*, but at the time New York papers generally referred to the operetta as *The Jolly Widow*.

[220] "Music by Electricity"; "Within a Month," *San Francisco Argonaut*, June 15, 1907.

with western art music and found the instrument inadequate for the performance of ragtime and other more rhythmic popular music.

Despite claims that Telharmonic concerts included ragtime music or would include it in the future, the only evidence of ragtime at Telharmonic Hall is the listing of "Cocoanut Dance" by Andrew Herman reproduced in Figure 5. Both Columbia and Victor released recordings of the instrumental tune in 1904 and 1910 respectively. The 1910 recording (available for streaming in the Library of Congress National Jukebox**)** features a Victor orchestra comprised of winds and brass that perform the song's main syncopated major melody at a moderate pace.[221] A sinuous minor melody in the B section contrasts the upbeat A section and is followed by a march-like modulatory C section. The sound of a percussion instrument, either coconut shells or another device fashioned to sound like them, punctuates the song's main theme each time that it returns.

It is difficult to speculate on how audiences in Telharmonic Hall or subscribing cafes responded to the performance of "Cocoanut Dance." Its presence in the otherwise ragtime-free Telharmonium programs was likely intended, in part, to demonstrate the instrument's versatility, even as the overall scarcity of ragtime numbers in the instrument's repertory suggested otherwise**.** The tune itself perhaps offered a relatively innocuous example of ragtime that did not undermine the instrument's presentation as a technology for the bourgeois home or its reception as a conduit for western art music. Coconuts have long been associated with black "primitive" characters in minstrel shows and other performing traditions.[222] The presence of coconuts, whether visual, or in this case textual and aural, signified a primitive and faraway blackness that

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[221] Andrew Hermann, "Cocoanut Dance," Victor 16609, July 15, 1910, Library of Congress National Jukebox, http://www.loc.gov/jukebox/recordings/detail/id/2024/ (accessed January 29, 2015).

[222] See, for example, the recent controversy about the "Britannia Coconutters": Kashimira Gander, "Will Straw defends 'black-face' Britannia Coconut Dancers…" *The Independent*, April 22, 2014, (accessed February 20, 2015, http://www.independent.co.uk/news/uk/home-news/jack-straw-defends-blackface-britannia-coconut-dancers-but-antiracism-campaigners-call-makeup-unacceptable-9275395.html). Also see Chaper 3 in Yuval Taylor and Jake Austen, *Darkest America: Black Minstrelsy from Slavery to Hip-Hop* (New York: W.W. Norton, 2012).

was presumably less threatening than the African Americans populating New York City in increasing numbers, whose presence helped fuel anti-ragtime sentiment even as the genre became enormously popular. What we do know about the Telharmonium's relationship with actual ragtime repertory was that it was a tentative one, defined largely by the instrument's reported deficiency with the genre.

Journalists and critics offered no specific explanations for the Telharmonium's inability to render ragtime effectively.[223] A number of the instrument's features might explain its reported failure in this area. One possible explanation is its wide range of expressive controls. The Telharmonium gave performers an enormous amount of control over every aspect of a tone's articulation, from the attack and decay of individual notes to overall dynamic control. This heightened level of control came hand in hand with a lack of automation, so that it may have been relatively difficult for performers to create the impression of a distinct attack for individual notes. As we will see in Chapter 3, decisive attacks were also difficult to execute using the theremin's "touch-less" interface. The Telharmonium also suffered from a technical problem termed "diaphragm crack," a rough sound that occurred at the start and end of notes. Legato playing could apparently mask the problem, so it is possible that players employed this technique as much as possible, even to the detriment of some musical styles.[224] The instrument most likely suffered from latency problems—which create a lag between time of attack and the initiation of audible sound—that plagued many electronic instruments invented in subsequent decades. Finally, the difficult layout of the Telharmonium's keyboards, with their continuous black-and-white-key alternation, almost certainly made rapid playing difficult. Any combination of these

[223] Most simply provided blanket statements, such as, "[The Telharmonium is] better adapted to the higher order of music than to popular airs." "It's Magical Music," *New York Globe and Commercial Advertiser*, January 12, 1907.
[224] *Magic Music*, 303.

possible difficulties might explain the instrument's troubles with ragtime, which depended on clear articulations and speed for its effect.

The Telharmonium's deficiency with ragtime thus seemed to be a by-product of its design. Although Cahill worked closely with Peirce on issues like just temperament and timbral blending, it seems that the inventor thought little about how easily performers might execute rapid or chromatic musical passages. Journalists covering the instrument shared Cahill's preoccupation with the timbral capabilities of the instrument; none chose to examine the Telharmonium's shortcomings with ragtime in any detail. Instead, most highlighted the aspects of the instrument that they believed suited it for the performance of western art music, in particular its expressive controls. Many outlets reported that the Telharmonium's "delicacy of expression" was so finely tuned that musicians could easily recognize the performance of a friend on the instrument.[225] Baker, writing for *McClure's*, reported that he could tell immediately when one musician substituted for another during a Telharmonium demonstration, although he was a mile away from the performers.[226] For writers like Baker, this acute expressivity granted the Telharmonium a privileged status by conferring an air of organicism on the machine. Marion Melius, writing for *World's Work*, claimed that the instrument was, "as sensitive to moods and emotions as a living thing."[227] Journalists most often compared the Telharmonium's expressive capacity to that of western orchestral instruments. For most, the violin, cello, and viola represented the apotheosis of musical expression, and they reported that the Telharmonium equaled or fell just short of the stringed instruments' mark.[228]

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[225] "Electrical Music."
[226] "New Music for an Old World."
[227] "Music by Electricity."
[228] See, for example, "The Generating and Distributing of Music by Means of Alternators."

As these comparisons to symphonic instruments indicate, journalists understood and interpreted the new instrument's expressive power almost exclusively within the context of western art music repertory and aesthetics. This is no surprise given the widespread interest at the time among critics, educators, and reformers in elevating the cultural taste of the nation's citizens. As part of this process, "high" and "low" culture came to be seen as opposites by cultural authorities and the broader public in the U.S., although programs like those at Telharmonic Hall suggest that those categories were not universally stable.[229] Most journalists writing about the Telharmonium for the nation's white middle-class readership, however, treated the bifurcation between "popular" and "classical" music as a given. Many of these reporters located a revolutionary power in the Telharmonium's potential to transmit "good" music to everyone in the nation, poor and rich, rural and urban. They believed that the Telharmonium could precipitate a transformation in the nation state's musical taste by making music of the highest quality available to all. The Telharmonium's capacity for expression and, by extension, for "good" music thus held far more important implications than did its ability to distribute popular music. Indeed, several reporters suggested that the instrument's struggle with the syncopated rhythms of ragtime was an advantage.[230]

The boundaries between "high" and "low" music that are legible in the Telharmonium's reception history were the result of complicated processes bound up in nationalist anxieties over the nation, immigration, and race.[231] Julia Chybowski has shown that those seeking to elevate American musical taste around the turn of the century believed that the social changes

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[229] Lawrence W. Levine, *Highbrow/Lowbrow: The Emergence of Cultural Hierarchy in America* (Cambridge, MA: Harvard University Press, 1988).
[230] "New Music for an Old World."
[231] *Highbrow/Lowbrow*; George Lipsitz, "High Culture and Hierarchy," *American Quarterly* 43, no. 3 (1991): 518-524; Steven Conn, *Museums and American Intellectual Life 1876-1926* (Chicago, University of Chicago Press, 1998); Alexis McCrossen, "One Cathedral More or Mere Lounging Places for Bummers? The Cultural Politics of Leisure and the Public Library in Gilded Age America," *Libraries and Culture* 41, no. 2 (Spring 2006): 169-188.

precipitated by industrialization and modernity created a demand for classical music but also "threatened its relevance for American life."[232] Good music, the argument went, could provide "spiritual uplift," build character, and improve home life.[233] In other words, good music led to good behavior in the classroom and society and created good and healthy citizens.[234] Popular music, ragtime, and later jazz, acted as critical foils to the western art music championed by leaders of what Chybowski identifies as the music appreciation movement. Daniel Gregory Mason, in his 1910 *A Guide to Music for Beginners and Others*, exhorted his readers to, "separate noble and everlasting works of genius from trivial meaningless jingles of the vaudeville theater, the hurdy-gurdy and the phonograph."[235] Mason's rhetoric suggests that hierarchical divisions between musical styles had to be strictly imposed on the average American listener.

The spaces and objects that Mason associated with "trivial meaningless" music were those available to, used by, and frequently associated with working class and immigrant people. However, it was music with African-American cultural roots that writers like Mason singled out for particular disdain in music appreciation literature. Much of their criticism mirrored anti-ragtime rhetoric that equated ragtime and jazz with physical diseases or vices like alcoholism.[236] When characterizing ragtime, and later jazz, as degenerate, music appreciation writers frequently

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[232] As Chybowski notes, the music appreciation movement was part of a broader cultural trend that sought to elevated the artistic taste (broadly defined) of the nation's middle classes framed as both civic and ethical agendas. Julia J. Chybowski, "Developing American Taste: A Cultural History of the Early Twentieth-Century Music Appreciation Movement" (PhD diss., University of Wisconsin-Madison, 2008), 97.
[233] "Developing American Taste," 83-86.
[234] Thomas Whitney Surette and Daniel Gregory Mason, *The Appreciation of Music: A Course of Study for Schools, Colleges, and General Readers* (New York: The H.W. Gray Company, 1907), 120-23.
[235] Daniel Gregory Mason, *A Guide to Music: For Beginners and Others* (New York: The Baker & Taylor Company, 1910), 15.
[236] "Developing American Taste," 109-10.

employed theories loosely based on Darwinian social theory, a move that endowed their aesthetic hierarchy with the sheen of science.[237]

Mason's 1907 *The Appreciation of Music*, co-written with T. W. Surette, is a textbook example of the evolutionary model of musical aesthetics adopted by those attempting to establish firm boundaries between popular and classical music. In it, Mason and Surette characterize the music of "savage," i.e. non-white, races as less evolved than the art music of white Europeans.[238] Beethoven's work, in contrast, represents the spiritual perfection and evolutionary height of musical achievement. The authors encouraged readers to appreciate the music of Beethoven, Bach, and Mozart on an intellectual level through analytical listening. In contrast, they claimed that popular music like ragtime possessed an "underdeveloped rhythmic quality associated with physical and emotional, rather than intellectual, effects on listeners," and therefore was not a candidate for intelligent listening.[239]

While race provided the framework for an evolutionary aesthetic hierarchy, gender ideology underpinned nearly every aspect of the music appreciation movement's approach to listening. Western women were long expected to provide emotional catharsis for their families in domestic settings through musical performance. With the advent of mass culture, advertisers of phonographs and piano players began to look to women less as music-makers and more as curators of the culture entering their homes. Marketing campaigns that drew on the themes of the music appreciation movement, like Victor's Red Seal records, directly targeted female consumers.[240] Yet at the same time, authors like Mason often sought to divorce the music appreciation music movement from any association with feminine musical roles by emphasizing

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[237] "Developing American Taste," 168-69.
[238] *The Appreciation of Music*, 2.
[239] *The Appreciation of Music*, 127-31, 174.
[240] "Early Audio Technology and Domestic Space," 6.

practices associated with masculinity. Mason and Surette spoke of "penetrating" music's mysteries and treating music as an intellectual pursuit grounded in logic, and Chybowski notes that many music appreciation texts disparaged music teaching as a feminized vocation.[241]

The Telharmonium was not the first piece of technology associated with the elevation of American musical tastes. Manufacturers of reproductive sound technologies like talking machines and player pianos were particularly eager to capitalize on the new emphasis cultural commentators like Mason placed on listening rather than performing.[242] Chybowski notes that by 1910, following industry marketing initiatives like Victor's Red Seal records, many regarded the phonograph as a "revolutionary educational tool."[243] The phonograph provided an efficient and stable means for apparently objective music study thus reinforcing the aura of masculinity that proponents like Mason sought for music appreciation.[244] Still, because of the talking machine's and player piano's ties to popular music, these technologies were not embraced by all, as Mason's quote lumping the phonograph together with vaudeville and jingles demonstrates.

Although much of the repertory performed in Telharmonic Hall could be classified as popular, several prominent writers found the instrument superior to the talking machine. In this context, the instrument's popular repertory mattered far less than its perceived links to "good" music and "pure" tone. Nationally-famous poet George Sylvester Viereck, in a lengthy article on "The Democracy of Music Achieved by Invention," compared the new instrument with both the player piano and the talking machine and found the Telharmonium "more revolutionary" primarily because of its harmonic and timbral possibilities.[245] Unlike the phonograph, the

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[241] *The Appreciation of Music*, 2-3; "Developing American Taste," 142.
[242] "Developing American Taste," 55.
[243] "Developing American Taste," 55-56.
[244] "Developing American Taste," 164.
[245] Viereck was enthusiastic about the artistic and educational potential of all three technologies, which he claimed brought the "world of music" to all. George Sylvester Viereck, "The Democracy of Music Achieved by Invention," *Current Literature* (June 1907).

Telharmonium could not replicate the timbres of voices and instruments associated with ragtime, but this was not a disadvantage to commentators like Viereck and Mason who imagined the instrument's timbral capabilities solely within the context of western art music repertory.

Viereck and others like Ray Stannard Baker frequently predicted that the Telharmonium's capacity for art music combined with its revolutionary means of distribution would usher in an era of musical democracy. Baker reasoned that democracy could not truly be achieved until all citizens had access to "good music, great pictures, and the best books." While libraries and museums existed for the latter two arts, music, by its ephemeral and costly nature, was not so easily democratized. Baker complained that "poor music may be had anywhere: good music is rare: it is hived up in grand opera houses, and supported by playing upon the social vanity of the rich." The Telharmonium, though, meant that "the best music may be delivered at towns, villages, and even farmhouses up to a hundred miles or more from the central station. Small sentry churches, town halls, schools, at present holding up no ideals of really good music, may be provided with the same high-class selections that are daily produced by the most skillful players in the cities."[246] This language echoes rhetoric that cultural critics used to promote the talking machine as a tool for musical appreciation and education.[247] In both cases, language about the democratic potential of music technology masked inequalities that the project of improving American taste reinforced.

This masking is most conspicuous in Baker's emphasis on the centralization and professionalization of music performance that he believes will occur through the Telharmonium. In Baker's democracy—and that imagined by many other journalists writing on the subject at the time—the lay person does not make music, but rather listens to it. Music making is diverted from

[246] "New Music for an Old World."
[247] "Developing American Taste," 60-62.

the hands and voices of amateurs and rural musicians and is transferred to the exclusive province of a professional and urban class. Nor do the citizens of the future democracy choose the type of music that they hear; presumably, it is chosen for them by some central authority. Although steeped in the rhetoric of democracy and revolution, this vision of the Telharmonic future realizes the aims of the music appreciation movement through control and authority. While these images of the nation's musical future seem paradoxical at first glance, a closer look reveals a logic shared in Edward Bellamy's *Looking Backward*.

Baker, Bellamy, and many others around the turn of the century writing about culture in the U.S. frequently conflated "musical democracy" with social engineering. For Baker, the Telharmonium's great potential was not that all people could use it for whatever musical activities they wished, but rather that some people could use the instrument to control the musical practices of all. Indeed, neither Bellamy nor proponents of the Telharmonium like Baker wished for a democratic or egalitarian society, but rather imagined an ideal nation as one founded on homogeneity and social control. As others have demonstrated about Bellamy's book, the Telharmonium's brief popularity rested not on its potential as a democratic tool for the masses but rather on its perceived ability to uphold the elite status of white Americans in an increasingly heterogeneous urban environment.[248] It would do so, many believed, by invigorating white middle-class bodies while controlling the bodies of immigrants and racial "others."

Conclusion

For all the expectations surrounding it, the Telharmonium faded rapidly out of the public's attention after its dismantling in 1908. Such a musical system, it seemed, was only sustainable in a fictional world. Although for a brief time the instrument was a popular and well-

[248] *Authoritarian Socialism in America.*

regarded topic in New York newspapers and national journals and magazines, it never became profitable despite the enormous sums of money sunk into its production and installation. Weidenaar estimates that at the height of its popularity in the spring of 1907, Telharmonic Hall pulled in about $1,000 to $1,500 in weekly ticket sales and generated only $800 or $900 in subscriptions from hotels and restaurants that paid $10 per day for the service. These sums were hardly enough to cover operational expenses and pay the salaries of musicians, engineers, and technicians at the hall.[249] Adding to the instrument's difficulties, Lee De Forest began experiments around the time of the instrument's installation that demonstrated the viability of broadcast radio (some of his demonstrations involved the Telharmonium itself).[250] Although broadcast radio would not become widely popular until the 1920s, De Forest's early work suggested that the Telharmonium's revolutionary method of sound distribution might quickly be eclipsed by more efficient technology.

The identity politics in the Telharmonium's marketing and reception played a critical role in what brief success the instrument did experience. As this chapter shows, many commentators considered the Telharmonium an ideal musical instrument because it promised to uphold the existing dominant social order in the U.S. Enthusiastic proponents of the instrument like Baker and Cahill saw the Telharmonium as an ideal vehicle for western art music, as the source of a "pure" musical timbre, and as a potentially life-changing new technology. These expectations rested on the instrument's perceived affinity to middle-class white cultural practices and bodies. At the same time, these aspects of the Telharmonium seemed to endow it with the power to control non-white bodies, like those of immigrants and factory workers, and to diminish the African-American cultural influences that many perceived as a threat.

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[249] *Magic Music*, 194.
[250] See *Magic Music*, 177-178, for a detailed discussion of De Forest's work with the Telharmonium.

Yet the reasons for the Telharmonium's brief success were inextricably intertwined with its failure to satisfactorily render other, racially marked, kinds of music that were far more popular that the "classical" melodies that were staples in the instrument's repertory. A new musical technology based solely on a reputation of "pure" whiteness and high culture had little chance of commercial success. Victor, after all, depended on popular music for the bulk of its record sales even as it lavished expense on the advertising budget for its operatic Red Seal records. Although Crosby amassed a considerable amount of resources for the Telharmonium, he was unable to situate the instrument within a network of popular musical activity that might have sustained it. We will see in the following chapters that the RCA Theremin faced similar challenges with repertory in the early 1930s, while the Hammond organ became the first commercially successful electronic music largely because performers and listeners found it suitable for many kinds of popular music.

Given mainstream electronic music history's emphasis on composers and western art music, it is no surprise that popular music does not enter into discussions of the Telharmonium in histories like Peter Manning's *Electronic and Computer Music* or *The Cambridge Companion to Electronic Music*.[251] The Telharmonium's legacy in these texts is based not on its popularity or failure during its brief tenure in New York City, but rather its status as a monumental cutting-edge technology. Peter Manning, for example, discusses the Telharmonium almost exclusively with regard to its technological achievement, emphasizing its size and expense, and bolsters its importance by noting Ferruccio Busoni's mention of the instrument in *Sketch for a New Esthetic of Music*.[252] Electronic music historians frequently treat Busoni's futurist text as a foundational

[251] Nick Collins and Julio d' Escrivan Rincón, eds., *The Cambridge Companion to Electronic Music* (Cambridge: Cambridge University Press, 2007); Peter Manning, *Electronic and Computer Music*, 4th ed. (Oxford: Oxford University Press, 2013).
[252] *Electronic and Computer Music*, 4.

work in electronic music's prehistory; the connection to the Telharmonium thus incorporates the instrument into Manning's main narrative. The reference to the Telharmonium in Busoni's text, however, is cursory and based entirely on the author's reading of Baker's essay on the instrument in *McClure's*—Busoni apparently never heard the instrument himself.[253] Surely the Telharmonium's significance rests not on Busoni's cursory interest, but rather on its actual use in New York City in the early twentieth century. Yet we cannot understand how or why the instrument mattered without taking into account the network of actors who funded it, built it, played it, listened to it, and wrote about it.

In attempting to understand how the Telharmonium's sound became meaningful to early twentieth century audiences, this chapter uncovered several trends that will reappear in this dissertation's case studies on the theremin and the Hammond organ. First, the Telharmonium's short history makes clear the potential repercussions when a new musical instrument's repertory is stylistically limited. The slow, lyrical pieces that comprised the bulk of the Telharmonium's repertory closely resemble the majority of theremin programming. In both cases, the limited repertories—the result of difficulties that the instruments' interfaces presented to performers—had a profound impact on the instruments' reception. This chapter also showed that audiences were quick to accept a new electronic musical timbre, despite the common assumption today that electronic music is esoteric, difficult, and unpopular. This trend continued for both the theremin and the Hammond organ.

Perhaps most significantly, this chapter demonstrates that rather than sounding "dead" or "mechanical" as many might expect, contemporary listeners heard the Telharmonium's electronic sonority as particularly expressive and emotive. Future listeners characterized the

[253] Ferruccio Busoni, *Sketch of a New Esthetic of Music*, trans. Theodore Baker (New York: G. Schirmer, 1911). Busoni's main instrument in the Telharmonium was in its potential as a tool for explorations of expanded equal temperament systems, including his proposal to divide the octave into 18 rather than 12 steps.

electronic sounds of the theremin and the Hammond in similar ways. The Telharmonium's expressivity, however, was contingent on the perception of its timbre as being racially pure. In other words, the Telharmonium's organicism valorized the emotional capacity of particular bodies. It should come as no surprise that race played such a profound role in the formation of musical meaning in the Telharmonium's reception, for race played a profound role in *all* of American life. As Matthew Frye Jacobson has noted, "race and racism are American history […] that is, to write about race in American culture is to exclude virtually nothing."[254] This includes electronic music. As this dissertation continues, it will be clear that the history of electronic music is inseparable from histories of power and identity.

[254] *Whiteness of a Different Color*.

Chapter 3

Early Theremin Practices: Performance, Marketing, and Reception History from the 1920s to the 1940s

> "The question is whether it will inspire men of genius. Its future depends on what men of genius do with it."
> —Violinist Joseph Szigeti on the theremin. "Ether Concert Stirs Musical Stars Here," *New York Times,* January 25, 1928.

Violinist Joseph Szigeti first heard the theremin in its debut concert in New York City's prestigious Plaza Hotel, where inventor Lev Termen performed popular "classical" melodies like Schubert's Ave Maria and Saint-Saëns' "The Swan" on the new electronic instrument. The invited audience at the concert included musical luminaries like Sergei Rachmaninoff and Arturo Toscanini, New York City celebrities like Vincent Astor and Charles Guggenheim and a host of music critics from the city's papers.[1] The theremin's mode of playing, by moving one's hands in the air rather than touching the instrument, caused a sensation with audience and press alike. Unlike the nearly universally positive response to the earliest Telharmonium concerts in the same city two decades earlier, the theremin's debut sparked controversy among critics, performers, and composers about the instrument's potential impact on musical life. As this chapter will show, the increased scrutiny that the theremin faced resulted on the one hand from the group carrying on the debate—prominent white male music critics and composers—and on the other from the perceived femininity of the instrument's performance practices. At the heart of the argument was whether the theremin was viable as a "serious" musical instrument, one suitable for the performance of canonical western art music and worthy of the attention of composers, or interesting only as a novelty.

Like many at the time, Szigeti believed that only composers—his "men of genius"—

[1] Albert Glinsky, *Theremin: Ether Music and Espionage* (Urbana: University of Illinois Press, 2000),76-77.

could definitively settle the matter of the theremin's proper use. Yet during its first decades in the United States, only a handful of composers chose to write for the instrument, and none of their works gained a lasting place in the theremin's repertory. In contrast, theremin performers developed techniques and repertory that had an enduring influence on the instrument's subsequent history. Performers today continue to use repertory and techniques first employed by Termen. RCA's marketing campaign for the instrument, which the company sold in the U.S. from 1929 to 1931, further shaped the theremin's reputation by emphasizing its suitability for domestic music-making at the hands of middle- and upper-class women. The career of thereminist Clara Rockmore, at its height from 1934 to 1945, further refined and cemented performance practices for the instrument as well as its critical and public reception. As this chapter will show, the lasting impact of the practices pioneered by Rockmore and Termen and marketed by RCA soundly refutes Szegeti's early prediction about the new electronic instrument. In 1928, the theremin's future depended on performers, not composers. Although RCA's instrument was a commercial failure, the theremin—unlike the now-obscure Telharmonium—remains a popular, if niche, product today, its use dominated by the performance activities of both amateurs and professionals.

Musicologists often use the term "performance practice" to refer to parameters that can be defined in exclusively musical terms: the use of historical instruments, for example, or the particular execution of an ornament. Here I will use the words "performance practice" in a more flexible way, drawing partly on Nicolas Cook's recent description of performance as "an indefinitely multi-layered and complex phenomenon."[2] As Cook notes, any given performance includes not just "the music itself" but also a range of extra-musical factors, for example the

[2] Nicholas Cook, "Bridging the Unbridgeable? Empirical Musicology and Interdisciplinary Performance Studies," in *Taking it to the Bridge: Music as Performance,* eds. Nicolas Cook and Richard Pettengill (Ann Arbor: University of Michigan Press, 2013), 83.

mopping of a brow, the particulars of a location, and the dress of the performers. Any of these elements can be performance *practices* if they become associated with a performer, ensemble, or instrument through repetition. Practices might be those of an individual—Glenn Gould's exclusive use of his famous chair, for example—or those belonging to a larger historical or instrumental tradition, like the formal concert attire of the western symphony.

As I discussed in Chapter 1, Robin Bernstein and Madeleine Akrich have separately developed the notion that objects possess scripts with the potential to shape the behavior of human users.[3] In this chapter, I define normative, mainstream, or otherwise dominant performance practices for a particular instrument as a script. A script for a musical instrument can establish where and how it is played, who does the playing, and what music is played. While a script may seem to be a series of commands, both Akrich and Bernstein emphasize that users may resist an object's script or reject it all together. Musicians, likewise, can adhere to, alter, or ignore dominant performance practices. Yet even when appearing to reject the parameters of a particular script, musicians frequently refer to or "cite" existing practices, much in the way that performances of gender cite preexisting standards, as Judith Butler has argued.[4] We might consider performances of both music and gender as citational practices in that they create meaning by conforming to and, alternatively, flouting norms and historical precedents. One might argue, for example, that while Glenn Gould often appeared to reject traditional piano practices altogether, many of his performances created meaning through their very denial of tradition. In the 1930s and 40s the theremin lacked the historical depth of the piano's performance practices, but thereminists could, and did, cite other instrument's performance

[3] Madeleine Akrich, "The De-Scription of Technical Objects," in *Shaping Technology/Building Society: Studies in Sociotechnical Change*, ed. Wiebe E. Bijker and John Law (Cambridge: MIT Press, 1992), 205-224; Robin Bernstein, "Dances with Things: Material Culture and the Performance of Race," *Social Text* 27, no. 4 (Winter 2009): 67-94.
[4] Judith Butler, *Bodies That Matter: On the Discursive Limits of "Sex"* (New York: Routledge, 1993).

practices, or scripts, to invest meaning and value in their work. These citational practices comprise a major thread in this chapter, not only because performers and RCA marketers used them in abundance, but also because they shaped the instrument's reception in powerful ways.

The theremin's materiality, in particular its famous "touch-less" playing interface, exerted a powerful influence on both its script and reception, shaping performance practices developed by Termen and Rockmore as well as critical reactions to those practices. In this chapter, I am especially interested in teasing out how the theremin's interface exerted a particular type of agency on performers by determining what they could and could not play on the instrument, while, at the same time, performers imposed their own will on the instrument. Other aspects of the theremin's materiality—in particular the large cabinet of the RCA model—also strongly suggested specific uses, which performers alternately conformed to and resisted. Throughout this chapter, I explore the ways in which agency was deployed in interactions between performer and instrument, examining how the theremin shaped the movements and positions of human bodies while those bodies adapted to and sometimes even altered the instrument's interface. While in the previous chapter, the lack of attention granted to Telharmonium players prevented me from examining their actions in much detail, the movements and performance choices of thereminists generated much discussion among music critics. The sensation caused by the instrument's interface produced a great deal of commentary, allowing me to explore how visions of bodies interacting with the theremin shaped perceptions of its sound.

The act of playing a musical instrument is, at its heart, a negotiation, not only between performer and instrument, but also between performer and existing performance practices, or scripts. In this chapter, the theremin's early history takes its shape, primarily, as a series of

negotiations. I explore how Termen negotiated with his invention's interface, drawing on his musical training to establish the elements of a performance practice that have been remarkably enduring. In my exploration of RCA's foray into theremin production, I trace the company's attempt to create a script for the instrument through the physical design of their model, repertory choices in radio programming, and advertising discourse about "good" western art music. In particular, I highlight how RCA's marketing for the instrument cited existing performance practices and industry strategies. Extending my analysis of RCA Theremin advertising to a local example in Madison Wisconsin, I explore how actors in specific locations harnessed and adapted national discourses to suite their own local goals.

This chapter culminates in a discussion of Clara Rockmore's theremin career. Rockmore's legacy continues to loom large in theremin performing circles today through surviving videos and recordings. Here, I focus on Rockmore's impact on the theremin's reception history from the mid 1930s through the mid 1940s, highlighting her work with Termen on the design of a custom instrument, her development of a repertory and technique, an early collaboration with Hall Johnson, and her 1940 and 1941 American tours with Paul Robeson. Through close readings of reviews for the Robeson-Rockmore tours I demonstrate how the vision of raced and gendered bodies shaped how critics heard the electronically-produced sound of the instrument and perceived both Rockmore's and Robeson's musical work.

By the end of this chapter it will be clear that critics' perception of the theremin's sound and their evaluation of the instrument's overall musical worth were contingent on far more than "purely" musical factors, if such elements can be said to exist at all. Rather, the instrument's reception history was a response to the complex negotiations that its performers and commercial manufacturer carried out on stage, over the radio, and in print. Associations among repertory,

playing techniques, advertisements, and human bodies all contributed to perceptions and evaluations of the instrument's sound. The result is a history that is complex and frequently contradictory. To some the theremin was a scientific device; to others a puzzling piece of magic. RCA attempted to market it both as cutting-edge technology and the heir-apparent to centuries-old musical traditions. Critics heard its sound variously as "chemical," beautiful, annoying, and disembodied. Perhaps most intriguingly, given popular characterizations of electronic sound as mechanical or without life, early critics consistently described the theremin's timbre as vocal, a phenomenon I will argue was intimately tied to performance practice, and one that resonates with other hearings of electronic instruments, like the Telharmonium, as particularly expressive or human.

Invention as Performance

From the early 1920s through the 1940s only a small number of theremins existed, including 500 produced for RCA in 1929 and a few dozen custom instruments built by Termen.[5] The theremins that I discuss in this chapter ranged in size and shape from the box-like instrument that Termen played during the late 1920s, which critics frequently described as "shabby," to the polished RCA models which stood on four elegantly tapered legs and resembled pieces of furniture. Despite differences in outward appearances, the interiors of these instruments featured roughly the same electrical design and components that created the instrument's unique playing interface.

Briefly, these theremins worked as follows. Two oscillators—electronic circuits that produce a repetitive electronic signal like a sine wave—combined to create the instrument's tone.

[5] Termen also built a small number of instruments for the Teletouch corporation, an entity formed by the inventor, M. Boyd Zinman, and Emanuel S. Morgenstern. See *Theremin: Ether Music and Espionage*, 152-56, for more details.

One of these oscillators was variable, the other constant; both produced frequencies outside the range of human hearing. The variable oscillator was connected to a vertical pitch antenna which generated an electromagnetic field. When an object like a human hand approached the pitch antenna it altered this electromagnetic field and, subsequently, the variable oscillator's frequency. The frequencies of the fixed and variable oscillators were then combined through a process known as heterodyning, so that like frequencies cancelled one another out and only the frequencies resulting from the position of the player's hand remained. These so-called "difference" frequencies—which fell within the range of human hearing and typically covered the span of about three octaves—were then routed through an external amplifier (which was, in the instrument's earliest days, no more than a paper horn) and made audible. Termen designed the theremin's interface so that as a player's hand drew nearer to the pitch antenna the instrument's pitch rose; as their hand pulled away the pitch fell. A second volume antenna mimicked the interface of the pitch antenna but was situated on the left side of the instrument in a horizontal loop. As a player's left hand approached the horizontal antenna, electrical current flowing to the amplifier was reduced, thus decreasing the instrument's volume.

At the time of the theremin's invention, no existing technology provided a straightforward way to control the instrument's timbre. Although during the 1920s and 30s Termen frequently suggested that his instrument could produce a limitless palette of tone colors, in truth the custom instruments with which he toured, "offered little more than a handful of [timbral] variations."[6] Waveforms in the upper registers were nearly sinusoidal, meaning that the sound possessed few harmonics. In lower registers, the instruments produced waveforms that most closely resembled those typical of the cello. Termen enhanced the overtones present in his

[6] Albert Glinsky, "The Theremin in the Emergence of Electronic Music" (PhD diss., New York University, 1992), 56-57.

personal instrument's tone by using filters that altered the electronic signal as it traveled to the attached amplifier, but these made only slight changes. Later, custom theremins also allowed players to adjust the instrument's tone color—for example, Rockmore's 1938 instrument included a switch that gave her an additional timbral variation—but the RCA model included no such options. Custom instruments like Rockmore's also produced more complex waveforms than the factory RCA models, but all of the instruments' timbres were similar.[7]

In his landmark book on the theremin, Albert Glinksky documents in detail the circumstances of the instrument's invention, situating it in the contexts of the international state of radio technology at the time and within the Soviet military research and development industry in which Termen worked. Glinsky explains how two military projects developed by Termen—the "Radio Watchman," an invisible burglar alarm, and a device used to measure electronic qualities of gasses—sparked the inspiration for the theremin.[8] In Glinsky's account, performance emerges as a catalyst in the invention of the theremin:

> [After making an adjustment to the audio output of a device for measuring the electronic qualities of gasses] Lev again noticed that movements of his hand near the circuitry were interpreted as fluctuations in density, this time registering as changes in pitch. As his hand moved closer to the capacitor, the whistle tone became higher; withdrawing the hand lowered the pitch. Shaking the hand in a gentle, tremulous motion created a subtle vibrato. The dormant cellist was roused. […] Lev began experimenting, stitching the air together with gentle back and forth motions of his hand, fishing for the notes of his favorite melodies. After a little practice he picked out approximations of Massenet's 'Elegy' and the 'Swan' of Saint-Saëns. Word quickly traveled among the students that 'Theremin plays Gluck on a Voltmeter.' The following day, many flocked to the laboratory to see for themselves.[9]

Accounts of inventive moments such as this one are notoriously susceptible to "creative" revision, in no small part because their sources, often the inventors themselves, are hyper-aware

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[7] For comparison, see the Fourier analysis in "The Theremin in the Emergence of Electronic Music," 384, and the waveforms in "Clara Rockmore RCA Theremin Report," May 31, 2012, 28, shared electronically with the author April 25, 2013.
[8] *Theremin: Ether Music and Espionage*, 13-27.
[9] *Theremin: Ether Music and Espionage*, 24.

of the historical significance frequently bestowed on such moments.[10] Glinsky notes that, in the case of Termen, problems of historical revisionism are compounded by what the author describes as a "paltry" paper trail, the inventor's tendency to contradict himself, and the complexities of historiography in the former Soviet state.[11] In fact, Glinsky's own telling of the theremin's invention relies heavily on an earlier account by Gleb Anfilov written in the U.S.S.R. in 1962, and it is difficult to know how reliable it might be.[12] Still, even if this origin story significantly distorts actual events, by nature of its very fabrication it provides insight into aspects of the instrument's inception that held significance for the inventor, early witnesses, and authors who continue to circulate the story today.

Glinsky's and Anfilov's account of the moment in which the idea for the instrument coalesced suggests that Termen's physical negotiations with a new musical interface inspired the theremin's invention. Perhaps most remarkable about this telling of this event is that in it, Termen, "the dormant cellist," began refining a technique and establishing a repertory before even beginning the process of designing the theremin. In other words, Termen started working out the particulars of a performance practice for the theremin before building or even planning the instrument. We might say then that Termen invented the theremin—that is, he imagined a musical instrument played without touch using the principle of heterodyning to generate pitches—through the act of performance.

Although Termen's musical training appeared to play a central role in the genesis of the theremin, we know frustratingly little about this aspect of the inventor's life before the 1920s. While Glinsky is able to provide a rich contextualization of Termen's scientific world during the

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[10] Jacalyn Duffin, *To See with a Better Eye: A Life of R.T.H. Laennec* (Princeton: Princeton University Press, 1998), 121; Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham: Duke University Press, 2003), 102.
[11] *Theremin: Ether Music and Espionage*, 1-7.
[12] Gleb Anfilov, *Physics and Music*, trans. Boris Kuzenetsov (Moscow: Mir Publishers, 1966), 143.

1910s and 20s, surviving details about the inventor's musical life are scarce.[13] Drawing on essays written by Termen in Soviet Russia during the 1970s, Glinsky notes that both of the inventor's parents played the piano in their middle-class home. According to his own account, Termen took piano lessons as a child and began studying the cello around the age of nine. In 1914, just before Russia's entrance into the First World War, Termen entered the School of Physics and Mathematics at St. Petersburg University and began to study the cello at the St. Petersburg Conservatory.[14] Other than these details, information about Termen's early musical life and his time at the St. Petersburg Conservatory in the years leading up to the Russian Revolution are difficult to procure.[15] Although we currently know little about the nature of Termen's cello studies, it seems clear that the skills developed during the course of his musical training influenced his approach to the theremin.

The act of musical practice—that is, repeated performance aimed at achieving proficiency—looms especially large in Glinsky's account of the theremin's invention. Through experimentation and practice, Termen was able to demonstrate the viability of the theremin, first to himself, then to others in his laboratory.[16] Termen's musical training was undoubtedly critical in these early practice sessions. Most obviously, the inventor drew on cello repertory for musical content; both "The Swan" and *Élégie* were well-known standards for the instrument frequently performed by professionals and amateurs alike. Of course, Termen could not simply transfer the physical memories of his cello technique to the theremin. In order to play melodies on a device developed for entirely other purposes and without any tactile feedback, Termen had to proceed

[13] *Theremin: Ether Music and Espionage*, 13-27.
[14] *Theremin: Ether Music and Espionage*, 11-13.
[15] I have been unable, for example, to learn who Termen's cello teacher at the Conservatory was. We can assume that Termen would at least have known of Leopold Auer, the famous violinist and pedagogue who taught at the Conservatory from 1868 to 1917.
[16] *Theremin: Ether Music and Espionage*, 24.

by trial and error. His musical training, however, would have assisted him in locating the positions of discreet pitches in the air and making subtle physical adjustments in response to what he heard. He then would have built muscle memory for each interval in the familiar melodies that he played in order to locate pitches efficiently, much as he once would have done while practicing the cello.

The theremin is notoriously difficult to play. Its pitch antenna does not divide the instrument's pitch range into discrete tones in the manner of a piano's keys or a guitar's frets. Rather, it makes the entire chromatic spectrum available, much like a trombone or fretless string instrument. However, unlike a trombone or violin, the theremin player does not receive any physical assistance from the instrument, like the constant length of a neck or slide, to locate pitches in space. Sustaining discrete pitches is also made difficult by the lack of tactile interface, which requires theremin players to hold their hand perfectly still in empty space. In my own experience as an amateur thereminist, I have found the task of steadily sustaining a pitch nearly impossible given that even the act of breathing can alter the instrument's pitch level.[17] All of this makes it difficult to play *any* music with discrete pitches on the theremin. When attempting to play even the simplest familiar tunes on the instrument, I often feel that the theremin is working against me at every moment, turning my attempts at melody into a mess of portamenti and poor intonation. In contrast, the gesture that is by far the easiest to produce on the instrument is the glissando.

The techniques and repertory that Termen developed during his early practice sessions with the instrument addressed each of the difficulties presented by the instrument's interface. Returning again to Glinsky's narration of the theremin's invention, we read that Termen initially performed three gestures on the instrument: he moved his hand toward the device, raising the

[17] I play a Moog Etherwave theremin that I constructed from the company's kit.

pitch, he moved his hand away, lowering the pitch, then he rapidly shook his hand in front of the instrument.[18] In other words, Termen played two glissandi and then a sustained note with vibrato. With these gestures, he hit upon indispensable devices for the performances of tonal repertory, one that allowed him to more easily locate pitches in air, the other that gave the impression of pitch stability. The use of vibrato and portamento were and remain central practices of thereminists. As we will see later in this chapter, both played an important role in the instrument's reception history in the United States.

As Termen realized that vibrato and portamento were critical to locating and producing discrete pitches on the instrument, he turned to repertory that easily accommodated these two techniques, namely slow legato melodies rife with sustained notes. At least the first ten notes in "The Swan," for example, are lengthy enough to allow time for vibrato as well as adjustments in pitch. A work's capacity for vibrato and portamento thus makes it idiomatic for the theremin, at least within the parameters of the performance practice, or script, that Termen established. The repertory that he chose for the instrument was, in effect, the result of a negotiation between instrument and inventor, in which Termen brought his training as a cellist to bear on the problems posed by the theremin's touch-less interface.

With Termen's selection of repertory like "The Swan," other elements of traditional western art music performance practices seemed to follow naturally. In surviving photographs of his stage performances in western Europe and the United States, the inventor embodies every aspect of the professional concert artist: his posture is perfect, his facial expression is serious and concentrated, his arms are poised gracefully in the air. He wears tuxedoes; his hair and mustache are neatly groomed. He might just as easily have projected an image of a wild scientist or a revolutionary musician of a new chromatic music. Indeed, the instrument's capacity for

[18] *Theremin: Ether Music and Espionage*, 24.

glissando seemed to call for such performances. Termen, however, drew on the musical practices and sounds that he knew best as he negotiated a workable practice for and with the theremin. His choices suggest that when considering the qualities that make a musical work idiomatic for a particular instrument, we ought to take into account not only what is physically possible or unchallenging, but also the training and capabilities of performers.

Figure 6. Photo of Termen, c. 1928 reprinted in, "Theremin: The Man, Music and Mystery, and Now the Movie." *New York Times*, August 24, 1993.

Termen's performances choices, with their overt ties to bourgeois culture, may seem curious given popular perceptions about the arts in Soviet Russia at the time. As Amy Nelson points out, however, during the 1920s, "official policies of accommodating the old intelligentsia and supporting artistic pluralism accompanied economic programs favoring limited capitalism and the gradual development of socialist modes of production."[19] Nor were official Soviet policies for music ever created or enforced in entirely systematic ways. Glinksy interprets

[19] Amy Nelson, *Music for the Revolution: Musicians and Power in Early Soviet Russia* (University Park: Pennsylvania State University, 2004), 9-10.

Termen's repertory choices not as a liability but as a savvy marketing tactic. Indeed, the astonishment that the inventor's theremin performances generated in their earliest days seemed to hinge not only on the sensational way in which the instrument was played, but also on the particular repertory that Termen performed. In Glinsky's story of the theremin's invention quoted above, early witnesses in the laboratory do not exclaim that Termen plays music, but that he plays "Gluck."[20]

Termen's performances of familiar western art music helped him win favor with his colleagues and supervisor, who allowed him to dedicate time and resources—in, of all places, a Soviet military research and development lab—to building a prototype instrument. Bruno Latour has observed that in order for new technology to become successful, its proponents must enlist actors to their cause, including sponsors, engineers, producers, and consumers.[21] Termen enlisted actors to the theremin's cause by performing. Although many reviews of the inventor's theremin concerts in the United States in the late 1920s and early 1930s described him as a mediocre musician at best, his proficiency on the instrument was adequate to attract the attention of critics, government officials, the public, and eventually American industry.[22] Moreover, his early successes in Russia generated institutional support that was crucial for the instrument's industrial future. Soviet government officials paved the way for Termen's performances in western Europe in 1927, including stops in Germany, France, and England, which generated extensive publicity for the instrument there and in the United States.[23] Soviet bureaucracy also played a critical role in situating Termen and his invention in the U.S. capitalist market, in particular by placing

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[20] It is unclear what melody by Gluck this was; perhaps it was a misidentification on the part of Termen's colleagues. *Physics and Music*, 143; *Theremin: Ether Music and Espionage*, 24.
[21] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge: Harvard University Press, 1987), 29, 111-13, 132.
[22] See, for example, "Ether Concert Stirs Musical Stars Here," *New York Times*, January, 1928.
[23] *Theremin: Ether Music and Espionage*, 26-72, for an account of this history, including Termen's performance for Lenin in 1922.

Termen in the care of George Julius Goldberg. Goldberg handled the inventor's patent applications and business deals in the west through a Soviet-controlled law firm posing as a German entity, and, in addition, filled in as a second thereminst during Termen's tours.[24] All of these connections and opportunities ultimately stemmed from Termen's ability to draw and captivate a crowd.

The Theremin's Early Reception in the United States

When Termen arrived in New York City in December of 1927 he continued to enlist actors to his cause, forming relationships with Rudolph Wurlitzer, Joseph Shillinger, and many other figures among Russian émigré, musical avant garde, and wealthy circles in the city. Perhaps most important though for the theremin's future as a commercial product was the enlistment of the American press as an advocate. U.S. newspapers had been reporting on Termen's wildly successful European tour for months, and, even before his ship had docked, the inventor began granting interviews using a translator (he spoke only broken English at the time of his arrival). Newspapers in New York ran prominent reviews of his first performances in the city in early 1928, and stories on the theremin appeared in newspapers across the country shortly thereafter.

Many of these early news stories began to establish what would become central marketing claims about the instrument's sound and ease of use for RCA's commercially-produced theremin in 1929. From the time of his first U.S. interview with an anonymous reporter for the *New York Times* (hereafter *NYT*), Termen proved to be a savvy manipulator of the press, using the opportunity to promote the instrument to American consumers and manufacturers.[25]

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[24] *Theremin: Ether Music and Espionage*, 42-43, 51-52, 95-96.
[25] All quotes in this paragraph are from: "Inventor to Exhibit 'Ether Music' Here," *New York Times* December 22,

Termen predicted massive consumer demand for his instrument, boasting that, "some day [… the theremin] would be more popular in homes than the piano is today." He went on to emphasize the ostensible ease of playing the instrument, claiming, "I am not a musician, but I can play the 'cello a little. This instrument is much better, because it is more responsive and it is less difficult to play. All you need is an ear for music and a sense of music within you, and the rest is easy." As we will see, this claim about the ease of playing the theremin playing became a central, and problematic, theme in RCA ad copy. The company would also take up Termen's claims about the instrument's sound as having great capacity for variety, described here by his first *NYT* interviewer thus: "The deepest notes can be made to resemble those of a tuba or the lowest notes of an organ, and the highest notes resemble sometimes those of a 'cello, sometimes those of a flute, sometimes the singing tone of a soprano voice." The article concluded with a hook for American industry: "'Of course I hope the apparatus will be manufactured in quantities in the United States,' [Termen] said, 'But I am not old enough to worry about the money I may obtain. I am more interested at present in demonstrating my musical discovery, and I hope to test the musical preferences of the American people.' [Termen] said he has already received offers from American radio firms for manufacturing his instrument."

This article was just one of many that helped establish the theremin's viability as a commercial product; stories like it would only increase when the RCA Theremin went on sale in September of 1929. Print was not the only medium through which Termen and others promoted the instrument, but it was an important and widely consumed platform. The medium was especially effective because it suggested to readers that its content was based in fact, rather than on the claims of interested parties. This type of promotional work was—and remains—widespread in the U.S. popular press. Scholars like Ellen Gruber Garvey have demonstrated that

1927.

from as early as the mid nineteenth century the American popular press had been a willing partner with marketing firms in blurring the line between content and advertising.[26] Even when newspapers and magazines provided visual cues that clearly differentiated news articles from advertisements, these two categories were often virtually indistinguishable in terms of content.

Termen's New York City debut demonstration on January 24, 1928 was likewise designed to leverage the press for promotional purposes. Rudolph Wurlitzer organized the concert, perhaps with an eye toward financial gain for his own instrument business (his New York City store would briefly sell the RCA Theremin).[27] As mentioned above, the debut took place in the lavish Grand Ballroom of New York's Plaza Hotel and featured a guest list that included society names like Astor and Guggenheim, musical luminaries including Toscanini, Rachmaninoff, and Szigeti, and local music critics. The performance followed what had by then become the typical format for Termen's recitals. It began with a lecture on "A New Way of Producing Music," which explained in simple terms how the instrument worked and claimed that the theremin would usher in a new revolutionary and scientific era in music. Most of the concert was filled by a musical program that included Schubert's "Ave Maria," Saint-Saëns's "The Swan," and similarly lyrical pieces by Rimsky-Korsakoff, Rubinstein, and others.[28] Julius Goldberg joined Termen on stage as a thereminist, while Kurt Ruhrseitz accompanied on piano.

Reviews of the debut ran in the *NYT*, the *New York Evening Post*, and the *New York Herald Tribune*; these were augmented a few days later by side-by-side analyses of the instrument by the *NYT*'s prestigious music and science critics, Olin Downes and Waldemar

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[26] Ellen Gruber Garvey, *The Adman in the Parlor: Magazines and the Gendering of Consumer Culture, 1880s to 1910s* (New York: Oxford University Press, 1996).
[27] Little information seems to survive about Wurlitzer's relationship with Termen.
[28] "Wave of Hand Draws Music From the Air," *New York Tribune*, January 25, 1928. The complete program printed in this review was: Ave Maria," Schubert; "Etude," Scriabine; "Night," Rubinstein; "Musette," Offenbach; "Song of India" (Sadko), Rimsky-Korsakoff; "Air of Dalila" (Samson and Dalila), Saint-Saens; "The Swan," Saint-Saens; "Air I," Mattheson; "Elegy," Glinka.

Kaempffert respectively.[29] With the exception of Kaempffert, music critics, rather than science writers, covered Termen's debut, assessing the theremin primarily on aesthetic grounds. In evaluating Termen's claim that the instrument was a catalyst for a "revolution" in music, Kaempffert, the science critic, waxed ecstatic while Downes and his colleagues expressed considerable doubt. Like most of his fellow music critics, Downes granted that the theremin was a fascinating device in scientific terms but questioned its viability as a musical instrument. Skepticism among the music critics stemmed at least in part from Termen's apparently lackluster performance—most complained about poor intonation—and the monotony of a program comprised exclusively of slow legato pieces. Several reviewers pointed out the "the sheer physical difficulty" of playing music that was fast, staccato, or in tune on the instrument.[30]

Opinions on the character and quality of the theremin's sound were mixed. While the science critic Kaempffert heard in the theremin a "fullness and richness of tone that suggests now a violincello, now a tuba, now a clarinet, now a flageolet"—a description that strongly resembled Termen's own—the music critics tended to hear both beauty and monotony in the instrument's timbre. Downes, for example, in discussing the "question of [the] musical and emotional value" of the theremin's sound, found the instrument lacking because it could not,

> exactly reproduce that of instruments now familiar to us. The tone that [Termen] produces has interesting and beautiful qualities, but essentially the tone is static and not in itself emotional or expressive. Its impersonal and disembodied character is corrected by the performer vibrating his hand while he plays, the vibration of the hand conferring a degree of warmth and color to the melody which is heard. But this is, after all, a subterfuge.[31]

Downes' description begins to indicate the extent to which perception of the theremin's timbre

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[29] "Ether Concert Stirs Musical Stars Here," *NYT,* January 25, 1928; Norman Klein, "A Toy? No, a Soul is this Music Wand," *New York Evening Post*, January 25, 1928; Lawrence Gilman, "Wave of Hand Draws Music From the Air," *New York Tribune*, January 25, 1928; Waldemar Kaempffert, "Music from the Air with a Wave of the Hand" and Olin Downes, "Theremin Opens a Musical Vista," *NYT*, January 29, 1928.
[30] "Wave of Hand"; "Ether Concert Stirs."
[31] "Theremin Opens a Musical Vista."

depended on a range of additional factors: he himself acknowledged that the use of vibrato altered his perception of the instrument's sound, if only unconvincingly. Further, Downes' description of the instrument's tone as "disembodied" could easily stand in as an illustration of the theremin's method of sound production rather than its tone color. For Downes, it seems that the apparent immateriality of the theremin's playing interface, combined with the instrument's inability to approximate the timbres of familiar instruments, rendered its sound impersonal and cold.

Downes' review also introduced what would become a major theme in the reception of theremin concerts featuring western art music: the criticism of "excessive" vibrato and portamento. Termen frequently told audiences that the addition of vibrato gave the theremin's timbre a more expressive quality, but the technique also served the more practical purpose of giving listeners the impression of accurate (or at least approximate) intonation. Additionally, as discussed above, the use of vibrato was the only way that Termen was able to sustain a pitch without seeming to waver. Along similar performative lines, the use of portamento assisted in the effective location of pitches. Dampening the instrument's sound to make clear breaks between notes robs performers of the aural feedback that portamenti provide and thus involves extra risk that a wrong or out-of-tune note will sound. Reviews indicate that Termen used both of these techniques in abundance.

Lawrence Gilman, in his review of Termen's debut for the *New York Tribune*, went farther than Downes in criticizing these aspects of the performance:

> First of all, [the theremin] 'scoops' like a fourth-rate opera singer, and there is a persistent slurring, an effect of continuous portamento. The different pitches of the notes of the melody are sounded by the relative nearness of the hand to the rod, and apparently it is not possible—or was not last night—to move the hand between its different positions, however rapidly, without sounding the intervening tones included in the interval traversed. We heard no clean and precise 'attack.' Each note was approached by

> a slide, with a feline whine more or less disturbing.
>
> Another obvious defect was the excessive tremolo of the tones. It was explained that this represented an endeavor on the part of the executant to give expressiveness and life to the music, as a fine string player does. But the effect produced last night was less like the sensitive vibrato of Mr. Kreisler's violin tone or Mr. Casals's cello than it was like the unpleasant tremolo that so annoys us in the singing of Mm. Wobblena, for example, as Fricka.[32]

Describing a musical sound is no simple matter, and in assessing the theremin's Gilman did what all critics do: he compared it to widely recognizable sounds. Other writers did much the same thing when they likened the theremin's tone to the timbre of musical instruments with which readers were already familiar. Gilman, though, turned to living bodies for points of comparison, in particular bodies that were different and somehow out of control: that of the whining cat and the "excessive" operatic soprano. In his review, the excesses of female and feline bodies stood in direct opposition to the refined musical "sensitivity" produced by the male bodies of Fritz Kreisler and Pablo Casals in contact with their instruments.

Although Gilman's soprano was fictional, she would have been immediately recognizable to readers of music criticism as an embodiment of the oft-derided "wobble." Since at least as early as the 1880s, music critics had complained about "excessive" tremolo, often comparing it, as Gilman did, to the "natural" expressivity of vibrato. The origins of the dreaded wobble were unclear, although many placed the blame on the shoulders of Italian tenor Giovanni Battista Rubini (1794-1854).[33] Critics and audiences equated the tremolo with a number of ills: it

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[32] "Wave of Hand."

[33] See, e.g. "The Quavering Voice," *NYT* March 4, 1888; "Voice of the People: The Odious Vibrato," *Chicago Daily Tribune*, September 11, 1909; J. Alfred Johnstone. "The Vice of Vibrato, and the Torture of Tremolo," *The Musical Standard* 34 no. 879 (November 5, 1910); H. Travers Adams and Ronald Swaffield, "The Lure of the Vibrato" *The Musical Times* 66, no. 990 (August 1, 1925): 731-32; F. Bonavia, "On Vibrato," *The Musical Times* 68, no. 1018 (December 1, 1927); Corbett Sumsion "The Curse of the Vibrato," *The Musical Times* 68, no. 1012 (June 1, 1927): 542; H. C. Stewart, "Vibrato *versus* 'Wobble'—some Impressions," *The Musical Times* 74, no. 1083 (May 1933): 467. The debate raged loudly enough to inspire "scientific" study in the form of phonophotography, a term that referred to a variety of devices, pioneered by psychologist Milton Metfessel, that captured images of singers and simultaneously recorded visual representations of a musical sound's intensity and pitch range. Metfessel and Carl E.

was a "vice," it was "unnatural," it had "staying power similar to that of influenza or the plague," it was "a positive danger, physically and spiritually, to the human voice," and it brought performances "to one dead level of gush and insincerity."[34] Like Gilman, many critics gendered the excessive tremolo as a particularly feminine fault. Tenors were also frequent candidates for censure: the high voice, it seems, was most likely to inspire vitriol.

The connection between "excessive" music and female bodies like Mm. Wobblena's was, of course, one with a long history that ranged far beyond the debates over vibrato sketched above. As Susan McClary and others have noted, composers of western art music have long used "excessive" chromaticism to aurally mark women who are sexually, psychologically, or otherwise aberrant.[35] Yet as Gilman's review evidences, the link between chromatic excess and femininity did not always correlate with actual music-making practices. After all, as an inventor and scientist, Termen—the actual producer of the theremin's vibrato and portamento—was in many ways the symbolic opposite of Mme. Wobblena. In describing the inventor's body Gilman wrote of, "a slender young man with a reddish pompadour and sensitive features," using the same descriptor for Termen's visage—sensitive—that he used to signify the superiority of musical expression by male instrumentalists in the same review. Tellingly, while Gilman did not make a clear distinction between instrument and player in the cases of Casals and Kreisler—he

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Seashore, who also wrote extensively about the experiments with the device, agreed that "There is no marked relationship between rate of pitch oscillation and loudness, tone placement, vowel quality, register, sex, or musical mode." See Milton Metfessel *Phonophotography in Folk Music: American Negro Songs in New Notation,* 1928; Metfessel, "The Vibrato in Celebrated Voices." *The Scientific Monthly* 28, no. 3 (March 1929): 217-19; Carl E. Seashore, "The Natural History of the Vibrato," 17, no. 12 *Proceedings of the National Academy of Sciences of the United States of America* (December 15, 1931): 623-626; Seashore, *The Vibrato* (University of Iowa: Iowa City, 1932); Seashore, "The Psychology of Music: The Vibrato: (1) What is it? *Music Educators Journal* 23, no. 4 (February 1937): 30-33; Seashore, "The Psychology of Music: The Vibrato: (2) What Makes it Good or Bad?," *Music Educators Journal* 23, no. 5 (March 1937): 30-31; Seashore, "The Psychology of Music: The Vibrato: (3) How Can We Approach an Ideal Vibrato?," *Music Educators Journal* 23, no. 6 (May 1937): 28-29.

[34] Johnstone. "The Vice of Vibrato, and the Torture of Tremolo"; "Voice of the People: The Odious Vibrato,"; Adams and Swaffield, "The Lure of the Vibrato"; F. Bonavia, "On Vibrato."

[35] Susan McClary, *Feminine Endings: Music, Gender, and Sexuality* (Minneapolis: University of Minnesota Press, 1991), 80-111; Mary Ann Smart, "The Silencing of Lucia," *Cambridge Opera Journal* 4, no. 2 (July 1992): 119-141.

wrote, for example, of "Kreisler's violin tone"—the critic did not refer to the body of Termen in his descriptions of the theremin's sound. Rather, in his review it is the theremin itself, not Termen, that does the scooping and the wobbling. It seems that a gap existed for Gilman between the theremin's glissando-laden sound and the vision of a serious male scientist. While Gilman depicts Casals and Kreisler as being in possession of their instruments' tones, Termen appears strangely disconnected from the theremin's sound. The vision of the neatly groomed and tuxedoed scientist could not appropriately signify the chromatic excesses that his instrument produced. Instead, Gilman called upon the bodies of an imaginary soprano and a whining cat—another a symbol of femininity—to illustrate the shortcomings of the theremin's sound.

In contrast to Gilman's hearing of the theremin as feminine, the *NYT* feature on the instrument that ran two days after the initial reviews of the instrument's debut attempted to measure the theremin's impact in cultural arenas explicitly defined as masculine: science and the symphony. The page of coverage devoted to the instrument included a large illustration of "The Symphony Orchestra of the Future," shown in Figure 7, which featured several tuxedoed men playing theremins, along with a conductor, as well as a photograph of Termen showing the inner parts of his instrument. Kaempffert, the *NYT* science critic, was effusive about both Termen's performance and the instrument's potential impact on music in the future. Olin Downes, in his response to Kaempffert, was clearly unconvinced, and openly mocked the idea of a theremin symphony. His description of such an ensemble starkly contradicted the *NYT* illustration that ran with his review: "Wild-eyed musicians will sit at the music racks and flourish their paws in the air. Their movements will be even more eccentric and incomprehensible than they are now. The 'supreme climax' occurs when the musician able to leap the highest reaches the highest pitch." Although Downes' imagined theremin symphony was at odds with the limited range of motion

4 XX THE NEW YORK TIMES, SUNDAY, JANUARY 29, 1928.

MUSIC FROM THE AIR WITH A WAVE OF THE HAND

How Théremin Produces Melodies by Taming the Familiar Radio "Squeals" —The Musical Possibilities of the Russian's Invention Discussed

AFTER having created a sensation in Berlin, Paris and London with his "ether wave music," Professor Léon Théremin, the young Russian physicist and inventor, has come to the United States to demonstrate his instrument. Here we present two articles on his astounding method of producing music by gesturing in the air, the one explaining the underlying scientific principles involved and the other discussing the musical possibilities of doing away with keys, strings, pipes and of relying solely on electric oscillations.

By WALDEMAR KAEMPFFERT.

ETHER-wave music," Professor Léon Théremin of the School of Physico-Mechanics of Leningrad calls the new art that he has created. He plays on an instrument that has no keyboard, no strings, no mouthpiece, no pipe. Standing in front of a simple wooden box, much resembling the modified radio set that it is, he moves his hands through the air. From huge loud-speakers come the strains of Schubert's "Ave Maria," or an étude by Scriabine with a fullness and richness of tone that suggests now a violoncello, now a tuba, now a clarinet, now a flageolet. He touches nothing. Mere gestures. And what a range of pitch! The scale runs from a note as deep as the lowest on an organ to one so high that it lies just within the range of audibility. And volume! The most delicate pianissimo or a thunderous fortissimo—the movement of the hand produces either.

From the right side of Théremin's instrument a short rod projects vertically upward. Radio amateurs recognize it at once as an antenna which sends forth invisible electric waves like those that convey messages across the ocean. Théremin moves his hand toward the rod. A 'cello-like note is heard. He moves it away from the rod. Another note, this time of lower pitch, wells out of a loud-speaker. So he gestures back and forth, slipping his hand hither and thither as if on an invisible string, and picks his melody out of the air. The familiar vibrato between zero and ten or twenty thousand vibrations a second.

Within Professor Théremin's wooden box is a maze of glowing radio tubes, coils and condensers. Their purpose becomes apparent after a little study. Here is a circuit in which an electric air current oscillates back and forth, let us say, 270,000 times a second, which is a frequency far higher than the ear

The Symphony Orchestra of the Future Will Play Concealed Instruments by the Waving of Hands.

siderable degree; and yet it must be remembered that if you remove entirely the physical limitations of technic, and provide an individual with a expressive medium which offers no boundaries to his ideas or his wishes, you may confer upon him less freedom than you intended. By which is meant the following:

Any performer, the most ignorant as well as the most learned in musical question of musical and emotional value of these sounds. Unless, of course, they have emotional and musical value they are useless to the artist. Last Tuesday night they approximated the sounds of stringed instrument, wind instruments and the voice. This they did, and when the inventor and his assistant performed with piano accompaniment a duet by Glinka the effect resembled considerably that of a contralto singing with a violin obbligato. But this effect was only approximate. The fundamental quality of the "ether wave" tone is not that of any known instrument, and it has yet to be proved that it can exactly reproduce that of instruments now familiar to us. The tone that Professor Théremin produces has interesting and beautiful qualities, but essentially the tone is static and not in itself emotional or expressive. Its impersonal and disembodied character is corrected by the performer vibrating his hand while he plays, the vibration of the hand conferring a degree of warmth and color to the melody which is heard. But this is, after all, a subterfuge—this vibrating of the hand. The tone of an oboe is not "wobbled" by the performer, but has in itself esthetic and emotional distinctions. The tone of a violin is frequently enriched by use of the vibrato, but the tone without the vibrato of the finger of the violinist's left hand is still warm, colorful and humanly expressive. Will the "ether wave" tone always remain a chemical, though beautiful, product, or will it prove the basis of the changeful and unlimited gamut of colors that Professor Théremin predicts? If the former, it will never be accepted by musicians or the great public that is reached by music.

Supposing, again, that a tone which is warm, emotional in its suggestion, responsive to any desire the performer may have for change of color as well as pitch, is produced? It remains that there are a great many things to be done in the technical realm before this instrument can be utilized with really sufficient musical results. At present, for example, it cannot—or did not last Tuesday night—play any rapid passages. The program then became tiresome because nothing but sustained and simple melodies, seldom of wide

Figure 7. "The Symphony Orchestra of the Future," *New York Times*, January 29, 1928.

actually used by Termen in performance, his invocation of non-normative and animalistic bodies resonated with Gilman's criticisms of the instrument.

Months after his initial assessment of the instrument, Downes expanded his criticism of the theremin in a review of Termen's Carnegie Hall performance of Joseph Schillinger's *First Airphonic Suite* for theremin and orchestra in December of 1929. Downes characterized the theremin's sound as being like "a purified and magnified saxophone" as well as a "smooth-toned wood-wind instrument" in its low range and an approximation of a violin in its upper registers. Downes went on to hope that the theremin would not become capable of producing "staccato, spiccato, or sforzando" tones, because:

> We do not like to think of a populace at the mercy of this fearfully magnified and potent tone that Professor Theremin has brought into the world. The radio machines are bad enough, but what will happen to the auditory nerves in a land where super-Theremin machines can hurl a jazz ditty with such horribly magnified sonorities that they could deaden the sound of an automobile exhaust from twenty miles away? Perhaps we are

hopelessly old-fashioned but we do not like this thought, progress or no progress.[36]

Downes' hearing of the theremin's sound as "magnified and potent" resonates with Gilman's complaints about the instrument's tremolo, both characterizing the sound as somehow excessive. Yet unlike Gilman, Downes' critique of the instrument centered around the theremin's qualities as a machine by highlighting its resemblance to the radio and its electronically amplified sound. Many artists and intellectuals at the time in Europe and the U.S. found aesthetic appeal and value in the sights and sounds of the "Machine Age." Others, including both liberal and conservative cultural commentators, shared Downes' fears that the industrialization of labor, cities, and homes threatened to rob Americans of their health and humanity. Although some of this anti-technology rhetoric grew out of concern over abysmal working conditions in industrial factories, much of these fears were explicitly racial, as over 1.6 million African Americans moved from the rural South to northern industrialized cities during the early decades of the Great Migration beginning around 1910. As both the product of African-American cultures and, for many, the musical embodiment of the Machine Age, jazz music and related social dances were frequently implicated in both celebratory and apocalyptic rhetoric about technology.[37]

As the reviews quoted here suggest, in the early years of the theremin's reception—when the most prominent performer was the inventor—descriptions of its sound varied widely. As the 1930s wore on, however, critics reached increasing consensus about the instrument's timbral qualities. In the late 1920s and early 1930s, critics compared the theremin's sound to a range of instruments, from the violin to the saxophone, and expressed varying concerns about the racial

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[36] Downes, "Glazounoff Draws a Rising Tribute," *NYT,* December 4, 1929.

[37] For one discussion of these issues see Joel Dinerstein, *Swinging the Machine: Modernity, Technology, and African American Culture Between the World Wars* (Amherst: University of Massachusetts Press, 2003). Downes' point about the theremin's inability to play jazz begins to indicate some of the theremin's challenges as a commercial product at the turn of the 1920s and 30s. At a time when social dance with an emphasis on rhythm like the Charleston was the most popular participatory musical practice in the United States, an instrument that could only play legato melodic material turned out to be a difficult sell.

and gendered characteristics of that sound. As the instrument's repertory became increasingly standardized—in no small part through RCA's advertising campaign—concerns about its potential use as a jazz instrument faded. Meanwhile, gender-based critiques like Gilman's grew more common as RCA sought to associate the instrument with female bodies and feminized cultural forms. Downes and Gilman, we will see, were among the first in a long line of critics who compared the excess that they heard in the theremin's sound to bodies that were out of control or unlike their own.

Selling "An Absolutely New Unique Musical Instrument"

Despite the misgivings and mocking of critics in New York City, executives at the Radio Corporation of America were no doubt encouraged by the mostly positive press that Termen's performances generated across the country. RCA purchased the rights to the theremin in 1929. The company's investment, including rights, royalties, and manufacturing, totaled $200,000 and marked its first foray into the sale of musical instruments.[38] The investment was tiny by RCA standards in 1929, when the company was in the midst of a period of rapid expansion. Although the 1919 agreement between the U.S. government and private industry that created RCA initially limited its autonomy (it was jointly controlled by several other corporations and could not manufacture it own products), the company grew in power and prestige with the ascent of radio broadcasting beginning around 1922.[39] RCA created the National Broadcasting Company (NBC)

[38] On March 12, Goldberg and Sons, representing Termen, negotiated a price of $100,000 for exclusive rights to the theremin and two other inventions (the radio watchman and an altimeter) for two years, with an additional 5% royalty on all instruments sold, with a minimum annual payment set at $25,000, regardless of sales. See *Theremin: Ether Music and Espionage*, 95-98, for more details.

[39] Robert Sobel, *RCA* (New York: Stein and Day, 1986). Under this agreement, General Electric, Westinghouse, AT&T, and United Fruit jointly controlled RCA. The company was formed to ensure American control of the radio industry in the wake of WWI. Prior to the war a British firm, the American Marconi Wireless Telegraph Company, controlled the largest part of the American radio market. When the U.S. entered the war in 1917, President Wilson authorized the Navy to take control of all wireless operations in the United States; at the war's close the government

in 1926 and gained control of RKO Pictures (one of the so-called "Big Five" movie studios of Hollywood's Golden Age) in 1928 before purchasing the Victor Talking Machine Company (at a cost of $157 million) in 1929. In short, RCA was becoming a multimedia conglomeration, of which the theremin was a very small part.

Business negotiations impacted nearly every choice made about the RCA Theremin, from design to marketing to price. The instrument's name change—from RCA Theremin to Victor Theremin—six months after its entrance into the commercial market in September 1929 was the result of RCA's acquisition of Victor.[40] The two instruments differed in name only: all 500 RCA Theremins were built during a single production run in the spring and summer of 1929 by Westinghouse and General Electric (GE) factories where RCA had outsourced all of their manufacturing to that point. RCA priced the theremin at around $230, including tubes and the recommended RCA loudspeaker, a cost roughly equivalent to that of the most expensive Victor Victrola and Victor-Radiola models at the time.[41] Although this price was far beyond the means of many—in 1930 thirty percent of American households, most of them in rural areas, were still without electricity—it was lower than the cost of most new upright pianos during the last years of the 1920s.[42] RCA executives hoped to eventually capture a broader market for the theremin—

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and military found themselves adverse to ceding control of the industry.

[40] In September 1929 the instrument was officially the product of the Radio-Victor Corporation of America, a temporary entity created after RCA's purchase of Victor. In December of 1929, the Radio-Victor Corporation became RCA Victor, which was a subsidiary of RCA. Before the corporate re-arrangement from Radio-Victor to RCA Victor the instrument was called the RCA Theremin; in March 1930 it was renamed the Victor Theremin.

[41] During the late 1920s, most high-end Victrolas were advertised in New York City at prices in the $200-$300 range. In May of 1929, Wanamaker's in New York advertised the Orthophonic Victrola Radiola at a cost of $100 although the instrument retailed for about $450.

[42] David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880-1940* (Cambridge: MIT Press, 1990), 16-22. Piano prices ranged widely by place and year. In Chicago a "small grand" piano "sponsored by Chickering" and built by Marshall & Wendell retailed at $595 in May of 1929, according to ads in the *Chicago Daily Tribune*. Steinway's famous "Instrument of the Immortals" advertisements around the same time (which ran in a variety of publications) priced a Steinway upright at $875 and a baby grand at $1375. Another ad, printed in the *Los Angeles Times* on May 20, 1928, advertised a new upright Schultz piano—the cheapest model listed in a full-page ad—for $335.

perhaps one resembling that for small radio receivers—with a more economic model.[43]

Termen's prediction that the theremin would surpass the piano in terms of popularity fueled RCA's dream of a mass market for the new instrument. The piano was by far the most popular domestic instrument among western European and American bourgeoisie during the nineteenth century and extending into the twentieth. Its popularity as a commercial product was, however, contingent on something the theremin lacked: a rich network of music-making and social traditions in bourgeois homes built on decades of history and international use. As scholars like Richard Leppert, James Parakilas, Judith Tick, and Ruth Solie have all shown, pianos were meaningful and valuable because they acted as tools for performances of far more than music alone.[44] Gender, in particular, played a critical role in piano practices given the nearly universal requirement that girls in Victorian homes learn to play the instrument. Solie, for example, explores how piano playing was a way of "girling," borrowing Judith Butler's term for both the societal maintenance of normative roles for girls and their own performance of girlhood.[45] Girling at the piano involved a range of performance practices, many of them, like courtship and emotional labor, extending well beyond the confines of the "purely" musical.

To fulfill Termen's promise about the theremin's potential popularity, RCA would have to demonstrate that this new instrument could support the types of meaningful, flexible, and varied uses to which the piano was put. The company needed to market a script for the

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[43] Victor Division, RCA Victor Company, Inc., to all Victor Distributors, March 11, 1930; G. Dunbar Shewell to Victor Distributors, August 19, 1930, quoted respectively in *Theremin: Ether Music and Espionage*, 114 and 123.
[44] Judith Tick, "Passed Away is the Piano Girl: Changes in American Musical Life, 1870-1900," in *Women Making Music: The Western Art Tradition*, ed. Jane Bowers and Judith Tick (Urbana: University of Illinois Press, 1986), 325-348; *The Sight of Sound*; James Parakilas, *Piano Roles: Three Hundred Years of Life with the Piano* (New Haven: Yale University Press, 1999; Ruth A. Solie, "'Girling' at the Parlor Piano," in *Music in Other Words: Victorian Conversations* (Berkeley: University of California Press, 2004), 85-117.
[45] "'Girling' at the Parlor Piano"; *Bodies That Matter: On the Discursive Limits of "Sex"*, 7-8, 232. Butler points out that the iterative nature of structures like "girlhood" makes them susceptible to "fissures and cracks" through acts that disrupt or challenge norms. Solie demonstrates that while some Victorian girls experienced the act of piano playing as oppressive, others found opportunities for self expression and even subversion in the practice.

instrument that demonstrated how consumers could—and should—play the instrument. More importantly, though, theremin advertising would need to convince consumers that the performance of this script could fill desires and purposes that transcended "mere" music making, as did the act of girling at the piano. RCA would have to do all of this for an instrument with an entirely new kind of playing interface with which consumers had no prior experience and for which no significant repertory, pedagogy, or technique existed. Rather than create a script from scratch, RCA and its local retailers crafted images and messaging for the theremin that cited many Victorian piano practices. In addition, RCA Theremin advertising frequently recycled themes and strategies from marketing campaigns developed for high-end music reproduction technologies like Victor's Red Seal recordings that targeted a white and well-off female demographic. As Marsha Siefert, Holly Kruse, and Susan C. Cook have shown, Victor's advertising, unsurprisingly, drew meaning and power by referencing notions of race, class, and gender; RCA's promotion of the theremin would do the same.[46]

Even before this advertising campaign began, engineers and executives made choices about elements of the instrument's design, in particular its exterior, that suggested certain types of uses and users for the instrument. Termen was closely involved in the design process for the RCA Theremin, meeting with teams of managers and engineers during the instrument's development and production phase in the spring and summer of 1929 and building a production model for both the GE and Westinghouse factories. Memos from Termen's meetings with RCA,

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[46] Holly Kruse, "Early Audio Technology and Domestic Space," *Stanford Humanities Review* 3, no. 2 (1993): 1-16; Marsha Siefert, "The Audience at Home: The Early Recording Industry and the Marketing of Musical Taste," in *Audiencemaking: How the Media Create the Audience*, ed. James S. Ettema and D. Charles Whitney (Thousand Oaks, MI: Sage Publications, 1994), 186-214; Siefert, "Aesthetics, Technology, and the Capitalization of Culture: How the Talking Machine Became a Musical Instrument," *Science in Context* 8, no. 2 (1995): 417-449; Susan C. Cook, "Talking Machines, Dancing Bodies: Marketing Recorded Dance Music before World War I," in *Bodies of Sound: Studies Across Popular Music and Dance*, eds. Sherril Dodds and Susan C. Cook (Burlington: Ashgate, 2013), 149-162. Also see Timothy D. Taylor, "Commodification of Music at the Dawn of the Era of 'Mechanical Music,'" *Ethnomusicology* 51, n. 2 (Spring/Summer, 2007): 281-305.

GE, and Westinghouse representatives show these groups of men grappling with details of the instrument's internal and external design.[47] RCA managers were eager for Termen to use as many existing RCA components as possible in the theremin's internal design in order to keep manufacturing costs down and expedite production, and the men decided to pair the instrument with an existing loudspeaker model, RCA's 106 Electro-Dynamic Loudspeaker. The theremin's cabinet thus was one of the instrument's few new components.

This new cabinet was both important and problematic for RCA, as evidenced by the multiple delays that it caused in the manufacturing process, which the sales department attempted to expedite in order to keep the new product a secret. As the GE and Westinghouse factories rushed to complete their theremin orders, the cabinet, which had to be custom designed and outsourced to the Jamestown Mantel Company, caused multiple delays. Everything from obtaining samples for the approval of the RCA "appearance committee" to a last minute change in the music rack's hinges (from nickel plated to bronze) held up production.[48] The significance of the theremin's cabinet design lay not only in its potential attractiveness to consumers but also in its capacity to suggest particular users and uses for the theremin. Polished a deep mahogany, the cabinet rested on four tapered legs and, including its antennas, stood over five feet tall and over two and a half feet wide. Its shape resembled that of a small writing desk or a podium with an antenna for pitch control extending vertically from one side and a ringed horizontal volume antenna protruding from the other. On one side the cabinet's surface was slanted to form a music rack. Below the rack's lip were a few discrete controls: switches for power and muting, a pilot

[47] Memorandum of Meeting with Professor Theremin, April 3, 1929; Minutes of Coordination Meeting #5084, Theremin Musical Instrument, June 10, 11, and 12, 1929, George H. Clark Radioana Collection, Archives Center, Smithsonian National Museum of American History.
[48] E. F. Kerns to P. R. Forton, May 14, 1929; Kerns to F. R. Deakins, May 24, 1929; R. H. Emerson to E. F. Kerns, June 4, 1929; Kerns, "Telephone Conversation with Harrigan this AM," September 10, 1929, all from George H. Clark Radioana Collection.

lamp, and knobs for adjusting the response of the pitch and volume antennas. Two doors on the outer side of the cabinet concealed the theremin's electronic components and automatically turned the instrument off when opened to prevent the risk of electric shock.

Although perhaps unremarkable at first glance, the design of the RCA Theremin's outer components suggested a script for performances that was quite specific. First, the cabinet encouraged that performances take place in domestic spaces. The cabinet resembled a piece of furniture, and its shape and size, in particular its permanently-attached legs, made transport difficult, as was the case for the piano. In addition to encouraging performances in particular locations, the RCA Theremin scripted specific bodily positions and movements. The cabinet's design required a player to stand in a stationary position with arms opened slightly wider than shoulder-width and raised roughly parallel to the ground. In order to properly control the instrument's pitch, the thereminist could only move his or her arms in circumscribed paths toward and away from the two antennas. The RCA Theremin's music rack—another feature the instrument shared with the piano—encouraged the use of sheet music while playing. Together, these design elements suggested a certain type of user. Domestic music-making that required minimal physical movement and involved musical notation was an activity, like piano playing, traditionally assigned to and taken on by women. RCA advertisements corroborated the image of an ideal thereminist who was young, well-dressed, white, and female, consistently describing the movements involved in theremin playing as "graceful," an adjective with feminine connotations, and almost exclusively picturing women playing the instrument. At the same time, the RCA Theremin's cabinet positioned a player's body in a shape not unlike that assumed by a conductor, a musical role dominated by men even today, perhaps opening the door for performances that called into question normative gender roles.

Despite the apparent specificity of RCA's ideal thereminist, much of the company's print advertisement openly declared that the instrument, and in particular its touch-less interface, was "universal." Each of the two official brochures for the instrument (one published in 1929 for the RCA Theremin, the second in 1930 when the instrument became the Victor Theremin) claimed that the instrument's lack of a tangible interface made it both easy to play and perfectly suited for self expression, qualities that ostensibly contributed to its universality. The 1930 Victor brochure claimed not only that the theremin's lack of "material media" freed performers from the need to "read notes" or undertake "tiresome or extended 'practice,'" but also that "anyone" could play it:

> …it is the easiest of all instruments to play! A child…an elderly lady…a skilled musician…even a blind person…all can learn to play this incredible instrument. It is destined to be the universal musical instrument. People will play it as easily, and naturally, as they now write or walk [ellipses in original].[49]

The same brochure went on at length to tie the instrument's interface to a capacity for self expression, even proposing the absence of a boundary between the theremin and a musician's body:

> …the music leaps into being from the ends of your fingers…it is, as it were, an extension of yourself. It is vitally and literally your music, brought into being by your body itself. It may be music in its ultimate and greatest form…it certainly is music that will thrill you beyond words with its beauty, its power, it endless variety, its expressiveness—and most of all with the consciousness that you *yourself have created it!*[50]

Despite invocations of universality, RCA's claims about the theremin's ease of use and capacity for self expression linked the instrument to specific cultural, social, and economic values. The claim that the instrument was easy to play was not only a misrepresentation but an example of what Timothy Taylor has termed the "democratization of ability," a common discursive practice employed to sell a range of new musical instruments and technological products, many of them

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[49] *The Victor Theremin*, Promotional Brochure (Radio Corporation of America, 1930).
[50] *The Victor Theremin*, Promotional Brochure.

marketed explicitly to white middle-class women.[51] And although the Victor Theremin brochure claimed that "few of us, very few indeed" did not "crave" self expression through music, the notion of authentic artistic self expression was one deeply rooted in nineteenth-century romantic western art music traditions.

Establishing a link between the theremin and western art music was, in fact, a central strategy of the RCA Theremin marketing campaign and one that involved not only notions of self expression but also descriptions of the theremin's sound and repertory. Print advertising consistently compared the timbre of the theremin to groups of instruments commonly associated with the western symphony. The description of the instrument's sound in the Victor Theremin brochure is representative:

> In the lower range its tone partakes of the quality of the bassoon, string bass and other low-pitched instruments; further up the scale the tone is extraordinarily like that of the 'cello; still further, the quality of viola, violin and flute are closely approximated. Toward the upper end of the scale, the Theremin can, with an amazing verisimilitude, represent the soprano human voice; and it can suggest powerfully the ethereal tones of the violin's harmonics.[52]

The brochure thus claimed a rough timbral equivalence with a truncated version of the western symphony—an entire string section and two winds—and a voice whose designation as a soprano suggested an operatic or perhaps a formal choral setting. It is no accident that while music critics sometimes heard a saxophone-like timbre in the theremin's tone, that particular instrument, then associated with jazz and popular dance music, was not included in the list quoted above. By citing the western art music tradition in this and other ways, RCA attempted to link the theremin to music that the U.S. public widely recognized as both elite and universally good.

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[51] Manufacturers of everything from egg beaters to player pianos promised to save middle- and upper-class white consumers time and effort. And while many new products in the twentieth century did drastically reduce the amount of human labor involved in a particular task, many others, like the egg beater, did not. "Commodification of Music," 289. Also see Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983).

[52] *The Victor Theremin*, Promotional Brochure.

By positioning the theremin in the context of western art music, RCA drew on decades of cultural history and advertising precedents within the music recording industry. Middle- and upper-class white audiences would have been familiar with western art music's purported ability to engender moral uplift, personal betterment, and social harmony. As discussed in Chapter 2, the belief that such music was both universal and inherently good originated in a process of cordoning off "high" and "low" art from one another that began in the mid nineteenth century. The process of delineating high and low art was often one in which white cultural authorities separated racially marked music—like ragtime, the tango, and jazz—from the ostensibly un-raced "sublime" music of the western canon. By the early decades of the twentieth century, these ideas appeared frequently in the marketing strategies of Victor and other leaders in music industry and education.[53] Western art music provided a particularly powerful marker for a product's social and cultural value, in part because it subtly but clearly indexed existing social hierarchies. Marsha Siefert, for example, has shown how Victor used its Red Seal opera recordings to signify "culture and expense" to consumers (and to confer those qualities onto its brand), while the bulk of its sales came from popular recordings, many with references to or origins in African-American culture.[54] As Susan C. Cook argues, in selling both "moral good" and the products of African-American musicians, "Victor and its fellow companies thus marketed both the modern disease and its necessary cure."[55] In a similar move, print advertisement for the RCA Theremin worked to tie the instrument to high culture while other marketing venues—in particular the radio broadcasts discussed below—attempted to capitalize

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[53] See the discussion of the music appreciation movement in Chapter 2 of this dissertation. Lawrence W. Levine, *Highbrow/Lowbrow: The Emergence of Cultural Hierarchy in America* (Cambridge, Mass: Harvard University Press, 1990); Michael Broyles *'Music of the Highest Class': Elitism and Populism in Antebellum Boston* (New Haven: Yale University Press, 1992); Julia J. Chybowski, "Developing American Taste: A Cultural History of the Early Twentieth-Century Music Appreciation Movement" (PhD diss., University of Wisconsin-Madison, 2008).
[54] "The Audience at Home."
[55] "Talking Machines, Dancing Bodies," 162.

on more popular musical forms to sell the instrument.

In addition to drawing power from the constellation of cultural and social hierarchies that positioned western art music as universal—and universally good—claims about the theremin's capacity for self expression also capitalized on fears related to industrialization. Ad copy for many musical products during the early decades of the twentieth century preyed on these concerns by deemphasizing the standardized nature of their products and highlighting (or inventing) connections to the "natural," the "live," or the "real." For example, Siefert has shown that Victor's advertisements from earlier in the century often depicted the Victrola as a musical instrument—rather than a talking machine—that played music with such fidelity it made listeners believe that they were hearing a live performance.[56] Along related lines, Taylor argues that ad copy for player pianos and pianolas in the 1900s and 10s responded to concerns about music's commodification by highlighting the instruments' possibilities for self-expression.[57] The 1930 Victor Theremin brochure directly addressed these concerns—and implicated RCA's and Victor's own products in the process—noting that: "It has been the fashion to say that everything is done by machinery nowadays… that musical marvels such as the modern radio and the marvelous electrical phonographs have reacted against the development of 'home-made' music. Victor's answer to that line of thought is the THEREMIN . . . the first musical instrument in the history of the world that is not a machine!"[58] By denying that the theremin was a machine at all, RCA ad copy disassociated the instrument from cultural expressions linked to machine aesthetics—i.e., jazz—and affirmed its suitability for domestic musical practices.

Clearly, contradictions were rampant in advertising for the commercial theremin. According to RCA, the factory-produced instrument was both a piece of cutting edge technology

[56] "Aesthetics, Technology, and the Capitalization of Culture."
[57] "Commodification of Music," 292.
[58] *The Victor Theremin*, Promotional Brochure.

more astounding than the radio or phonograph: "not like anything you have ever heard or seen." Yet it was also decidedly "not a machine." The theremin simultaneously possessed the timbral quality of a range of symphonic instruments and "did not aim to imitate any other instrument." It was, RCA suggested, perfectly suited for the most traditional types of music-making, but it was also, "a *new* instrument, in every sense."[59] These contradictions were not especially new or unique to the RCA Theremin campaign, nor were they accidental. Rather, as demonstrated in the above-quoted work by Seifert and Cook, the contradictions were inherent to talking machine industry practices that had been in place for decades. As Cook has shown, industry executives were acutely aware of and eager to capitalize on the paradoxes inherent in a marketing strategy that benefitted from both the ideology attached to "high" culture and the salability of popular music.[60]

Contradictions also marked the programming of RCA-sponsored theremin performances, which almost certainly reached a far larger number of consumers than did print advertising. Recitals and demonstrations took place in stores, community spaces, and at radio fairs and were broadcast on radio stations across the country.[61] Two of Termen's students, Zenaide Hanenfeldt and Alexandra Stepanoff, both of them Russian émigrés like many in the inventor's circle, took on the bulk of performing duties at department stores in New York and exhibitions like the Radio World's Fair in Madison Square Gardens, the Chicago Radio Show, and the Boston Radio Exposition.[62] Lennington Shewell, the son of the sales manager for the theremin, George Shewell, embarked on a tour of theremin demonstrations across the country in 1929 and 1930

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[59] *The Victor Theremin*, Promotional Brochure.
[60] "Talking Machines, Dancing Bodies," 154.
[61] Glinsky also notes that RCA began to explore promotion for the instrument on vaudeville stages in 1930, although this did not appear to go very far. *Theremin: Ether Music and Espionage*, 111-12.
[62] Hanenfeldt played at several Wanamaker's department store demonstrations in the fall of 1929. Glinsky also discusses the women's radio show appearances. See *Theremin: Ether Music and Espionage*, 103-04.

that included performances in stores and a range of settings including the RCA-owned RKO Hollywood movie lot, the Kiwanis Club's Ladies Night in Hagerstown Maryland, a Rotary Club luncheon in San Antonio, and even appearances with Rudy Vallee's dance band, the Connecticut Yankees.[63] The practices of these RCA Theremin performers both reinforced and contradicted messaging in the company's printed advertising.

The promotional demonstrations, recitals, and radio broadcasts worked not only to familiarize audiences with the theremin's sound, but also to demonstrate particular uses for it—in the form of repertory choices—and to suggest who had access to it, through the locations in which events were set. While these events were generally free, access to them varied. Most took place in urban spaces primarily occupied by the white middle and upper classes. For example, among the most prominent theremin retailers were two of Manhattan's largest and most luxurious department stores, Stern Brothers and Wanamaker's. The former boasted seven floors; the latter had eleven and occupied an entire city block. Both stores included dozens of departments along with cafes, tea rooms, restaurants, and gathering spaces, amenities that historian Susan Porter Benson notes, "suggested to the customer that she was of the class which deserved to be served, that her consumption was a token of her standing in the urban bourgeoisie."[64] By the twentieth century, many department stores included musical concerts among their amenities, attempting to entice clientele into stores and create an aura of cultural authority, tempting consumers to buy more expensive goods in the process.[65] Stores frequently

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[63] "Kiwanis Ladies' Night is Featured by Late Musical Invention, Called Theremin," *The Morning Herald*, Hagerstown, Maryland, February 28, 1930; "Instrument to Make Music from Ether Waves Coming," *San Antonio Express*, March 23, 1930; *Theremin: Ether Music and Espionage*, 112-13. Unfortunately, little evidence about Shewell's collaboration with Vallee seems to survive, and I have yet to uncover reviews or other writing about these performances.

[64] Susan Porter Benson, *Counter Cultures: Saleswomen, Managers, and Customers in American Department Stores, 1890-1940* (Urbana: University of Illinois Press, 1986), 4.

[65] Some of the most notable department store concerts took place at Wanamaker's in Philadelphia, including Walter Damrosch's "Damrosch Orchestra" in 1903, Artur Rubinstein in 1906, and Leo Ornstein in 1913. Richard Strauss

paired concerts with musical wares like pianos and sheet music.[66] Victor had long sold its products in department stores, no surprise given that between eighty and ninety percent of customers there were women, the company's targeted demographic.[67]

Although these stores were ostensibly open to anyone, in truth middle- and upper-class white women dominated their clientele. Most people of color during the first half of the twentieth century had access to the stores primarily through roles as support personnel like cleaners and elevator operators.[68] Store layouts and displays generally funneled working-class white customers to separate "bargain-price departments" located in out-of-the-way spaces like the basement.[69] Theremin demonstrations at Wanamaker's and Stern Brothers' took place in the stores' more exclusive spaces: Wannamaker's sold the RCA Theremin in its Piano Salon while Stern Brothers held demonstrations in its Music Salon and Tea Room. Both Stern Brothers and Wanamaker's also scheduled demonstrations primarily during weekday afternoons, times when many prosperous women customers shopped and men were most likely at work. Notices for theremin events ran in October of 1929 and April of 1930 in Wanamaker's full-page *NYT* advertisements among illustrations of hats, silk stockings, lamps, clocks, bird-feeders, and neckties, domestic objects that women were likewise expected to select and purchase.[70]

The audiences at RCA Theremin radio fair demonstrations were almost certainly more

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conducted two programs of his works at Wanamaker's New York City store during a U.S. tour in 1904. See Linda L. Tyler, "'Commerce and Poetry Hand in Hand': Music in American Department Stores, 1880-1930," *Journal of the American Musicological Society* 45, no. 1 (Spring, 1992): 75-120.

[66] "Commerce and Poetry Hand in Hand," 101-102.

[67] *Counter Cultures*, 76.

[68] As Linda L. Tyler has documented, however, African-American elevator operators at Wanamaker's formed musical ensembles beginning with a 1905 glee club in the Philadelphia store. Glee clubs in Philadelphia and New York grew into large organization that included "a large chorus, a band, and a few smaller ensembles" that performed in large courts in the stores. Spirituals and "camp meeting songs" comprised the bulk of the groups' early repertory, but later expanded to include cantatas and opera excerpts. "Commerce and Poetry Hand in Hand," 90.

[69] Benson also notes that while most department store clerks were white, there is some evidence than many women of color who could "pass" worked in those positions. Most stores had quotas on Jewish employees. *Counter Cultures*, 89-90, 208-09.

[70] See Wanamaker's ads in the *NYT* October 15, 1929, October 19, 1929, November 16, 1929, April 2, 1930 (when daily demonstrations took place for a week), and Stern Brothers ads in the same paper on December 5 and 11, 1930.

Figure 8. RCA Theremin at Unidentified 1930 Radio Show. Clark Radioana Archives.

diverse than those at the department store recitals.[71] Although little-studied today, radio fairs were incredibly popular at the time of the theremin's debut, with attendance often numbering well over a hundred thousand in large cities.[72] The shows featured hundreds of booths for product demonstrations, temporary radio studios that broadcast to local stations, and special events like competitions and celebrity appearances. Thousands of people reportedly witnessed theremin demonstrations at radio fair shows in Boston, Chicago, and New York. One surviving

[71] The fairs were open to the public, and, in New York City, announcements for the 1929 Radio World's Fair ran in both the *NYT* and the *New York Amsterdam News*, the city's African American paper, at least suggesting that the readership of both papers were able to attend. In some ways, these radio fairs resembled the better-studied world fairs and expositions, and one might argue that, like those events, the radio fairs performed a variety of cultural and social work, for example, modeling ideal behavior and bodies and framing consumerism as citizenship.

[72] For example, "Television Luring Radio Show Crowds," *NYT*, September 26, 1929, estimated that 187,000 people viewed last year's radio fair television exhibit and predicted that 150,000 would the same exhibit at the current year's fair.

photo (Figure 8) from an unidentified 1930 show suggests that although members of the working-class may have attended these demonstrations, RCA still emphasized the instrument's ties to western art music values and traditions. The photo shows Stepanoff and an unidentified pianist in formal concert attire on a stage draped with velvet curtains, with a few rows of empty chairs arranged to face them.[73] RCA apparently used the trappings of elite art to disassociate the theremin from both technology and consumption even at an event expressly dedicated to the marketing of machines.

Radio itself offered even larger audiences to RCA marketers of the theremin. While radio fair demonstrations frequently aired on local radio stations, the most widely-heard theremin performances were almost certainly those broadcast in a series of nationally-syndicated theremin programs that, beginning in January 1930, ran each Saturday for several months on RCA-owned NBC.[74] Domestic radio use was rising rapidly during this time. The percentage of American homes with a radio grew from 20% in 1926 to 30% two years later; by1940 over 80% of American homes included one. In the late 1920s, the radio receiver lagged behind only the light bulb and flat iron in popularity with American consumers. Like most new technologies, though, the radio's adoption was uneven across class and race lines: poorer, more marginalized communities acquired radios more slowly.[75] RCA, of course, rose to prominence on the rapid expansion of the radio market, and was perfectly positioned to take advantage of broadcast radio to market new products like the theremin.

The music that radio and fair audiences heard played by thereminists like Stepanoff was not solely, or even primarily, comprised of repertory from the western art music that the concert

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[73] Clark Radioana Collection.
[74] See, for example, "Theremin Program," *CT*, February 1, 1930.
[75] Ronald C. Tobey, *Technology As Freedom: The New Deal and the Electrical Modernization of the American Home* (Berkeley: University of California Press, 1996), 23, 159; Michele Hilmes, *Radio Voices: American Broadcasting, 1922-1952* (Minneapolis: University of Minnesota Press, 1997).

hall setting pictured in Figure 8 seemed to imply. To the contrary, Stepanoff's recitals at the Boston Radio Exposition in October of 1929 featured popular songs like "Mother Machree," "The Pink Lady," and "Because."[76] Other surviving records of theremin performances and radio broadcasts indicate that most featured repertory like Stepanoff's popular songs, along with well-known western art music melodies like those common to Termen's repertory.[77] Common programs for Lennington Shewell, according to Glinsky, included numbers from Sigmund Romberg's *Student Prince,* the overture to the *Magic Flute*, movements of Rimsky-Korsakoff's *Scheherazade,* and the "latest popular melodies."[78] Broadcasts from the NBC series on April 25 and May 9 were representative of standard programming. The first included "Goin' Home," Raff's "Cavatina," Rachmaninoff's "Romance," "St. Louis Blues," and "I'm Just a Vagabond Lover"; the latter featured "An aria from Pagliacci," "Mighty Lak' a Rose," "Pale Moon (Indian Love Call)," and "Oh, that we two were Maying."[79]

These repertory choices were shaped in part by practical considerations, foremost among them tempo. The difficulty of performing fast passages on the theremin precluded the use of all melodies but those that could be taken at moderate or slow tempi. As discussed above, the more vibrato and portamento a melody could accommodate, the better. Theremin programming also took advantage of RCA's numerous industry holdings. Rudy Vallee, who was at the height of his film and radio career in 1929 and 1930, had a contract with RCA-owned NBC. "I'm Just a

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[76] *Theremin: Ether Music and Espionage*, 103-104.
[77] In 1930 Lennington Shewell recorded several 78s for Victor records, and at least one song from these sessions, "Dancing With Tears in My Eyes," made it onto a Victor album that was publicized in a print ad during the fall of 1930. The same year, George Shewell oversaw the recording of two pedagogical discs for the instrument at Victor recording studios, with guided exercises and accompaniments played not by a thereminist, but by a pianist. It seems that the pedagogical recordings saw limited—if any—circulation. They were made not long before RCA ceased to market the instrument, and I have not uncovered any evidence of their advertisement or sale. See "New Victor Records," *Wisconsin State Journal*, September 26, 1930, for the advertisement featuring Shewell's rendition of "Lover, Come Back to Me!" on Record 22495.
[78] *Theremin: Ether Music and Espionage*, 113.
[79] See radio schedules in the *WSJ* on April 25, 1930 and May 9, 1930. It is unclear to which Rachmaninoff "Romance" or Pagliacci aria this listing refers. The Raff "Cavatina" is probably from Joachim Raff's Six Morceaux op. 85.

Vagabond Lover" was a song so popular that RCA's recent studio acquisition, RKO, based a film on it (with Vallee in the starring role).

The listings for the NBC theremin broadcasts suggested clear distinctions between popular and "classical" repertory, in particular through the inclusion of composers' names, but in practice many of the works occupied more ambiguous positions. The popular song, "Mighty Lak' a Rose," for example, appeared on Victor's high-end Red Seal label in 1915 in a performance by soprano Frances Alda and an accompanying orchestra. The western art music on the programs, meanwhile, was dominated by recognizable romantic melodies from instrumental character pieces or arias. This "popular classical" repertory was one strongly associated with women's clubs and audiences and often positioned in contrast to ostensibly more "serious" music, particularly by proponents of musical modernism.[80] Likewise, the popular songs on the programs—nearly all of which can be classified as part of sentimental song traditions—were ones associated with white female listeners and music makers. Scholars like Charles Hamm, Dale Cockrell, and Allison McCracken have traced a long history of the American sentimental song, from the genteel parlor songs of the middle and late nineteenth century, like "Oh, that we two were Maying," through songs like "Vagabond Lover" sung by male radio and phonograph "crooners" like Vallee.[81] The sentimental song's feminine cultural spheres included Victorian

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[80] See, for example, Judith Tick, "Charles Ives and Gender Ideology," in *Musicology and Difference: Gender and Sexuality in Music Scholarship,* ed. Ruth A. Solie (Berkeley: University of California Press, 1993), 83-106; Catherine Parsons Smith, "'A Distinguishing Virility': Feminism and Modernism in American Art Music," in *Cecilia Reclaimed: Feminist Perspectives on Gender and Music,* ed. Susan C. Cook and Judy S. Tsou (Urbana, IL: University of Illinois Press, 1994), 90-106.

[81] Charles Hamm, *Yesterdays: Popular Song in America* (New York: Norton, 1979); Eric Lott, *Love and Theft: Blackface Minstrelsy and the American Working Class* (New York: Oxford University Press, 1993); Susan Key, "Sound and Sentimentality: Nostalgia in the Songs of Stephen Foster," *American Music* 13, no. 2 (Summer 1995): 145-166; Dale Cockrell, "Nineteenth-century Popular Music," in *The Cambridge History of American Music*, ed. David Nicholls, (Cambridge: Cambridge University Press, 1998), 158-185; Allison McCracken, "'God's Gift to us Girls': Crooning, Gender, and the Re-creation of American Popular Song, 1928–1933," *American Music* 17, no. 4 (Winter, 1999): 365-395; Allison McCracken, "Real Men Don't Sing Ballads: The Radio Crooner in Hollywood, 1929-1933," in *Soundtrack Available: Essays on Film and Popular Music*, eds. Pamela Robertson Wojcik and Arthur Knight (Durham: Duke University Press, 2002), 105-133.

America's cult of domesticity and the legions of (purportedly sex-crazed) flappers who were said to fuel the crooners' popularity.[82] The RCA Theremin radio repertory was thus united not only in tempo and lyricism but by its strong associations with the white elite female consumers who comprised RCA's target market for the instrument.

Sentimental songs also frequently drew meaning from references to ostensibly pathetic, simple, or noble racial "others," as in the case of "Pale Moon (Indian Love Call)." Theremin programming often included songs that used blackness to signify the sentimental or melancholic, a favorite trope of the American entertainment industry, and one that has been traced by Hamm, Cockrell, McCracken, and Cook.[83] This connection is most obvious in songs with stereotyped dialects like "Mighty Lak' a Rose," which was part of a "mammy" crooning tradition whose participants included minstrelsy performers and classically-trained sopranos like Frances Alda.[84] Even the Rudy Vallee number came from a crooning tradition that McCracken has shown had roots in minstrelsy's "sob song."[85] It is worth noting that this RCA Theremin programming aired at a time when *Amos 'n' Andy* was one of the most popular shows in radio.[86] In a repertory already dominated by vocal works, a significant portion of theremin programming thus involved the performance of melodies meant to invoke or imitate the voice of racial "others."

The extremely sparse surviving reception history of RCA-sponsored theremin concerts and radio broadcasts gives little indication of how audiences and critics understood the instrument's sound in these contexts. Yet it seems reasonable to suppose that the repertory used established these theremin performances as ones of middle class whiteness. Many have noted

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[82] See, for example, "Sound and Sentimentality"; "God's Gift to us Girls" and "Real Men Don't Sing Ballads."
[83] *Yesterdays*; "Sound and Sentimentality"; "Nineteenth-century Popular Music"; "Real Men Don't Sing Ballads"; and Susan C. Cook, "'In Imitation of My Negro Mammy': Alma Gluck and the American Prima Donna," in *The Arts of the Prima Donna in the Long Nineteenth Century*, eds. Rachel Cowgill and Hilary Poriss (Oxford: Oxford University Press, 2012), 290-307.
[84] For more on this tradition, see "In Imitation of My Negro Mammy."
[85] "Real Men Don't Sing Ballads," 110-11.
[86] See, for example, *Radio Voices: American Broadcasting*, 81-96.

that songs which sentimentalized the identity of racial "others" established that otherness as a romantic or exotic mode of performance that could be temporarily put on and then taken off, in the process confirming the raced, classed, and gendered identity of the performer.[87] Eden Kainer and Laurie Stras have explored how white performers invoked black identities explicitly through the sound of their voice—a type of performance practice that they term "blackvoice" and "singing black," respectively.[88] Another way to think of these songs is as part of performance scripts that, through the slippage between the aural impact of false dialects sung by white bodies, affirmed the whiteness of the performers. Did the theremin, in performances of songs like "Goin' Home," seem to listeners to take on the qualities of a black voice? Or, as in the case of classically-trained singers like Alma Gluck and Frances Alda who recorded "mammy" songs for Victor's Red Seal label, did musical gestures like vibrato and portamento render these performances what Cook calls "a kind of reverse operatic whiteface"?[89] Given the presence of western art music in theremin programming as well as the instrumental nature of these renditions—which also erased the songs' exaggerated racialized dialects—the latter interpretation seems likely. We can, perhaps, understand these performances as affirmations of the theremin's suitability for expressions of sentimentality among the American bourgeoisie.

A Mysterious "Co-ed": Theremin Advertising in Madison, Wisconsin

Although RCA's theremin radio broadcasts reached urban audiences across the United States, the company otherwise did little in the way of national advertising, leaving the bulk of

[87] Michael Paul Rogin, *Blackface, White Noise: Jewish Immigrants in the Hollywood Melting Pot* (Berkeley: University of California Press, 1996).
[88] Eden Elizabeth Kainer, "Vocal Racial Crossover in the Song Performance of Three Iconic American Vocalists: Sophie Tucker (1884-1966), Elsie Janis (1889-1956) and Ella Fitzgerald (1917-1996)," (PhD diss., University of Wisconsin-Madison, 2008); Laurie Stras, "White Face, Black Voice: Race, Gender, and Region in the Music of the Boswell Sisters," *Journal of the Society for American Music* 1, no. 2 (2007): 207-255.
[89] "In Imitation of My Negro Mammy," 303.

marketing responsibilities up to local retailers. The company's print campaign was particularly limited, including only the brochures discussed above. One might expect that the lack of a nationally-coordinated marketing campaign would lead to splintered and contradictory messaging about the Victor Theremin across the country. To the contrary, RCA and Victor had long communicated with local retailers about messaging and sales tactics through industry publications. Retailers across the country were familiar with—and frequently savvy manipulators of—the types of messaging discussed above. Madison, Wisconsin provides a particularly rich example of how RCA and Victor Theremin advertising played out in locations far from eastern centers of theremin production and distribution. The brief advertising campaign for the Victor Theremin mounted by retailers there filtered the identity politics of RCA's advertising through a local lens and drew on notions about "good" music and music-making that circulated on a national level.

Two retailers in Madison, the Ludlow Radio Company and Forbes-Meagher Music, first began to advertise in the city's newspapers that the theremin was available for purchase in October of 1930.[90] Ads for the Victor Theremin coincided with Lennington Shewell's arrival in town to promote the instrument with a short series of demonstrations and a local radio broadcast.[91] Several months before the first Victor Theremins arrived in the city, Madison listeners were able to tune in to the NBC series of nationally-syndicated theremin programs on local stations including WHAS and WSM.[92] The fifteen-minute-long programs aired each Saturday evening, a popular time that targeted families listening at home.[93] While anyone in

[90] See Ludlow's ads for the theremin in the *WSJ* on October 14, 19, and 26, 1930.
[91] "New Musical Instrument to be Heard Here Tonight," *WSJ*, October 13, 1930; Carl Wieninger, "W-I-S-J Listeners Thrill to New Broadcast Music," *WSJ*, October 14, 1930.
[92] "Radio Hour by Hour," *WSJ*, April 3, 11, 18, 45, and May 9, 1930.
[93] Although the national series premiered in January, newspaper advertisements in Madison indicate that local broadcasts did not begin until April of 1930.

Madison with a radio could have listened to these theremin broadcasts, Shewell's October concert, jointly sponsored by the Ludlow Radio Company and Forbes-Meagher Music, was a more exclusive affair. Although the concert was free, it took place in the lavish Crystal Ballroom in the Loraine Hotel, a building which remains one of the city's most exclusive spaces in its current incarnation as a high-end condominium building. Given the nature of the building, it is reasonable to assume that only members of Madison's white middle and upper classes were welcome to attend Shewell's performance.

Complementing the Loraine Hotel concert and the Victor Theremin radio broadcasts was a steady stream of press in Madison's most prominent newspapers, the *Wisconsin State Journal* and the *Capital Times* (hereafter *WSJ* and *CT*), which provided two highly visible forums for theremin advertising. As was the case in newspapers and magazines throughout the country, although visual cues clearly differentiated news articles from advertisements, these two categories were virtually indistinguishable in terms of content. For example, in April of 1930 the radio editor for the *WSJ* promoted the theremin syndicated broadcasts in his regular column the "Dial Dope," writing that, "there's a real thrill in them."[94] And in October, Carl Wieninger, the organist and musical director of the *WSJ's* radio station WISJ, penned a generous review of Shewell's performances in which he faithfully repeated the selling points that RCA representative William H. Nolen presented to audiences at the concert.[95]

By far though, the most flashy promotional gambit ran in the *CT* on behalf of the Ludlow Radio Company, appearing just a week after Shewell's brief visit. This ploy was no simple ad but a prominent cover-page story that played on town-gown relations and was titled "Seek

[94] W. L. D., "Dial Dope," *WSJ*, April 20, 1930.
[95] "W-I-S-J Listeners Thrill."

Seek 'Mystery Co-ed' Who Plays Theremin, Newest Music Maker

Ludlow Firm Introduces Latest Instrument to Madison

A THOROUGH search for a "mystery girl" at the University of Wisconsin, who is said to be a "wonder" at coaxing tunes out of the Theremin, newest musical instrument, is being conducted by the Ludlow Radio Co., 116 N. Fairchild st., which is the first Madison firm to demonstrate this latest tone marvel here.

This Theremin-playing co-ed faces an opportunity of achieving some local fame if she will demonstrate her musical abilities to M. H. Ludlow, of the Ludlow firm, who is conducting the search.

But for the benefit of those to whom the Thermin is yet a mystery, let Mr. Ludlow describe the instrument:

"The Theremin is an instrument which produces musical sound by exclusively electrical means. It has no keyboard, strings, reeds or other mechanical aids or sources of sound. It employs RCA radiotron tubes, two metal bars as antennae, and a loudspeaker. One antenna, a straight, perpendicular bar on the top of the instrument, controls the tone, or pitch, or in other words, the voice of the Theremin.

Other Controls Volume

"The other antenna, a loped horizontal bar, controls volume, or intensity of sound.

"When any object, such as the human hand, is brought into the sensitive electric field surrounding the vertical antenna, the field is so affected that sounds are produced. These are amplified through the loud speaker. As the hand approaches the antenna, the pitch of the sounds becomes higher; as the hand is withdrawn, the pitch becomes lower.

"The other antenna is also affected by the proximity of the hand. As the hand approaches it, the power of the Theremin's voice is lessened, in minute gradations down to the faintest whisper; as the hand is moved away from the antenna, power is increased, by the same delicate gradations, to an intensity exceeding that of the most powerful stringed instrument.

"Thus, playing this almost incredible

(Continued on next page)

FORBES-MEAGHER CO. ALSO ANNOUNCES THEREMIN

The Forbes-Meagher Music Co., 27 W. Main st., one of the oldest music firms in the city, and also a Victor dealer, has announced a special showing of the Theremin at the store here Monday. This firm received a shipment of the new instruments last week.

—Photo by McVicar's Photo Service

Although she admits she doesn't know a lot about it yet, Miss Charlotte Hilton, office manager at the Ludlow Radio Co. store, is shown here practicing on the Victor Theremin, newest musical instrument, which she is determined to master. The Ludlow firm is the first Madison concern to handle the Theremin, which produces a tone of a quality never heard on any other instrument, and which, they say, is very easy to learn.

Figure 9 "Seek Mystery 'Co-ed' who Plays Theremin," *Capital Times*, October 19, 1930.

Mystery 'Co-ed' who Plays Theremin, Newest Music Maker."[96] The article announced to readers: "A thorough search for a 'mystery girl' at the University of Wisconsin, who is said to be a 'wonder' at coaxing tunes out of the Theremin, newest musical instrument, is being conducted by the Ludlow Radio Co., 116 N. Fairchild St., which is the first Madison firm to demonstrate this latest tone marvel here." The article went on to claim that, "information from reliable sources has it that a certain out-of-town girl, now attending the university, learned to play the instrument during the summer, and that she is something of a genius at it." Accompanying the

[96] "Seek 'Mystery Co-ed' Who Plays Theremin, Newest Music Maker," *CT*, October 19, 1930.

article was a full-length image of the Ludlow Radio Company's office manager, Charlotte Hilton, posing with one of the instruments. The caption to this photograph revealed that Hilton "admits she doesn't know a lot about it yet," but was "determined to master" the instrument. This caption painted a more realistic story than the one that ran in the article's title, given the lack of evidence that Ludlow's co-ed ever existed as anything other than a calculated marketing gimmick. While the remainder of the piece adhered closely to standard RCA ad copy, emphasizing the instrument's supposed ease of playing and its seemingly magical new technology, the addition of the "mystery co-ed" added local detail to theremin advertising in a city where the University of Wisconsin played a dominate role in social and cultural life.

The specter of a mysterious out-of-town female student in this piece of Victor Theremin advertising communicated a number of messages to Madisonian readers. Most obviously, the absent student was simply another example of a female theremin player, a young, educated model designed to entice Madison's wealthier women to consider purchasing the instrument. The large photograph of the smartly-dressed Hilton invited female readers to imagine themselves in her place, looking similarly attractive and gracefully positioned. Female students like the mystery thereminist were, however, often a source of concern in Madison where student behavior at the university frequently generated controversy, as Susan C. Cook demonstrates in her ongoing work on popular dance.[97] University leaders had long attempted to control unruly female student bodies in mixed sex situations through curfews, gymnasium classes, and the prohibition of activities ranging from inter-varsity sports to popular dances.[98] At the same time,

[97] Susan C. Cook, "Fun in the Archives: Global Trends, Local Practices," Colloquium talk at the University of Wisconsin-Madison, April 27, 2012.
[98] For background on some of these issues, see Marian J. Swoboda and Audrey J. Roberts, *University Women: A Series of Essays* (Madison: University of Wisconsin-Madison Office of Women, 1980). Also: Women's Student Government Association records and Student Life Committee Records, University Archives, University of Wisconsin-Madison.

student publications including newspapers and yearbooks frequently lampooned the ostensible frivolity and vanity of female students.[99] In fact, the label "co-ed" often functioned as shorthand for these popular caricatures, and the term was one that many women at the university publicly denounced.[100] The out-of-town origins of Ludlow's mystery thereminist further invoked vexed notions of insiders and outsiders that circulated about and among the female student population. University students of both sexes who hailed from out of town were often looked upon with suspicion, and female students frequently complained about the yearly importation of university men's prom dates from out of town.[101] Given these factors, the out-of-town "co-ed" was a problematic figure, at best.

However, in describing the mystery "co-ed" thereminist as "something of a genius" and emphasizing her anonymity, Ludlow perhaps absolved her from the usual accusations of self absorption. And the woman's "out-of-town" origins suggested that she was not from a far-away location—and therefore subject to local stereotypes about outsiders from Eastern cities—but a more immediate area. To come from out of town allowed one to be an alluring mystery without becoming a threat. Perhaps most importantly, to play the theremin meant to use one's body in a way that adhered to even the most rigorous standards of female comportment. As the photograph of Hilton demonstrated, performance of tonal music on the Victor Theremin scripted good posture, fluid arm movements, and stillness. These physical gestures and positions signified traditionally feminine qualities like grace, poise, and reserve that the modern university woman and the demographic targeted by RCA and Victor Theremin advertising were expected to

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[99] See the student newspaper, *The Daily Cardinal*, and yearbook, *The Badger* from the late nineteenth century through the 1930s.

[100] Members of the women's Student Government Association objected to the term in *The Daily Cardinal*'s Women's Page during the mid 1910s.

[101] See, for example, Jonathan Z. S. Pollack, "Jewish Problems: Eastern and Western Jewish Identities In Conflict at the University of Wisconsin, 1919-1941," *American Jewish History* 89, no. 2, (June 2001): 161-180. Complaints about out-of-town prom dates appeared in *The Daily Cardinal's* Women's Page.

embody. In fact, the theremin scripted physical movement that was in many ways the mirror opposite of that involved in social dances like the Charleston or the Lindy Hop, which university officials and community leaders viewed as deviant. The Victor Theremin thus seemed to offer even the problematic university co-ed a proper and admirable way to act out her white femininity. Like theremin advertising in New York City and across the county, the Ludlow "co-ed" gimmick demonstrated that the new instrument, like the piano, scripted performances that embodied mainstream ideals of white femininity.

Material Problems: RCA Discontinues the Theremin

It is unclear how well this tactic worked with consumers in Madison. Sales numbers for the Victor Theremin at the Ludlow Radio Company and Forbes-Meagher Music stores do not seem to survive. We do know, however, that RCA sold 485 of the 500 theremins that it manufactured, and that it did so at a loss. Although executives predicted a "bright future" for the instrument as late as March 1930 in a report to Victor distributers, in 1931 the company ceased production and declined to renew their rights to Termen's patent.[102] They had little choice: the De Forest Radio Company pressed a suit against RCA Victor claiming infringement on Lee De Forest's 1915 patent, *Electrical Means for Producing Musical Notes*. De Forest settled for $6,000, a minuscule amount compared to RCA's numerous eight-figure investments.[103] The De Forest Radio Company clearly planned to do nothing with the theremin, which was no surprise given that press and industry insiders alike considered RCA's investment in the instrument to

[102] *Theremin: Ether Music and Espionage*, 137-38.
[103] Fish, Richardson, and Neave to Samuel E. Darby Jr., July 15, 1931, Clark Radioana Archives. As Glinsky notes, the theremin suit was part of a larger industry dispute over radio tubes. See *Theremin: Ether Music and Espionage*, 137.

have been a major mistake in judgment.[104]

The reasons for any product's success or failure can typically be traced to a number of variables, but it seems clear that a major contributor to the theremin's demise was that RCA cast the instrument in a role it could not realistically play.[105] The idea that one could simply wave one's hands in the air to produce beautiful melodies may have been appealing, but it turned out to be an empty promise. While ad copy assured consumers that the theremin required little practice and was the easiest of all instruments to learn, the instrument's playing mechanism made it incredibly difficult for even experienced musicians to play simple melodies. And instead of experiencing the freedom of expression through graceful waves of the hand that RCA promised, players attempting to play even a simple melody in tune might easily became stiff and uncomfortable. By relying on long-held industry marketing tactics and borrowing Termen's own claims, RCA built its advertising campaign for the theremin around a script for the instrument—domestic performances by amateurs—that the theremin's materiality actively undermined.

The manager of RCA's show division, George H. Clark, quickly realized the contradictions inherent in theremin ad copy and material reality when he observed and interviewed over five hundred people who played the instrument at demonstrations in March of 1930. In response to these interviews, Clark created a series of recommendations that he believed would make the theremin easier to play, which he communicated in two lengthy letters to RCA's Director of Patent Development and Advertising Manager.[106] Nearly every one of Clark's

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[104] Benjamin F. Miessner to George H. Clark, March 10, 1938, Clark Radioana Collection.

[105] Although sales of the RCA Theremin began just after stock market prices had begun to fall and just a month before the Black Tuesday crash on October 29, the product's failure can hardly be pinned on the Great Depression. If, by the start of 1931, RCA's total sales were flagging, sectors of the entertainment industry, remained strong or at least stable during the Depression. And although RCA's lead in radio receiver sales slipped, the radio industry as a whole outperformed the rest of the economy during the 1930s. (See See *RCA*, 91-100.) Financial woes did not preclude the desire for entertainment; if anything they sharpened it. And, as we will see in Chapter 3, the Hammond Organ, also a new electronic instrument, sold well at the height of the Depression.

[106] George H. Clark to Schairer and Grover, March 26, 1930, Clark Radioana Collection.

recommended changes involved altering how players physically manipulated the instrument. Some of his ideas took into account matters of comfort, such as his recommendation that players be able to sit while performing. Others considered the engrained musical instincts of western consumers, including his suggestion to orient the pitch antenna so that players could control pitch by moving their hand vertically rather than horizontally, something many did automatically. Clark also recommended that a number of additional physical elements be added to the instrument, including a mechanism to create an automatic tremolo and a removable keyboard. He himself had already constructed a number of auxiliary parts including an automatic player (using rolls for player pianos) and metal rod attachments for the pitch antenna which players could touch to sound notes.

Perhaps even more damning than the difficulty inherent in playing the theremin was the instrument's inability to resonate with the most popular participatory musical practice at the time, namely, social dance. When the instrument entered the market crooners like Vallee were drawing huge audiences of white middle class listeners, but by far the most popular participatory practice involving music was dance. While popular social dances incorporated a range of movements distributed across the body, from shakes to kicks and jumps, the theremin required players to stand almost completely still and move only their arms. Nor did the instrument provide opportunity for physical interaction with another human being. The theremin's technique may have seemed magical to witnesses, but to those seeking active musical practices its interface was restrictive, despite RCA's promises about freedom of expression. Perhaps, then, the RCA Theremin failed not only because it was difficult to play, but also because it scripted movements that offered consumers little in the way of kinesthetic pleasure or fun.

Emerging Performance Traditions and Reception History

Although the RCA Theremin was a resounding commercial failure, the company's marketing campaign for the instrument continued to influence the ways in which audiences, critics, and performers would hear and use the theremin for years to come. While the theremin failed to become the universal domestic instrument that RCA hoped it would, it did not fall into complete obscurity after 1931. Although only a few hundred models existed, the number was enough to spawn several distinct theremin performance traditions, which, along with RCA marketing, shaped the early reception history of the instrument's sound. In direct opposition to RCA's (apparently unenforced) stipulation that its theremin was licensed "for private use in homes" only, emerging performance practices took place on public stages in venues across the country. Although the theremin appeared in a few dance bands during the 1930s and 40s, the instrument's performance practices during these decades were dominated by concert-hall performers on the one hand and novelty acts on the other.

Among those who used the theremin in variety acts during the 1930s and 40s were many who played the instrument literally for laughs. For example, a traveling vaudeville show that stopped at Madison's Orpheum Theatre in 1942 featured "Gregary, Raymond, and Cheri extract[ing] music and comedy from a vacuum cleaner, a violin, bagpipes, a theremin, a rubber glove, etc."[107] Others used the theremin to invoke notions of the spiritual and otherworldly. Several traveling preachers, including Orben Sime, a "missionary of music and song," and the Rev. E. C. Mills traveled throughout the country in the 1930s and 40s preaching, singing hymns, and playing the theremin.[108] The instrument offered multiple possibilities to these "novelty

[107] "Notes for You… At the Orpheum," *WSJ*, September 9, 1942.
[108] "Unusual Music is Heard Here," *The Brownsville Texas Herald*, May 18, 1939; "Sime Will Play Here at 8 p.m.," *WSJ*, February 6, 1944. The former article, announcing a performance by Mills, described the theremin as a "ghost-like instrument." The latter described Sime as a "missionary of music and song," and noted that the event would

thereminists." Its invisible playing interface would have allowed comedic performers to stage moments of surprise or confusion over the source of the instrument's sound, while the theremin's glissando might have been used to mimic a range of slapstick actions from falling to dizziness. Religious performers, meanwhile, could have used the theremin's in-the-air playing method and unfamiliar timbre to invoke notions of the spiritual and otherworldly. These speculations are impossible to confirm, however, for novelty theremin performances generated little press, and eye-witness accounts and recordings do not seem to survive. This lack of commentary can be attributed not only to the general obscurity of the performers themselves but also to the non-controversial nature of their performances. Indeed, references to these acts appeared most frequently in reviews of performances by thereminists in concert halls in which critics referred to the theremin as a novelty instrument.

Thereminists who, following the precedent set by Termen, used the instrument for the performance of western art music, were far more prominent, and, as we will see, more controversial, than their novelty counterparts. Termen himself continued to concertize on the theremin and other new musical instruments of his invention (including a "theremin cello") until his return to the Soviet Union in 1938.[109] The inventor's performances often featured ensembles of his students; the largest of these was a 1932 concert at Carnegie Hall with the sixteen-member Theremin Electrical Symphony Orchestra. In addition to Termen and his students, a number of solo theremin artists carried on the instrument's concert-hall tradition. Most of these thereminists were white women who devoted countless hours to the difficult task of developing a playing technique for the instrument. These women's practices stand in apparent contradiction to

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"feature music produced by unusual instruments in a program at Bethel Lutheran church at 8 tonight. The one-stringed fork-cello and the theremin, an electrical instruent, will be presented. Hymns sung in English, Scandinavian, and German will also be included in the 60-minute program." Also see the Ripley's Believe it or Not ad, "You Have Never Seen or Heard One Before: The Theremin," *Denton, Texas, Record-Chronicle* April 9, 1931.

[109] For details on Termen's departure, see *Theremin: Ether Music and Espionage*, 188-93.

traditional narratives about male aptitude for new technology, but, perhaps also indicate a limited measure of success for RCA's marketing tactics. Lucie Rosen was initially the most famous of the female thereminists active during the 1930s and 40s; other performers included Vera Richardson Simpson in Michigan, Virginia Hope in San Antonio, and Juliet Shaw in Connecticut.[110] Rosen's fame was eclipsed in the mid 1930s by Clara Rockmore, who, most contemporary critics agreed, was the only concert thereminist to definitively overcome the difficulties of intonation and articulation that the instrument posed.

By the time Rockmore launched her career in 1934, a number of perceptions about the theremin and its sound had begun to solidify, including its "proper" use as a novelty instrument and the characterization of its sound as somehow different or deviant. For example, an anonymous review printed in *Time* magazine after the April 1932 Theremin Electrical Symphony Orchestra concert at Carnegie Hall mentioned above, noted that, "the stage of Manhattan's Carnegie Hall might have been set for Funnyman Joe Cook one evening last week."[111] The reviewer went on to describe Termen's inventions as "stunts" and the sound of the ensemble as "not unlike a group of children, a little uncertain as to pitch, blowing on combs and tissue paper." This final reference to the simple craft project, which involves making a kazoo-like instrument from a comb and paper, was one that appeared in theremin reviews throughout the 1930s and 40s and was generally used, as in the quote above, to characterize the instrument's sound as childish and annoying.

Writers also lampooned the instrument on the basis of its supposed popularity among

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[110] For more information on Rosen, including her financial support for Termen, see *Theremin: Ether Music and Espionage*, 127-130, 248-49, 161-62, 164-65, 196-97, 277-79, and the website for her former estate, Caramoor, which is now a museum that includes one of her custom theremins, at: http://www.caramoor.org/rosen-house-and-gardens/lucies-theremin. Simpson performed with the Detroit Civic Orchestra at the 1938 Michigan State Fair and played the theme music for the radio show *The Green Hornet.* Hope and Shaw both performed in local recitals.

[111] "Music: More Theremin," *Time*, April 11, 1932.

female audiences. Feminizations of the instrument easily borrowed from and built upon the theremin's status as a childish novelty, for women—particularly those in public spheres—were frequently dismissed as childish novelties themselves. A news item in Madison's *WSJ*, printed just as RCA officially announced that it would not renew its rights to the theremin's patent, told readers that, "it is said that RCA was originally interested in [the theremin] because of the great enthusiasm shown by women's clubs over the country."[112] After noting that the instrument was "little more than a novelty and too expensive to produce as such," the piece closed with a final joke: "We call it the Hairdresser's Instrument—because it uses electricity and finger waves." Thus, the writer relegated the theremin to a category of products that remains a frequent target of scorn by the popular media and has long been neglected in histories of technology, namely those used for female grooming and adornment. The theremin appeared here as neither a musical instrument nor a piece of technology, but rather, like its reportedly female audiences, a novelty not to be taken seriously.

While the *WSJ* article quoted above mocked the theremin as a product for female consumers, Gilbert Swan, a society writer for Madison's *CT*, took aim at the instrument's sound. This piece of satire ran in January 1930 in the same newspaper that would, a few months later, widely publicize the instrument.[113] Swan noted that "those Theremin machines" were "solving the party problem for scores of worried hosts" by providing entertainment for guests who "will amuse themselves as innocently as children on Christmas morn." He went on to describe such a scene:

> I observed the worldly-wise Mr. Ben Hecht, variously of Chicago, Hollywood and Broadway, going quite lunatic while trying to perform 'Home Sweet Home' or whatever it was. Actually it sounded like a couple of old-fashioned Irish 'banshees' on a New Year party. Whereas the cherubic Miguel Covarrubias, the caricaturist, can make the Theremin

[112] "OH OH! We Just Ran Across this Tidbit," *WSJ*, March 17, 1931.
[113] Gilbert Swan, "About New York," *CT*, January 18, 1930.

> seem slightly more like a quartet of banshees at choir practice, without taking half the trouble.

Swan's characterization of the theremin as little more than a ridiculous and obnoxious toy for a childish elite was in part a straightforward response to the instrument's links to the wealthiest segments of society, established through RCA advertising tactics and no doubt reinforced by the instrument's cost. However, Swan's references to mental instability and the banshee, a female spirit from Irish mythology whose wails were believed to accompany or predict a person's death, resonated with a growing number of criticisms about the instrument's sound formulated in more serious discussions of the instrument.

A favorable 1930 review penned by Carl Wieninger, the organist and musical director of Madison's *WSJ* radio station, suggests that the perception of the theremin's sound as feminine was beginning to dominate public opinion.[114] In contrast to Swan's dismissal of the instrument, Wieninger was completely won over by Lennington Shewell's theremin performances, describing the theremin's sound over a local radio station as "heavenly […] something between the sound of a violincello and human voice, as if angels—I mean male angels—had broadcast their daily singing down to our planet, the earth." Wieninger's insistence on the gender of his imaginary choir of angels suggests that he feared readers might too readily associate the theremin's sound with that of a choir of sopranos. The voices of male angels, the distinction implies, were superior to those of female ones.

As the 1930s wore on, composers began to weigh in on the theremin, some of them offering explicitly gendered assessments of the instrument's sound. Modernist composer Marc Blitzstein penned a review of a performance by the Theremin Electrical Symphony Orchestra that took place at the New School in New York in 1932. Blitzstein's assessment for the premier

[114] Carl Wieninger, "W-I-S-J Listeners Thrill to New Broadcast Music," *WSJ*, October 14, 1930.

new-music journal at the time in the U.S., *Modern Music*, was brief but scathing:

> Theremin's electrical instruments have undergone steady perfecting; without much result. Their tone color (it is the same for all—keyboard, space control and fingerboard instruments) remains lamentably sentimental, without virility. The most perfected one, like a cello, exposes most brutally the cloying sound.[115]

It is difficult to discern what stereotypically "feminine" quality Blitzstein heard in the instrument's timbre, particularly given its medium pitch range. Blitzstein's hearing of the theremin as "without virility" in all likelihood stemmed from associations between femininity and common theremin practices, in particular the prominent use of vibrato and portamento as well as the repertory of the Theremin Electrical Symphony Orchestra. Although somewhat varied—including arrangements of a Bach chorale, the Debussy piano prelude *Bruyères,* and Glinka's song, "The Lark"—slow, lyrical, and recognizable melodies from the western art music canon predictably comprised the bulk of the program.[116] As mentioned earlier in this chapter, many new-music composers at the time explicitly associated music of this type with female audiences and women's clubs. Many in Blitzstein's circle used the term "virile" as shorthand for work that was dissonant, complex, and experimental, music, in other words, that was the stylistic opposite of the European canon that continued to dominate western art music performance as a whole in the United States.[117] These factors suggest that Blitzstein's assessment of the theremin's sound had more to do with the performance practices and repertory of thereminists than with timbre itself. Blitzstein's language in this review implies that he viewed the theremin as part of a larger tradition—namely the domination of the European canon of western art music in U.S. concert halls—that posed a threat to his own agenda as a composer of new music.

Conductor Benjamin Grosbayne's writings and his preference for romantic-era music

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[115] Marc Blitzstein, "Premieres and Experiments-1932," *Modern Music* 9, no. 3 (March-April 1932): 127.
[116] *Theremin: Ether Music and Espionage*, 145.
[117] "Charles Ives and Gender Ideology"; "A Distinguishing Virility."

reveal a musical persuasion far more traditional than Blitzstein's, but his commentary on the theremin demonstrates that he too felt that there was much at stake in the instrument's future. In a lengthy diatribe on the evils of electronic music printed in the *NYT* in 1931, "Electricity, Ether and Instruments," Grosbayne feminized the physical movements of theremin players, writing that the theremin should be popular "with certain ladies who admire a graceful woman harpist, from the mesmeric and caressing motions they require in action."[118] Grosbayne's main purpose, however, was to warn his readership of the serious threat that he believed all electronic instruments posed to the future of music:

> It is high time to diagnose this disease and grievous affliction [of electronic musical technology], and to describe its etiology and histology. It began with the sterility of which jazz was one manifestation, the second stage was characterized by such lesions as the vitaphone [an early sound system for film, famously used for *The Jazz Singer*] and similar contraptions, and the third and final (fatal) stage seems to be with us in these remote, jejune and desiccate approximations of living music [like the theremin]. The cause, of course, is also to be traced in a desire to get the fastest and largest and loudest musical machine for the least money.

Much of the language used here by Grosbayne echoed the type of invective that characterized jazz and other types of music with roots in African American culture as diseases—here represented as sterility—infecting the white youth of America.[119] Grosbayne's history of music further locates consumerism at the root of all (electronic) musical evil. According to the author, the popular and commercial manifest themselves in both the cultural expressions of African Americans and the "lesions" of products associated with popular culture. The theremin's inferiority is further confirmed for Grosbayne by its popularity with women who, according to the author, care little for "living music" but rather are mesmerized by the graceful movements of thereminists. In short, for Grosbayne, the theremin was the product of an overly commercialized

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[118] Benjamin Grosbayne, "Electricity, Ether and Instruments," *NYT*, September 6, 1931.
[119] See, for example, Ronald Radano, "'Hot Fantasies: American Modernism and the Idea of Black Rhythm,' in M*usic and the Racial Imagination*, eds. Ronald Radano and Philip V. Bohlman (Chicago: University of Chicago Press, 2000), 459-480; *Swinging the Machine*.

and frighteningly racially diverse cultural landscape, one that threatened his own values and livelihood as a conductor.[120]

As the reviews quoted above make clear, theremin criticism in the U.S. from the late 1920s through the early 1930s represented a mix of reactions against consumerism and popular culture, the increasing dominance of women performers, and the instrument's status as a new piece of technology. Critics frequently filtered these reactions through the lens of identity politics. For several, including Blitzstein and Gosbayne, the instrument represented the convergence of the feminine and the popular, a connection with deep roots in western culture, as scholars like Andreas Huyssen have shown.[121] Beginning with some of the earliest critiques of the instrument, prominent cultural authorities like Olin Downs and Lawrence Gilman invoked the bodies of women and people of color to convey the instrument's shortcomings. We will see in the remainder of this chapter that as the instrument's ties to women performers solidified, so too did perceptions of the theremin's sound as feminine.

A "Serious" Thereminist: Clara Rockmore's Performance Practice and Reception History

Clara Rockmore was well aware of criticisms of the theremin in the years preceding her 1934 debut with the instrument. What many dismissed as a novelty, she saw as a vehicle for musical expression and a career. Rockmore, born to a Jewish family in 1911 in what is now Lithuania, was a child violin prodigy of the highest order. She began studying with Leopold Auer, the famed violinist, teacher, and conductor, at the St. Petersburg Conservatory at the age of

[120] Grosbayne's essay also reflected growing concerns that electronic musical instruments and technologies threatened the jobs of human musicians. Grosbayne had, in fact, already lived through the realization of this threat when the advent of the vitaphone made his job as a traveling conductor for the film studio Paramount Pictures obsolete. "Benjamin Grosbayne Dies at 82," *NYT*, January 26, 1976.
[121] Andreas Huyssen, *After the Great Divide: Modernism, Mass Culture, Postmodernism* (Bloomington: Indiana University Press, 1986).

four. Her sister Nadia Reisenberg, an outstanding concert pianist, remembered that Rockmore, in addition to having perfect pitch, could "pick out tunes at the piano before she could speak, [and] could read music when she was three."[122] In 1921 the sisters moved with their family to New York City where Clara resumed her violin studies with Auer and, seven years later, met Lev Termen. The inventor was so impressed by Rockmore's first attempts with his new invention that he purchased an RCA Theremin as a gift for her.[123] Rockmore was intrigued by the possibilities of the theremin. Years later she recalled that on first playing the instrument, "I was fascinated by the aesthetic part of it, the visual beauty, the idea of playing in the air, and I loved the sound."[124] Yet she was a busy violinist, and only took up the theremin in earnest after an arm injury forced her to give up the violin. The new instrument offered her a way to extend what had been a promising career as a virtuoso performer, and, according to Rockmore, saved her "musical sanity."[125]

When she began to study the instrument, no thereminist had come even close to the level of virtuosity that Rockmore had previously mastered on the violin. Even performers like Termen with years of experience remained limited to repertory that was uniformly slow and lyrical. Overcoming the idiosyncrasies of the theremin was a monumental task. Rockmore spent years developing and refining fingering systems for each new composition that she learned on the instrument, later noting that, "as I played more difficult pieces, I always had to invent a way of doing them. A lot of trial and error went into it."[126] The physical motions that Rockmore painstakingly adapted for each musical work were far more complex than anything used by her

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[122] Quoted in Robert Sherman, Liner Notes for *Clara Rockmore's Lost Theremin Album*, Bridge Records CD 9208, 2006. Sherman is Reisenberg's son.
[123] For more on the relationship between Rockmore and Termen see *Theremin: Ether Music and Espionage*, 141-46.
[124] Quoted in Robert Sherman, Liner Notes for *Clara Rockmore's Lost Theremin Album*.
[125] Quoted in Robert Sherman, Liner Notes for *Music in and on the Air*, Roméo Records CD 7286, 2011.
[126] Liner Notes for *Music in and on the Air*.

contemporaries and even by most thereminists since. Most players, including the inventor, simply pinched together the pointer finger and thumb of their right hand and moved the entire hand in relation to the pitch antenna. Players might slightly alter this basic hand shape by drawing the fingers closer to the palm or extending them away from it. In contrast, Bob Moog, who began building theremins in the late 1940s, described Rockmore's technique thus:

> For instance, if [Rockmore] were to play an upward arpeggio, she would start on the lowest note with right hand tilted back and fingers withdrawn. To play the next note she would abruptly move her hand forward from the wrist, while keeping her right arm motionless. The third note would be played by rapidly extending the little finger, and the fourth note by extending one or two more fingers while simultaneously turning the wrist sideways to bring the newly-extended fingers nearer to the pitch antenna. She would then continue the arpeggio by moving her whole arm closer to the pitch antenna while drawing her hand and fingers back, then repeating the above-described succession of movements. At the same time, she may articulate each individual pitch by rapidly shooting the fingers of her left hand into the volume antenna loop, then withdrawing them, to silence the tone during the very short periods of time that her right hand moves from one pitch to another.[127]

Rockmore's system of discrete hand positions granted her a new level of control over the instrument's mechanism that allowed her to play more rapidly, accurately, and with more varied articulations (including staccato) than any previous thereminist and most since. Many performance scores in the Clara Rockmore Collection at the University of Maryland bear numbers that refer to these hand positions.[128]

Rockmore also carefully curated a repertory for the instrument—drawn largely from existing works for violin, cello, and voice—first focusing on music with slow tempi and a great deal of step-wise motion and later tackling more difficult pieces. Her programs featured works like Joseph Achron's *Hebrew Melody*, and Ravel's *Pièce en forme de Habanera* as well as selections by Bach, Tchaikovsky, and Stravinsky. She scoured the literature for a complete solo

[127] Robert Moog, Liner Notes for *The Art of the Theremin*, Delos CD 1014, 1987.
[128] Clara Rockmore Collection, Series 9: Scores, 1895-1960, Special Collections in Performing Arts, University of Maryland.

sonata that could be adapted for the theremin, finally settling on César Franck's Cello Sonata in A Major. Although she strived to find music that would suit the theremin's idiosyncrasies, she was not beyond altering scores that were overly cumbersome, if not impossible, for the instrument and sometimes drastically rearranged problematic passages. Several performance scores in the Clara Rockmore Collection, including *Hebrew Melody* and Gaspar Cassadó's *Requiebros* for cello and piano, display hand-written modifications which simplify melodic material, shift material from the soloist's part to the piano accompaniment, or cut out short passages entirely.[129]

Rockmore's development of a playing technique as well as her search for and, in some cases, adaptations of, repertory were a series of negotiations with the theremin's difficult playing interface. Ultimately, though, her RCA Theremin fell short of her musical goals. Particularly problematic was the response of the instrument's volume antenna, which Rockmore described as being like "molasses."[130] She turned to Termen to develop a custom instrument with an extended pitch range and a more finely-tuned volume control that would allow her to clearly articulate fast and staccato passages. The two worked closely together on the new model. Mike Buffington and Andrew Baron, engineers who specialize in the restoration of theremins made during the 1920s and 30s, describe this custom instrument as representing "the highest degree of the artist-engineer collaboration."[131] Decades later, in letters that he wrote to Rockmore from Russia, Termen lamented the loss of their work together and longed for her feedback on his newest instruments.[132] Rockmore also valued their collaboration and noted that although the

[129] Clara Rockmore Collection, Series 9: Scores.
[130] Quoted in Robert Sherman, Liner Notes for *Clara Rockmore's Lost Theremin Album*.
[131] Mike Buffington and Andrew Baron, "1938 Rockmore Theremin," RCATheremin.com, http://rcatheremin.com/38rockmore.php (accessed December 9, 2013).
[132] Termen to Rockmore, June 12, 1965; Termen to Rockmore, January 22, 1971, translator unknown, Clara Rockmore Collection, Series 4: Writings and Correspondence, 1924-1998.

instrument's increased sensitivity made controlling it more difficult, the new model was "musically more satisfying. I had to make—and then meet—my own standards."[133]

All of Rockmore's work—the development of a playing technique, the detailed score rearrangements, and the collaboration on a new custom instrument—was bent on legitimizing the theremin as a vehicle for western art music. Without such legitimization, Rockmore knew that she could not achieve the acclaim she once enjoyed as a violinist. Her career as a thereminist was thus necessarily not only the professional work of a musician, but also the decades-long project of a proselytizer bent on convincing the world of the theremin's worth. A public announcement for her debut performance promised that she would "prove that the instrument may be a medium for musical expression."[134] Years later she recalled: "I just wanted to be a serious musician… play Bach!"[135] And, indeed, Rockmore made herself a serious musician in everything that she did as a thereminist: the programs of canonical works, the dramatic gowns in which she performed, and the fastidious technique, each cited long traditions of the concert hall. Rockmore thus drew power from the norms of the western art music world even as her instrument positioned her outside its inner circle. By doing so, she ensured that even if critics could dismiss the theremin as a novelty, they could not deny her immaculate execution of concert hall performance practices. Still, as we will see, she fought an uphill battle against the disparaging critical reactions that the theremin so frequently inspired.

Rockmore's debut as a thereminist took place on October 30, 1934 at New York's Town Hall with Joseph Yasser and Pierre Luboschutz assisting on organ and piano. The program included works by Bach, Ravel, Tchaikovsky, Rachmaninoff, and Stravinsky and closed with a

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[133] Quoted in Robert Sherman, Liner Notes for *Clara Rockmore's Lost Theremin Album*.
[134] H. H. "Music: Theremin Recital," *NYT*, October 31, 1934.
[135] Quoted in Steven M. Martin, *Theremin: An Electronic Odyssey,* DVD (Santa Monica, CA: MGM/UA Home Entertainment, 1993).

Figure 10. Clara Rockmore's Theremin Debut, Program Cover, October 30, 1934 at Town Hall. Clara Rockmore Collection, Series 3: Programs, Publicity, and Tour Arrangements, 1932-1990, Special Collections, University of Maryland.

group of four spirituals arranged by Hall Johnson for a sextet of male singers and theremin. Rockmore knew Johnson through her husband Robert, who provided financial backing for Johnson's 1933 musical *Run, Little Chillun* and acted as lawyer and agent for the show's star Paul Robeson.[136] The sextet that performed with Rockmore for her theremin debut was a performing unit of the famous Hall Johnson Choir, established in the late 1920s. Johnson rose to prominence through the choir's popular and critically-acclaimed performances of his spiritual arrangements, including their appearance in the 1930 Pulitzer-Prize winning play *The Green*

[136] For more on the relationship between Robeson and Rockmore see Martin B. Duberman, *Paul Robeson* (New York: Knopf, 1988).

Pastures.[137] Johnson no doubt did Rockmore a great service by contributing his fame, his compositional work, and the presence of the sextet to her debut. His arrangements for theremin and voice of four spirituals and the sextet's performance with Rockmore is also the first documented interracial collaboration in electronic music history.

Despite Johnson's fame, most reviews focused on Rockmore's performance alone. Opinion on this count was mixed, with many criticisms echoing familiar complaints about the theremin's shortcomings. An anonymous critic for the *NYT* complained about Rockmore's "irritating" and "excessive" vibrato, "frequent false intonation," and the slow tempi that dominated the program.[138] The critic for the *New York Herald Tribune*, identified as F. D. P., agreed that Rockmore failed to prove the instrument's musical worth, but also took note of her advanced technique, writing that, "the slide from one note to another has been virtually eliminated in the smaller intervals; there is increasing, if not invariable, command of accuracy of pitch."[139] Although the *New York World-Telegram* was slightly more positive, reporting that the theremin "came closer to proving its rightful place," most critics agreed that Rockmore—still performing on her RCA Theremin at the time—had yet to fulfill her promise for the instrument.[140]

Only the *New York Amsterdam News,* New York City's African-American newspaper, explicitly assessed Rockmore's collaboration with the Hall Johnson Sextet, describing their joint

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[137] Eileen Southern, *The Music of Black Americans: A History* (New York: W.W. Norton, 1971), 420; Judith Weisenfeld, "'The Secret at the Root': Performing African American Religious Modernity in Hall Johnson's Run, Little Chillun," *Religion and American Culture: A Journal of Interpretation* 21, no. 1 (Winter 2011): 43-44.
[138] H. H. "Music: Theremin Recital."
[139] F. D. P., "Miss Rockmore Gives Recital on Theremin," *New York Herald Tribune* October 31, 1934.
[140] D. O. B. "Theremin Takes Forward Step: Clara Rockmore Uses it Well in Recital," *New York World-Telegram,* October 31, 1934.

rendition of the song "Water Boy" as "particularly effective."[141] For this anonymous reviewer, the theremin's expressive power during this particular piece stemmed from the instrument's tone color, which "was more than faintly reminiscent of the throaty humming of a Negro singer."[142] Another writer, Paul Harrison, who published a piece of satire on Rockmore's debut in his syndicated column, "In New York," seemed to corroborate the *Amsterdam* reviewer's hearing, claiming that Termen had "improved [the theremin] so that it now can be made to sound like the choral humming of a hundred Negro voices."[143] Remarkably, Harrison made this comment without so much as mentioning the presence of the Hall Johnson Sextet or their performance of spirituals with Rockmore. In contrast to the anonymous *Amsterdam* reviewer, Harrison's comparison of the theremin's sound to that of black voices reads as disparagement. His use of the word "improved" carried a hint of irony, and the overall tone of his review was mocking. His piece ended with the following description of Rockmore: "A lovely and graceful girl, but too serious about her new art. She'll have to invite members of the audience to the stage to try the Theremin, or some of the customers will go away convinced that it's just a vaudeville trick done with mirrors."[144]

Despite the contrasting tones, both Harrison's and the *Amsterdam* critic's reviews clearly demonstrate that repertory and visual cues like the black bodies on stage profoundly influenced the authors' perception of the theremin's timbre. The *Amsterdam* critic quoted above, for example, also compared the sound of the theremin to that of a violin and cello when discussing

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[141] "Hail Miss Rockmore in Theremin Recital: Hall Johnson Sextet Assets in Town Hall Musical Adventure," *The New York Amsterdam News*, November 3, 1934. A few other reviewers noted the presence of sextet but did not comment farther.

[142] The reviewer also noted that "Swing Low Sweet Chariot" and "O Lord Have Mercy on Me" were "well done," but that "Stan' Still, Jordan," the first spiritual on the program, suffered from "a nervous uncertainty on the part of the voices and the artist."

[143] Paul Harrison, "In New York: Out of the Air," ran in: *The Frederick Post*, November 20, 1934; *Olean Times Herald*, November 19, 1934; and *Buffalo Times*, November 17, 1934.

[144] "In New York: Out of the Air."

segments of the program that featured western art music, in spite of the fact that the timbre of Rockmore's RCA instrument could not be altered. The theremin's tone thus acted as a kind of sonorous blank slate onto which the identifiers—racial, gendered or otherwise—of the bodies, objects, and repertory accompanying it could be inscribed. As the Harrison and *New Amsterdam* reviews demonstrate, when critics (whether consciously or not) transferred the vision of bodies to their perception of timbre, they often did so by likening the theremin's sound to that of a voice. In this way, perhaps inadvertently, they ascribed decidedly human qualities to an electronic musical sound. As Harrison's satire shows, such comparisons were not always complementary; often, when white critics compared the theremin to feminine or black voices, they did so to devalue the instrument. Sometimes, like Harrison, they even went so far as to obscure the very real presence of black bodies and performances in the process.

In the years following her debut as a thereminist, Rockmore enjoyed increasing critical success, which rose precipitously after the completion of the customized instrument she designed with Termen. Reviews of her first performance with the new instrument in October of 1938, when she appeared again at Town Hall in New York, were almost uniformly positive. Noel Straus, writing for the *NYT,* declared the recital "an effective demonstration of the present capabilities of the theremin ether-wave instrument in the hands of a fine musician who has fully conquered its difficult technique."[145] He praised Rockmore's "intonation, legato and staccato playing, accentuation and nuances," and noted that in the Franck Sonata she performed, "Miss Rockmore evinced not only her exceptional control of every phase of theremin playing but also a highly developed musical imagination and estimable interpretative powers." A critic writing for *Musical America* confirmed that Rockmore proved "in this recital that her instrument need no

[145] N. S., "Miss Rockmore Gives Recital on Theremin: Offers Skillful Performance on Ether-Wave Instrument," *NYT*, October 28, 1938.

longer be regarded as a curiosity upon the concert platform."[146] None of the critics, however, recognized Rockmore's role in the construction of her custom theremin; those who did mention her instrument's improvements credited them to the pianist Joseph Hoffman.[147] Still, the years of labor over technique, repertory selection, and the development of the new model finally seemed to be generating the type of legitimization that Rockmore sought for her instrument.

A few years after the second Town Hall concert, Rockmore joined Paul Robeson on two national tours in 1940 and 1941. As her esteem grew among New York's critics, touring with Robeson offered Rockmore the opportunity to reach a national audience far larger than any she could attract on her own. Robeson, famous as an athlete, actor, and singer, was at an especially high point in his career. After several years spent abroad, his return to the U.S. in 1939 was punctuated by a performance for the CBS radio premiere of John Latouche's cantata *Ballad for Americans* that was a phenomenal popular success.[148] Although in coming years Robeson's increasingly public commitment to the civil rights movement and communism would precipitate the revocation of his U.S. passport and a public backlash, in 1940 and 1941 he still enjoyed widespread popularity in the country. While as a singer Robeson was best known for his renditions of spirituals, beginning in the mid 1930s his solo concerts included repertory from around the world. He frequently featured arrangements of folk songs by composers like Bedřich Smetana and Roger Quilter. Grant Olwage interprets these programming choices, as well as Robeson's custom to sing non-English songs in translation as well as their native text, as an expression of Robeson's cosmopolitanism and commitment to unity and neighborliness.[149]

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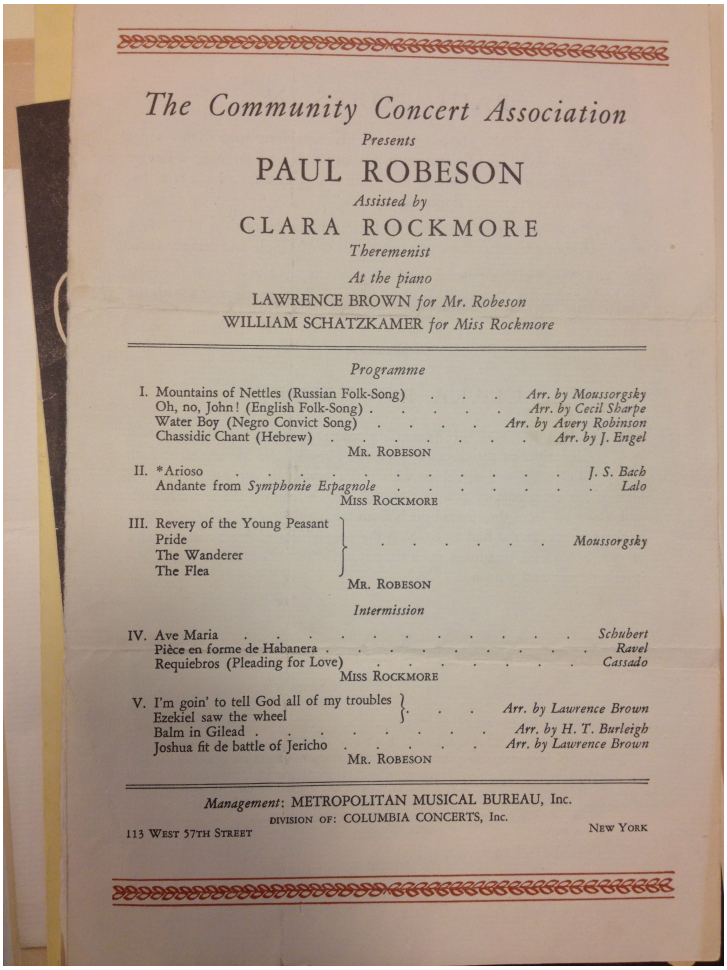
[146] "Clara Rockmore Gives a Theremin Recital," *Musical America*, November 10, 1938.
[147] "Miss Rockmore Gives Recital on Theremin."
[148] For more on this work and Robeson's performance see Lisa Barg, "Paul Robeson's Ballad for Americans: Race and the Cultural Politics of 'People's Music,'" *Journal of the Society for American Music* 2, no. 1 (February 2008): 27-70.
[149] Grant Olwage, "The World is His Song: Paul Robeson's 1958 Carnegie Hall Concerts and the Cosmopolitan Imagination," *Journal of the Society For American Music* 7, no. 2 (May 2013): 165-195.



The Community Concert Association

Presents

PAUL ROBESON

Assisted by

CLARA ROCKMORE

Theremenist

At the piano

LAWRENCE BROWN *for Mr. Robeson*

WILLIAM SCHATZKAMER *for Miss Rockmore*

Programme

I. Mountains of Nettles (Russian Folk-Song) . . . *Arr. by Moussorgsky*
Oh, no, John! (English Folk-Song) . . . . . *Arr. by Cecil Sharpe*
Water Boy (Negro Convict Song) . . . . . *Arr. by Avery Robinson*
Chassidic Chant (Hebrew) . . . . . *Arr. by J. Engel*
MR. ROBESON

II. *Arioso . . . . . *J. S. Bach*
Andante from *Symphonie Espagnole* . . . . . *Lalo*
MISS ROCKMORE

III. Revery of the Young Peasant
Pride
The Wanderer
The Flea
} . . . . . *Moussorgsky*
MR. ROBESON

Intermission

IV. Ave Maria . . . . . *Schubert*
Pièce en forme de Habanera . . . . . *Ravel*
Requiebros (Pleading for Love) . . . . . *Cassado*
MISS ROCKMORE

V. I'm goin' to tell God all of my troubles
Ezekiel saw the wheel
} . . . *Arr. by Lawrence Brown*
Balm in Gilead . . . . . *Arr. by H. T. Burleigh*
Joshua fit de battle of Jericho . . . . . *Arr. by Lawrence Brown*
MR. ROBESON

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Figure 11. Robeson-Rockmore Program, Undated, for the New York Community Concert Association. Clara Rockmore Collection, Series 3: Programs, Publicity, and Tour Arrangements, 1932-1990, Special Collections, University of Maryland.

By all accounts, both of the Robeson-Rockmore tours drew large and enthusiastic crowds in cities across the country including Chicago, Los Angeles, and Salt Lake City.[150] The concerts typically took place in front of white audiences and were reviewed by the white press, although one review of a performance at the North Carolina College for Negroes (now North Carolina Central University) reported that both whites and blacks attended, but were physically segregated

[150] My discussion of the tours is based on largely on the reviews and programs preserved in the Clara Rockmore Collection, Series 1: Articles and Reviews, 1910-1998 and Series 7: Scrapbooks, 1915-1941, where the reviews I cite below are preserved.

in the auditorium, with black audience members in the center and balcony sections.[151] The programs were split between the two performers so that sets of songs by Robeson opened and closed the concerts while Rockmore's appearances bookended the intermission. See Figure 11 for a representative example of a program from the pair's tours. Robeson's portion of the programs typically featured a mix of folk songs from around the world, songs by Mussorgsky, and at least one group of spirituals. Rockmore played works by Bach, Schubert, Ravel, and others. The extensive collection of reviews from these tours preserved in scrapbooks at the Clara Rockmore Collection (from which the quotes below are drawn), offer further insight into the ways in which critics' perception of musical sound was filtered through the bodies and objects that they saw on stage.

The reception history of these concerts also offers further insight into existing analyses of Robeson's career by historians and musicologists including Hazel V. Carby, Lisa Barg, and Grant Olwage.[152] In one respect, many reviews of Robeson's performances during his tours with Rockmore provide relatively straightforward examples of paternalistic racism that manufactured and celebrated uncivilized qualities in a man who was fluent in multiple languages, in possession of a law degree, and adept in several cultural arenas. The singer's lack of formal vocal training figured prominently in these formulations in that it allowed him, according to the critics, to express the "very core of a racial feeling."[153] These writers recognized Robeson's art as great only insomuch as it was "no ivory-tower thing."[154] Although such assessments appeared in both positive and negative reviews, critics with unfavorable opinions typically expanded on notions of

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[151] "Paul Robeson Pleases with Recital Here," *Durham Sun*, October 7, 1941
[152] Hazel V. Carby, *Race Men* (Cambridge, Mass: Harvard University Press, 1998); "Paul Robeson's Ballad for Americans"; "The World is His Song: Paul Robeson's 1958 Carnegie Hall Concerts and the Cosmopolitan Imagination."
[153] Marie Hicks Davidson, "Paul Robeson Scores Triumph in San Francisco Recital," *Call Bulletin, San Francisco*, November 13, 1940.
[154] John K. Sherman, "Music: Robeson Opens 'U' Artists' Course," *Minneapolis Star-Journal*, October 24, 1940.

Robeson's artlessness, characterizing his programs as "lightweight" and finding fault with interpretations of the ostensibly more "serious" selections by Mussorgsky.[155] In apparent contrast to Carby's reading of Robeson's roles in film and theater during the 1930s as embodying modernist narratives of inwardness, music critics of the 1940 and 1941 tours tended to hear Robeson's voice as representative of a racial collective. Ultimately, though, like the narratives of inwardness that Carby traces, these reviews enacted an erasure of the U.S. history of racial injustice through the celebration of a collective melancholy that the critics believed oppression had produced. To these critics, Robeson's individuality was subsumed into pure racial expression through the "natural" quality of his voice.[156] Critics corroborated their hearings of Robeson's voice as particularly natural with descriptions that marked his body as racially distinct. Robeson was never simply a baritone, but always a "Negro baritone," his body acting as visual evidence of his voice's authenticity.

In the same reviews, but in different ways, the visual impact of Rockmore playing the theremin profoundly shaped the critical reception of her performances. The theremin's "in the air" mode of sound production and, by extension, Rockmore's playing technique were, for many, major distractions. During the tours, the vision of Rockmore's still body, outstretched arms, and subtle hand movements through empty air frequently overwhelmed the aural impact of her performances. What critics saw when they watched Rockmore play the theremin registered

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[155] John Mason, "Paul Robeson Draws 5,000 to U.C. Gym," *Oakland Tribune*, February 11, 1941. Mason described the Mussorgsky songs as, "tender and introspective studies of the Russian folk mind, they failed to find a perfect medium in Robeson's broad, genial basso. I still prefer him in the songs of his own race." Among the many critics who complained that Robeson's programs were too "light" or popular were: Cecil Smith, "Robeson Gives His Concert to Popular Songs," *Chicago Daily Tribune*, November 25, 1940; Oscar Thompson, "Robeson is Heard in Song Program," *New York Sun*, October 7, 1940; "Robeson Returns as Recitalist to Carnegie Hall," *Musical American*, October 10, 1940.

[156] Among the many reviews that described Robeson's voice as "natural" were: "Robeson Recital Fills Carnegie Hall," *New York Post*, October 7, 1940; Ruth K. Nolan, "4,000 Crowd Center to Hear Deep, Rich Voice of Robeson," *White Plains Evening Dispatch*, October 19, 1940; "Music: Robeson Opens 'U' Artists' Course,"; and "Noted Negro Baritone Will Sing in OSC Gym on Monday Night," *Gazette Times Corvallis Oregon*, November 2, 1940.

neither as the adept manipulation of musical technology nor the precise technique of a virtuoso but rather as "uncanny" and "modern witchcraft."[157] These supernatural powers were literally embodied in what observers saw as Rockmore's "strikingly exotic" femininity.[158] While her Jewish heritage appears to have gone unnoticed during the tours (and throughout her career), Rockmore's pale skin, slender body, and sleek black hair presented a striking figure onto which critics were able to project a number of "different" identities. She appeared to them, for example, as "a Hindoo priestess" and one "enchanted or under the spell of pixies."[159] One wrote that she "attracted attention vying with the instrument. Garbed in sombre black, her fine features immobile, and black hair brushed tightly to the head and parted in the middle, she might have stepped from the pages of a novel by Gorky or Chekov."[160] To some critics her powers were explicitly sexual: one even imagined her in a bedroom with the theremin as a dressing stand and its amplifier as a mirror.[161] Few wrote about her technique as innovative, and none recognized the role that she played in design modifications to her custom instrument. In this commentary, the visual effect of Rockmore's body in motion obscured the very real labor of her intricate performance practices.

Despite the apparent visual distraction of Rockmore's performances, critics were generally enthusiastic about her musicianship, which they tended to discuss most seriously when using it as a foil to Robeson's ostensibly natural gifts. Many critics framed the Robeson-

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[157] Isabel Morse Jones, "Paul Robeson Concert Attracts Large Audience," *Los Angeles Times*, November 15, 1940; J. D. Callaghan, "Detroit Audience Thrilled by Songs of Paul Robeson," *Detroit Free Press*, December 7, 1940; "Paul Robeson Sings for Audience of 3000: Hearers Stirred and Excited by Voice and Simplicity of Manner," *St. Louis Post-Dispatch*, February 18, 1941; Peggy Post, "Paul Robeson Captures Enthusiastic 'U' Audience," *Seattle Post Intelligencer*, November 7, 1940.

[158] "Paul Robeson Encores Outnumber Listed Songs on Norwalk Program," *Bridgeport Post*, Connecticut, January 20, 1941.

[159] "Rockport Concert One of Best Given this Summer," clipping from unidentified newspaper in Clara Rockmore Collection, Series 1; M.A.A., "Robeson Thrills Meany Audience," *Seattle Times*, November 7, 1940.

[160] A. S., "2,800 Acclaim Paul Robeson Encore His Spirituals," *The Ottawa Journal*, date unknown.

[161] E.R.C., "Robeson a Great Hit; Thereminist Scores," *Utica Daily Press*, date unknown.

Rockmore concerts in this way; I quote just two whose reviews are representative. Wade N. Stephens wrote for the *Salt Lake City Desert News* in November of 1940:

> The spirituals and other Negro songs were interpreted [by Robeson] with a sincerity and naturalness that could hardly be surpassed. […] In all his songs Mr. Robeson displayed the full throaty resonance that seems to be peculiar to fine voices of his people. Singers of other races try in vain to imitate it. […] The few art-songs that were included in the program were not quite so successful. The very qualities that make Mr. Robeson's folk-singing so appealing prevent him from being most artistic in other musical fields. […]
>
> [Rockmore] has chosen to perform only compositions of a very high type, and she does them with fine musicianship, imitating perfectly every detail of the technique of stringed instruments. Her interpretations are artistic in phrasing and accurate in pitch, except for a slight tendency to sharp in the higher range just as a violinist often does. This may be caused by playing in the pure scale instead of the tempered system used in tuning the piano, as Miss Rockmore has absolute pitch.[162]

Another review by Shibley Boyes, pianist and music critic for the *Los Angeles Times*, written in December of 1941, offered readers an even more pointed comparison:

> Clara Rockmore, thereminist, was the intriguing co-artist and did much to comfort those yearning for true musical skill from the podium. [… Robeson] winds his audience about his finger but the artistically demanding are left unsatisfied. […] Real musicianship and refinement of phrasing characterized the work of Clara Rockmore, whose instrument, the theremin, gives forth a tone similar to a cello and is handled with phenomenal technique on her part.[163]

To these critics and many others, Rockmore and Robeson each possessed what the other lacked, offering perfectly mirrored embodiments of nature and culture. The contrast made for colorful reviews that allowed writers to demonstrate their erudition through details about tuning systems or Rockmore's training and simultaneously granted them the opportunity to indulge in white fantasies about the mythic, yet immature, power of the black race. Taken as whole, the extensive collection of reviews from these tours shows that critics granted Rockmore musical agency almost exclusively in the process of denying it to Robeson.

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[162] Wade N. Stephens, "Paul Robeson Wins Favor in S. L. with Folks Songs," *Salt Lake City Desert News*, November 20, 1940.
[163] Shibley Boyes, "Robeson, Thereminist Co-artists," *Los Angeles Times*, December 9, 1941.

The full impact of these reviews demonstrates that even as critics painted Rockmore and Robeson as opposites, the performers appeared to be two sides of one coin, both oddities to their white middle- and upper-class audiences and critics. Whatever music they made, the material reality of their bodies and their musical labor dictated that neither need be taken very seriously. Their accomplishments were easily reduced to the work of "racial feeling," in Robeson's case, and the quasi-spiritual outpourings of a fake priestess, in Rockmore's. These moves allowed critics to easily dismiss Robeson's clearly political programs featuring themes of oppression and human endurance as overly popular and lightweight, and to diminish Rockmore's virtuoso performances to cheap magic tricks. Even in the act of praising the musicians, critics denied them legitimacy within the world of western art music. They admired Rockmore for her musicianship but censored her for wasting it on a novelty instrument, while using Robeson's "natural" gifts to disqualify him as a "civilized" artist.

As the above discussion demonstrates, the reception history of the Robeson-Rockmore tours distilled attitudes about race and gender that shaped histories of both music and technology in powerful ways. Yet, beyond this, Rockmore's collaborations with both Robeson and Johnson remind us that there are other stories about electronic music that musicologists might tell. Both men, but Robeson in particular, gave Rockmore's career powerful boosts by appearing with the lesser-known thereminist in concert. Rockmore could hardly have undertaken two extensive national tours that exposed her work to thousands of people across the United States without a star like Robeson. While her relationship with the two men began through her husband, Rockmore, Robeson, and Johnson shared musical goals that almost certainly fostered mutual sympathy among them. Rockmore sought to legitimize the theremin as a means for artistic expression, while Johnson and Robeson worked to establish the spiritual as an art form no less

deserving of respect than western art music. Their rhetorical strategies were remarkably similar at times. Johnson asserted that the spiritual was "always serious music, and should be performed seriously," and Rockmore argued that the theremin "was a serious musical instrument *seriously* taken by people."[164] Of course, the similarity between the two musicians' rhetorical strategies does not indicate that Rockmore's and Johnson's struggles on behalf of their art can or should be equated. Rather, Robeson's and Johnson's support of Rockmore's work with the theremin offers a powerful example of collaboration between established artists outside of the electronic musical world and an emerging one within it.

A few years after her tours with Robeson, when Rockmore premiered a concerto written for her by Anis Fuleihan with Leopold Stokowski conducting the New York City Symphony in 1945, the reviews summed up many of the critical responses that her career as a thereminist had generated.[165] The *NYT* highlighted Rockmore's musicality, praising her musical "authority" and "spirited" interpretation of the concerto.[166] Harriet Johnson of the *New York Post* emphasized the visual impact of Rockmore's appearance and playing technique, writing, "the effect, while charming when turned out by the efficient and exotic-looking Miss Rockmore, is still slightly reminiscent of an artistic spirit in a trance soulfully clutching the air."[167] And Donald Fuller contributed a gendered hearing of the theremin's timbre in a review for *Modern Music*, describing the performance as sounding "like fifty mothers all singing lullabies to their children at the same time."[168] As these reviews indicate, although Rockmore's performances challenged the established norms of the concert world, they did not decisively gain the acceptance that she

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[164] Hall Johnson, *Thirty American Spirituals* (New York: G. Schirmer, 2007); Rockmore quoted in Martin, *Theremin: An Electronic Odyssey*.
[165] Stokowski commissioned the concerto for Rockmore.
[166] M. A. S., "Stokowski Offers Concert Novelties," *NYT*, February 27, 1945.
[167] Harriet Johnson, "Stokowski and Theremin," *New York Post,* February 27, 1945.
[168] Donald Fuller "Forcast and Review," *Modern Music* 12, no. 3 (March-April, 1945): 179.

sought for the theremin.

In the end, Rockmore's bid to legitimize the theremin through the performance of western art music set up a tension between the old and new that few cultural authorities in the 30s and 40s were willing to reconcile. In 1937, composer Carlos Chávez called those who played "sentimental melodies" on the theremin naïve, claiming that, "there is no sense in making a new instrument for old music."[169] Similarly, John Cage, a composer often praised for his commitment to artistic freedom, complained in a 1937 talk that:

> When [Termen] provided an instrument with genuinely new possibilities, Thereminists did their utmost to make the instrument sound like some old instrument, giving it a sickeningly sweet vibrato, and performing upon it, with difficulty, masterpieces from the past. Although the instrument is capable of a wide variety of sound qualities […] Thereminists act as censors, giving the public those sounds they think the public will like. We are shielded from new sound experiences.[170]

For Cage and Chávez only the development of new compositional ideas—formed without regard for public opinion—counted as musical innovation. In addition, Cage clearly divided the work of the male inventor from that of the presumably female theremin player, blatantly ignoring the fact that Termen himself performed "masterpieces from the past" on the instrument. In the resultant dichotomies between old and new, intellectual and physical, Rockmore's impact on the theremin's design and her development of a new playing technique are not only devalued; they disappeared entirely.

Conclusion

Cage's words and the reviews quoted throughout this chapter represented the beginning of the codification of the theremin's sound as being some combination of frightening, feminine, and foreign. These characterizations of the instrument reflected a host of contemporary anxieties

[169] Carlos Chávez, *Toward a New Music: Music and Electricity* (New York: Norton and Company, 1937), 165.
[170] John Cage, *Silence: Lectures and Writings* (Middletown, CT: Wesleyan University Press, 1961), 3-4.

among the musical elite about the tenuous position of art music in U.S. society, among them the continuing dominance of European music in the concert hall and the emergence of new technology. The theremin's critics included both musically progressive and conservative men whose concerns about the state of music varied, but to each of them the theremin was decidedly "other," and it was the instrument's ostensibly non-masculine qualities that they most derided and wished to cordon off from the elite musical traditions that they counted as art. Reviews also demonstrate that as the theremin's associations with female consumers and players solidified, commentators tended less and less to characterize the instrument as a piece of technology. This trend reflects the bias identified by scholars like Ruth Oldenziel and Zoë Sofia, in which technology used primarily by women is not considered technology at all.[171] This slanted view of technology is further reinforced by the historic feminization of both consumption and popular culture.[172] For composers like Cage and Blitzstein, nearly every aspect of the script that thereminists like Rockmore followed represented a form of feminization, including repertory, the bodies of performers, and the prominent use of techniques like vibrato and portamento.

Cage's limited definition of musical innovation matters because it is not simply his own, but is one many musicologists continue to teach in music history classes. For mainstream electronic music historians, the feminization of the theremin props up musicological biases about the intellectual work of composition and the physical work of performance, automatically cordoning off the contributions of thereminists from the historical record. Within this

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[171] Cynthia Cockburn and Susan Ormrod, *Gender and Technology in the Making* (London: Sage, 1993); Ruth Oldenziel, *Making Technology Masculine: Men, Women and Modern Machines in America, 1870-1945* (Amsterdam: Amsterdam University Press, 1999); Zoë Sofia, "Container Technologies," *Hypatia* 15, no. 2 (Spring 2000): 181-201; Mary Frank Fox, Deborah G. Johnson, and Sue Vilhauer Rosser, eds., *Women, Gender, and Technology* (Urbana: University of Illinois Press, 2006).

[172] Victoria de Grazia and Ellen Furlough, eds., *The Sex of Things: Gender and Consumption in Historical Perspective* (Berkeley: University of California Press, 1996); Roger Horowitz and Arwen Mohun, eds., *His and Hers: Gender, Consumption, and Technology* (Charlottesville: University Press of Virginia, 1998); *After the Great Divide: Modernism, Mass Culture, Postmodernism*.

construction Cage's legacy as an electronic innovator is secure, Rockmore's far from it. But as musicology as a whole turns more and more to material concerns—to the physicality of performance and the stuff of music technology—we can imagine a new version of electronic music history, one in which Rockmore's achievements are no longer dismissed as the naïve work of a mere performer, but are recognized as innovations in their own right. Recently, scholar and composer Tara Rodgers proposed that Rockmore's performances can "provide an alternative origin story for electronic music," one that opens "a space for mutual encounters between humans and technologies, between familiarity and otherness, that motivates wonder and a sense of possibility instead of rhetorics of combat and domination [that currently dominate electronic music narratives]."[173] I would add that a thorough engagement with materiality is critical to such a reimagining of electronic music history. Only when we begin to take into account the work of performers, including both their intellectual and physical labor, will we be able to construct a truly alternative narrative of electronic music history.

As this chapter demonstrated, one way to acknowledge the labor of performers is by examining how they respond to and shape scripts, or performance practices, for their instruments. In the case of the theremin, the most widely followed script in the 1930s and early 1940s included a popular and "classical" repertory, women performers, erect posture and graceful hand movements, and concert attire and settings. These dominant practices resisted some elements of the script promoted by industry giant RCA—in particular its attempts to cultivate amateur use of the theremin in domestic settings—and conformed to others, like the images of feminine grace in marketing materials. As Akrich emphasizes in her formulation of the script, creators of new technologies, including corporations like RCA, may design and attempt to control how consumers use their products, but users frequently adjust and sometimes actively

[173] Tara Rodgers, *Pink Noises: Women on Electronic Music and Sound* (Durham: Duke University Press, 2010), 8-9.

undermine those parameters. Some users even change the physical design of a technology, as Rockmore did in her collaboration with Termen on a custom theremin.

By exploring the theremin's early existence as both a commercial product and tool for musical performance through the central concept of the script, this chapter showed the myriad ways in which materiality shaped the critical reception of the theremin's sound. Audiences and critics responded to the theremin and invested its sound with meaning by listening and looking—to and at the bodies of women and African Americans, the repertory they heard and saw printed, and the instrument's unique playing method. Even in the context of radio, when listeners could not see performers or their movements, cues like repertory helped audiences attach meaning to the theremin's timbre. Chapter 2 of this dissertation demonstrated that the reception of the Telharmonium's sound as "pure" similarly depended on non-aural factors, including rhetoric from the field of acoustics and the presence of immigrant bodies in New York City. These reception histories clearly demonstrate Jonathan Sterne and Mitchell Akiyama's contention that the, "extreme plasticity of the senses, lays bare the degree to which the senses themselves are articulated into different cultural, technological, and epistemic formations."[174] Because our sensorial perceptions are so contingent on a wide array of factors, the perception of timbre is extremely mutable across time, place, and listeners.

This chapter showed that hearings of the theremin converged with certain performance practices, in particular the instrument's use by women. If we continued to trace the instrument's reception history through its use in the 1940s and 50s in film and lounge music, we would see perceptions of the instrument's timbre as feminine morph into hearings of the sound as strange, frightening, and exotic. If we extended our reception history into the present, we would find that

[174] Jonathan Sterne and Mitchell Akiyama, "'The Recording that Never Wanted to be Heard' and Other Stories of Sonification," in *The Oxford Handbook of Sound Studies*, eds. Trevor Pinch and Karin Bijsterveld (New York: Oxford University Press, 2011), 546.

the instrument's recent and ongoing popularity with a variety of working musicians has reshaped how audiences hear and value the instrument yet again. The Hammond organ's history, now over eight decades long, is similarly varied; the instrument's sound has functioned differently and meant different things to performers and audiences who interact with the instrument in a variety of musical settings from gospel to rock to soul. In the following chapter, and the final case study of this dissertation, we will see a similar variety of factors at work as new listeners struggled to define, and in some cases defend, the instrument's new sound.

Chapter 4

"Real Organ Music": The Federal Trade Commission and the Hammond Organ

In 1936 the Federal Trade Commission (FTC) accused the Hammond Clock Company (HCC) of making "deceptive, misleading and false" advertising claims that "unfairly diverted" trade to its new product, the Hammond organ, and away from its pipe organ competitors.[1] The advertising claims at issue covered a range of topics, from the Hammond's price to its suitability for the performance of "great works." The central question raised in the complaint and explored in the resultant hearing, though, was whether the new electronic instrument could produce sounds equivalent to those made by the so-called king of instruments.[2] Was the Hammond's sound, as the HCC claimed, beautiful? Could the Hammond produce an "infinite variety" of tone colors? Was the instrument adequate for the performance of canonical organ literature? Was it appropriate for church? To answer these questions, defense and prosecution attorneys brought together pipe organ experts, scientists, performers, HCC employees, Hammond and pipe organs, and acoustical instruments. These actors convened in many different spaces, from a university chapel to an FTC hearing room to an African American Episcopal church, to gather information and testify about instrumental sonorities both new and old.

For the first time in this dissertation, we turn our attention to a commercially successful product, in fact the first electronic musical instrument that can be described in this way. The Hammond's sustained popularity from the time of its debut and for decades following make it

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[1] William Chantland and Bryan A. Jacques, *Brief of Attorneys for the Commission*, Federal Trade Commission Docket 2930, 1937, Hammond Organ Company Records, Chicago History Museum, Research Center (hereafter HOCR).

[2] Barbara Owen, et al., "Organ," *Grove Music Online*, Oxford University Press, http://www.oxfordmusiconline.com/subscriber/article/grove/music/44010 (accessed August 20, 2014).

difficult to examine the bulk of the instrument's early reception history, as I did with the Telharmonium and the theremin. The instrument's success necessitates a narrowing of scope to a single controversy, that addressed in the FTC hearing. By focusing on this single, although extended, event, I follow Bruno Latour's suggestion to look closely at dissenters of and controversies over new technologies. In doing so, I show that "the construction of facts" about the Hammond in the FTC hearing was a "collective process," one dependent not only on the many people and objects involved in the hearing, but also on the musical, scientific, and industrial networks in which the hearing participants were themselves embedded.[3] Again following Latour's methodology, I do not seek to settle the debates of the hearing, but instead to trace the connections between controversies discussed within the hearing and ones that took place outside of it.[4]

Sound itself proved a slippery element during the proceedings—at the heart of everything and yet unable to act as evidence or speak for itself. Even the title of the proceedings, "hearing," is somewhat misleading, for although a Trial Examiner literally heard the testimony of witnesses, it was the translation of that testimony into text by a court stenographer and the printed briefs of the attorneys that a five-member Commission used when ruling on the complaint. Just as the court stenographer transcribed spoken word into printed text, human witnesses and machines transformed the tones of Hammond organs and acoustic organ pipes so that sound might serve as evidence. These transformations from one sensory medium to another took the forms of tests with both humans and machines: a "blind" listening test in which hearers marked on paper whether they heard a Hammond or pipe organ, and measurements by an instrument that recorded

[3] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge: Harvard University Press, 1987), 29.
[4] Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2005), 23.

the instruments' harmonics. The materials produced by these tests—charts showing machine readings and sheets marked with human answers—were treated by the Commission as evidence of the highest importance.

The premium that the hearing's participants placed on visualizations of sound begins to indicate the extent to which non-aural information shaped listeners' perceptions of the Hammond's sound. Indeed, I will argue in this chapter that the new electronic sound of the Hammond was only legible to the FTC hearing participants when understood in the context of other sensory and social experiences. As I have argued throughout this dissertation, hearers made sense of new electronic sounds only through existing ideologies, practices, and experiences. Testimony about the Hammond's sound bore the residue of decades of change and controversy not only in the pipe organ world, but in popular culture, the field of acoustics, and religious practices and organizations in United States. The theater organ's massive popularity in the 1920s and attendant controversies over organ design and sound, the shifting landscape of American religious organizations, the recent institutionalization of the field of acoustics: each of these factors shaped the terms of the FTC hearing on the Hammond organ. The networks of actors, both people and instruments, that coalesced in these musical, scientific, and religious fields were critically important to the hearing, supplying the experts, instruments, and scientific and musical theories requisite for testimony, evidence, and ruling.

Timbre played an especially important role in the FTC hearing on the Hammond. In recent years, scholars have pointed out that musicologists and music theorists have historically neglected questions about timbre.[5] Pipe organ experts who took part in the hearing were

[5] See, for example, Emily Dolan, *The Orchestral Revolution: Haydn and the Technologies of Timbre* (Cambridge: Cambridge University Press, 2013); and Tara Rodgers, "Synthesizing Sound: Metaphor in Audio-Technical Discourse and Synthesis History" (PhD diss., McGill University, 2011), 134.

particularly attuned to quality of sound because of the importance of registration in pipe organ performance practices and of timbral variation in organ construction. Registration itself, and what constituted "proper" registration, were of great importance throughout the hearing. Timbre also was (and remains) a matter of major concern to those working with electronic musical processes. Analyses of the Hammond's timbre made during the hearing are all the more interesting for their timing, following the recent professionalization of the field of acoustics in the U.S. The debates grant us insight into rapidly shifting opinions within a professional musical community about the proper role of science in establishing musical value and defining "good" musical sound. At the same time, the hearing demonstrates how participants invoked science to confirm their own biases about musical timbre and practice.

The hearing—which brought together witnesses, attorneys, and instruments, and produced some four thousand pages of testimony, argument, and evidence—is an excellent example of the type of group-forming event that Bruno Latour has noted is valuable for generating rich records that allow historians to trace connections between actors.[6] This chapter takes advantage of a wealth of archival material. Nearly three thousand pages of testimony are preserved in the Hammond Organ Company's records at the Chicago History Museum and the FTC's records in the National Archives.[7] The Chicago History Museum's collection also contains most of the evidence offered by the defense and prosecution, correspondence related to the hearing, the attorneys' briefs, and the Trial Examiner's final "Report Upon the Facts." In addition to archival records of the hearing itself, I draw on commentary about the Hammond published in pipe organ trade publications in the years leading up to and including the trial, as

[6] *Reassembling the Social*, 45-46.
[7] The records pertaining to the Hammond's FTC hearing in the HOCR are in boxes 44 and 45. The HOCR does not include transcripts of the testimony that took place in October 1937, but these can be found in the National Archives at College Park, MD, Record Group 122: Records of the Federal Trade Commission, Docketed Case Files, 1915-1972.

well as coverage in the mainstream press and music journals. The chapter begins with a brief description of the Hammond organ itself, with particular attention paid to aspects of its sound production that played a role in the FTC hearing. I then discuss the reception of the Hammond among the pipe organ community in 1935 and 1936 that led directly to the FTC complaint and hearing. Finally, I examine the hearing itself, summarizing and evaluating the tests and main arguments that shaped the FTC's ruling on the matter.

Critics of the Hammond organ, who were invariably champions of the pipe organ, frequently commented on what they considered to be the heavy historical import of the trial. The hearing, they believed, would be seen by historians of the organ in future decades as one of the "epoch-making developments of the century."[8] Yet today, little historical memory of the trial in either popular literature or musical scholarship exists. Popular publications on the Hammond like Mark Vail's *Beauty in the B* give the hearing no more than passing attention, and scant scholarship on the matter exists.[9] The FTC's decision appeared to have little impact on either Hammond sales or the pipe organ industry, and, in fact, the Hammond organ's impact on the pipe organ industry was negligible. I suggest, in the conclusion of this chapter, that the concerns of the pipe organ proponents who initiated and took part in the FTC hearing were so narrowly defined that they limited the potential impact of the event.

The Hammond Organ Goes on Sale

When the Hammond organ entered the market in April 1935, it was the latest in a string

[8] "The Hammond Decision," *The Diapason*, August 1, 1938.
[9] Mark Vail, *The Hammond Organ: Beauty in the B* (San Francisco: Backbeat Books, 2002). Tom Rhea gave the hearing a brief overview in "Electronic perspectives; Hammond organ: Hammond and the FTC," *Contemporary Keyboard* 3 (June, 1977). Frode Weium also mentions the hearing in "Technology and Authenticity: The Reception of the Hammond Organ in Norway," *Material Culture and Electronic Sound*, eds. Frode Weium and Tim Boon, 67-93. Tiffany Ng recently presented a paper on the hearing: "Electric Organology: How Hammond Fooled the Federal Trade Commission" (paper presented at the conference "From Bone Flute to Auto-Tune: On the Long History of Music & Technology," University of California, Berkeley, April 24, 2014).

of newly invented electronic organs. During the first half of the 1930s, the United States alone saw the invention of the Rangertone Organ, the Everett Organtron, the Syntronic Organ, the Hardy-Goldthwaite organ, the Westinghouse organ, and the hyperbolically-named Radio Organ of a Trillion Tones.[10] While most of these instruments were never produced on a commercial scale, the proliferation of electronic organ inventions in these years indicated that many believed an electronic substitute for the pipe organ held commercial promise. A mass-produced electronic instrument might be built and sold at costs far lower than those for traditional pipe organs, which were usually made-to-order for specific spaces. An electronic organ would also enjoy the advantage of an existing market in churches and the promise of a new domestic market including students, professionals, and amateurs who lacked the space and means to install a pipe organ in their homes. A portable electronic organ might also appeal to professionals in dance and jazz bands as a performance instrument.

When Laurens Hammond began developing a musical instrument in the early 1930s, no one had come even close to tapping this potentially lucrative electronic organ market. Hammond's own success in the field came not through any groundbreaking new means of sound production but rather through the refinement of processes already developed by others. Hammond also had the distinct advantage of material and labor resources in the form of the HCC, of which he was president, which produced some of the most popular electric clocks in the U.S. at the time. The clocks ran on a synchronous motor of Hammond's invention that he would also used to power the Hammond organ. Before the clock, Hammond used the motor to power several other products including (briefly successful) 3D glasses invented for the Ziegfeld Follies in 1922, and a device for running battery-powered radios with electricity.

[10] Simon Crab's website, www.120years.net, is one of the most extensive resources for information on early electronic instruments like these.

Hammond developed each of his new inventions as the previous one ceased to be profitable, and the Hammond organ was no exception. The Great Depression hit the HCC particularly hard. By 1932, just four years after the company was founded, its previous year's half million dollars in profits had dissolved into a net operating loss. By the end of fiscal year 1933 the HCC was in the red for $240,000. Hammond began casting about for another product that could turn the fortunes of the HCC around. His first attempt—a bridge table that dealt cards automatically—only sank the company deeper into debt. While the bridge table represented a serious miscalculation of consumer desires, the Hammond organ's eventual success owed much to its inventor's careful study of the musical market. In their book on the first commercially successful synthesizer, T. J. Pinch and Frank Trocco credit inventor Bob Moog's responsiveness to his customer's needs as key to the Moog synthesizer's popularity.[11] The same can be argued in the case of the Hammond organ. As Hammond frequently remarked to the press, he was no musician but became a careful student of the musical instrument market while developing his electric organ. Hammond studied instrument design and acoustics and brought musicians to his lab to provide feedback on all aspects of the organ. He enlisted the HCC's assistant treasurer William Lahey, who was also an organist, as a musical consultant and sought the advice of pipe organ experts in the Chicago area, including William Barnes, who would later become one of the Hammond's most vocal critics.[12]

Like many inventors seeking to capitalize on the commercial promise of an electronic organ, Hammond used a system that combined mechanical and electrical processes to generate

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[11] Trevor Pinch and Frank Trocco, *Analog Days: The Invention and Impact of the Moog Synthesizer* (Cambridge, MA: Harvard University Press, 2002), 54.

[12] Information about Lahey's role comes from the anonymously authored company history, *When Electrons Sing: The Story of the Hammond Organ Company* (Hammond Organ Company, Chicago: 1966). Barnes testified about meetings with Hammond during the FTC hearing on March 17, recorded in Federal Trade Commission, *Official Report of the Proceedings before the Federal Trade Commission Docket No. 2930 in the Matter of the Hammond Clock Company, a corporation*, Chicago, New Post Office Building, Ethel E. Fisher, official reporter, HOCR, 1073-77.

sound for his instrument. At the heart of this design was the tonewheel, a small cogged disc that rotated in proximity to a magnet that had been used in other instruments including the Telharmonium and the Rangertone organ. The regular cogs on the tonewheels disturbed the magnetic field, and a wire wound around the magnet translated these disturbances into a fluctuating electric current which was then fed into a loudspeaker where the signal was amplified and thus converted into sound. While the tonewheels could easily create a range of different pitches, all produced roughly the same sound, that associated with the sine wave. In order to produce additional timbres, Hammond and his engineers used the process of additive synthesis, blending different frequencies created by several tonewheels to create a single tone with a complex waveform. As discussed in Chapter 2, the principal that simple waves can be combined to make complex waves had first been proposed by Joseph Fourier in the 1820s and most famously expanded with regard to sound by Hermann von Helmholtz in the 1860s.[13] As Cahill had done with the Telharmonium, Hammond cited Helmholtz's work in his instrument's patent. Hammond and his team determined that in addition to the fundamental, providing players with eight possible harmonics would provide a satisfactory variety of timbres. Critical to the instrument's design was the use of harmonics from a tempered scale rather than the just or "natural" harmonics produced by vibrating strings or pipes and used by Cahill in the Telharmonium. The use of tempered harmonics drastically reduced the number of tonewheels necessary for the instrument, thus making it commercially viable, but was an aspect of design that figured prominently in criticism of its sounds.

Even with the tempered harmonics, the Hammond's means of sound production necessitated many working parts in order to control the timbre of each note on the instrument.

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[13] Hermann L. F. von Helmholtz, *On the Sensations of Tone as a Physiological Basis for the Theory of Music*, trans. Alexander J. Ellis (London: Longmans, Green, and Co. 1875).

The result was an interior that one official company history described as "a complexity of some 1,500 tiny switches with long-wearing paladium contact points and eight-an-a-half miles of wire, some as thin as human hair"—yet still one that could be manufactured, assembled, and sold at a profit. Hammond housed this inner complexity in an organ console that presented players with a traditional interface—two manuals, a pedalboard, a swell pedal and so on—save one new feature, the instrument's drawbars, also called tonebars. As shown in the diagram in Figure 12, each manual on the Hammond possessed two sets of drawbars (labeled "Harmonic Controllers" in the diagram) that allowed players to control the instrument's timbre. Each of the nine drawbars corresponded to a note in the harmonic series, including two "sub-harmonics" (one which sounded the octave below the fundamental, the other a fifth above it) and the second, third, fourth, fifth, sixth, and eight harmonics above the fundamental.[14] The drawbars allowed players to control the intensities, on a scale of zero to nine, of those harmonics along with that of the fundamental tone.

As familiar as the Hammond organ looked, its drawbar system was entirely different from the stops on traditional pipe organs, which corresponded to ranks of pipes designed to make specific sounds. On a pipe organ, one pulled out a stop marked "Flute" or "Trumpet," causing the organ to allow wind to flow through the pipes corresponding with those stops when the manual's keys were depressed. On a Hammond, rather than pull out a single stop, a player set each of the nine drawbars. For a "Stopped Flute" sound, a player would set the drawbars to the following strengths: 00 5200 000; for a Trumpet: 00 5665 421. On the one hand, the Hammond's system of "registration," as the art of selecting and blending stops was known, gave players a great deal of timbral control by allowing them to manipulate the strengths of individual

[14] The seventh harmonic was not included because Hammond and the HCC engineers deemed that it was too far in pitch from the nearest tempered note.

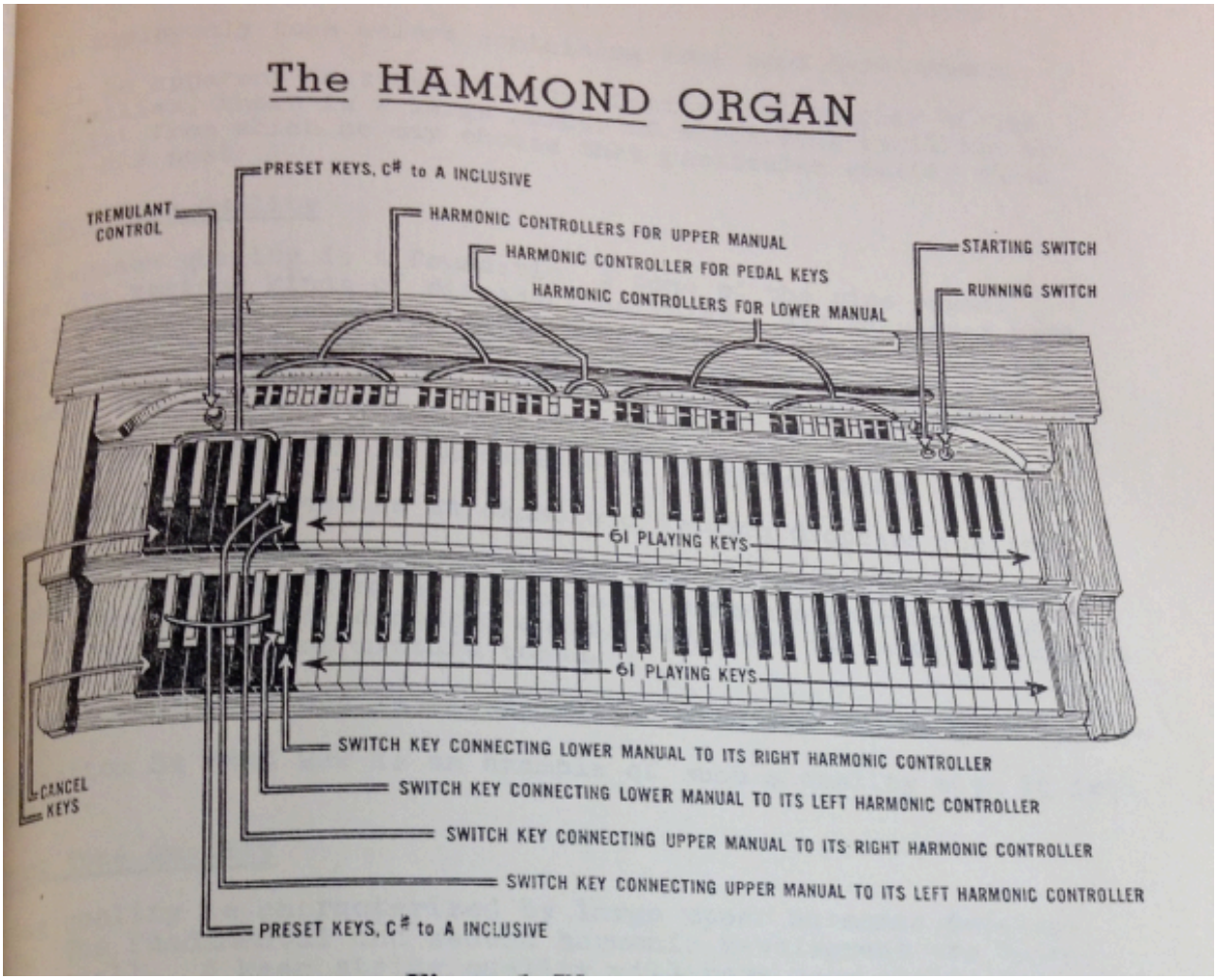

Figure 12. Diagram from "Sales Instructions: The Tonal Controls of the Hammond organ," Undated, The Hammond Clock Company, in *Commission's Exhibits*, HOCR.

harmonics. On the other, the drawbars presented players with a non-intuitive method with no basis in the traditional organ practice of registration. To ease these difficulties, Hammond organs came with a number of preset "registrations" available on short keyboards to the left of the manuals for which the key's color scheme was reversed. The HCC also published a guide, *Playing the Hammond Organ*, that explained the basic mechanics of the drawbars and provided tips on how best to use them.[15]

[15] *Playing the Hammond Organ* (Chicago: Hammond Clock Company, 1936), 43.

Hammond Advertising and Sales

While the Hammond's drawbars were new technology, all of the preset timbres and most of the sounds that *Playing the Hammond Organ* prescribed mimicked familiar organ stops, including diapasons, flutes, oboe, Tibia Clausula, strings, and so on. The new drawbar system, the company claimed, allowed players greater control over musical expression than any other instrument, while its traditional preset sounds rivaled those of any good pipe organ. The instruction book echoed ad copy that trumpeted the Hammond's purportedly "millions of possible tone qualities," while consistently linking the instrument's sound to that of a traditional pipe organ.[16] The Hammond's factory preset pipe organ sounds and advertising claims about its sounds were part of a larger marketing strategy, created in co-development with the organ's design, that linked the instrument to existing cultural values while simultaneously celebrating the new possibilities it offered musicians. The instrument's April 1935 debut, for example, featured a mix of technological sparkle—provided by the setting at the Industrial Arts Exposition in Manhattan's Rockefeller Center—and cultural cachet, with St. Patrick's Cathedral organist Pietro Yon performing and conductor Fritz Reiner present as guest of honor.[17] As discussed at length in Chapter 3, this combination of exciting novelty and respectable tradition was *de rigueur* in the music technology marketing strategy, having been employed to sell talking machines, Telharmonium music, theremins, and many other products.

Like theremin advertising just five years earlier, Hammond ad copy aimed at the domestic market also drew heavily on romantic notions of musical expression that privileged creation over performance and listening. Early photos in ads like the one pictured in Figure 13 featured adults and children, clearly upper- or middle-class, seated at the Hammond, bathed in

[16] "The Hammond Organ" 1935 sales brochure in *Federal Trade Commission vs. Hammond Clock Company Commission's Exhibits*, HOCR.
[17] "Hammond Electric Organ Makes Debut: New Instrument on View," *The Diapason*, May 1, 1935.

light, gazing into the distance, apparently in the throes of a transcendent experience. "Many people love fine music too deeply to be satisfied with mere listening," the ad copy claimed. "*Only by creating it themselves* can they secure the sense of fulfillment and release that music can and should bring to everyone."[18] Lavish full page ads like this one ran in publications like the *New York Times*, *New Yorker*, and *Time Magazine*, while more modest ads ran in smaller publications and aimed at a slightly less wealthy segment of the population. The message in both tiers of domestic ads was the same, though: buy a Hammond and experience music in a profound and sophisticated way.

Figure 13. "For Your Home – A New Miracle of Organ Music!" ad, which appeared in *The New Yorker* on November 7, 1936 and *Time* on November 9, 1936. *Commission's Exhibits*, HOCR.

[18] The HCC ran far too many ads to document here. Just a few examples can be found in the following: *Time*, March 23 and May 4, 1936; *Fortune Magazine*, December 1936; *Newsweek*, December 1936; *The New Yorker*, December 1936; *Scientific American*, February, 1937; *New York Times Magazine*, February 21, 1937. The ads listed here, and many others, are compiled in *Commission's Exhibits*.

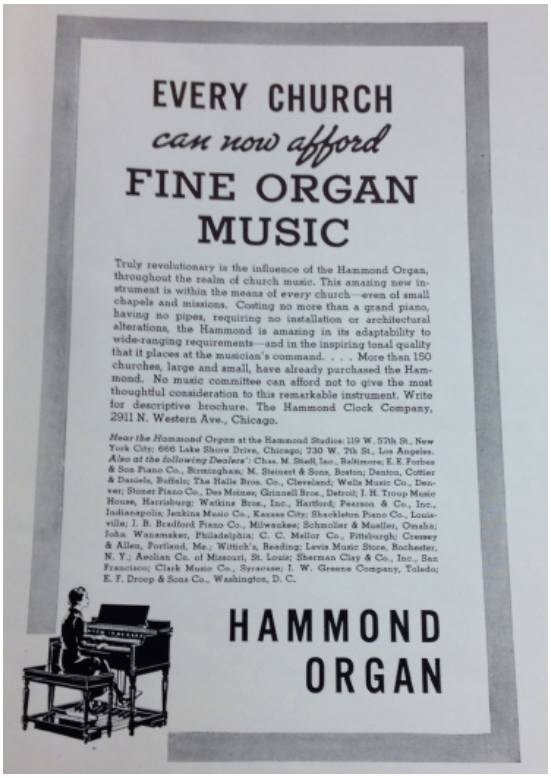

Figure 14. "Every Church Can Now Afford Fine Organ Music" ad, which appeared in *Extension Magazine* in January 1936 and *Christian Herald* in February 1936. *Commission's Exhibits*, HOCR.

In addition to its domestic advertising, the HCC also ran ads in journals like *Christian Herald* and the Catholic publication *Extension Magazine* that appealed to the interests of church committees and clergy. While Hammond ads for the domestic market targeted relatively wealthy individual consumers, HCC sacred advertising generally addressed organizations with limited financial resources. Ads like the one shown in Figure 14 highlighted practical concerns like the Hammond's "compactness and mobility," low cost, and ease of installation. Churches previously unable to purchase an organ, ads like this declared, could now own an instrument that produced "fine" organ music equal to that of a "concert" or "cathedral" organ.[19] The price comparison was undoubtedly compelling to church committees and clergy in the market for an organ in the midst

[19] See: *Catholic Buyer's Guide*, 1936; *Christian Herald*, February and June 1936; *Extension Magazine*, January and May 1936; *The Diapason*, March 1936.

of the Great Depression. $1250 was the cost of a "standard installation," which included the Hammond console and a pair of loudspeakers. While hardly cheap—new Chevrolet sedans in 1935 cost around half as much—the Hammond was markedly less expensive than most pipe organ installations.[20] Although some small pipe organs sold for less (one Wicks model on the market at the time cost $775), those instruments were designed for small spaces and offered a limited range of sounds.[21] It was far cheaper to purchase additional loudspeakers with a Hammond instrument than to install a pipe organ in a large sanctuary. In addition, the Hammond required only the most minimal of ongoing maintenance, whereas pipe organs needed regular tuning and upkeep.

As lists published by the HCC show, the over 2,500 religious institutions that purchased a Hammond from 1935 to 1937 represented a range of types.[22] Mainline Protestant organizations, including Baptists, Presbyterians, and Episcopalians made up half of sacred Hammond buyers. Non-mainstream Protestant churches, dominated by Evangelicals but also including groups like Christian Scientists, made up another fourth of sacred purchasers. The other fourth of buyers were Catholic institutions. Ten Jewish synagogues also bought Hammonds in these years. The religious buyers listed by the HCC were rural and urban and located in all corners of the United States, from the First Baptist Church in tiny Newton Pennsylvania to St. Mary's in St. Petersburg, FL that seated 1,200. While these official company lists were dominated by churches with white congregations, both the First Church of Deliverance and the Progressive Baptist Church, two of Chicago's most important and prominent African American

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[20] Chevrolet ads from 1935 advertise sedan prices ranging from $550 to $615.

[21] "Compare Wicks 'Fuga' with Other Small Organs" advertisement, *Federal Trade Commission vs. Hammond Clock Company Respondent's Exhibits*, HOCR.

[22] The information in this paragraph is drawn partially from lists printed in Hammond ads but primarily from two documents in *Respondent's Exhibits*, "A Partial List of Hammond Organ Purchasers," undated (probably 1937) HCC document and "Memorandum Regarding Nature of Hammond Organ Customers," May 8, 1937, HCC document prepared for the FTC hearing.

churches with respective memberships of 450 and 1500, appeared on an internal company list that the HCC submitted as evidence during the FTC hearing.[23] The HCC included neither of these African American churches on public lists used in advertising.

Although a thorough analysis of the data in the HCC's lists of Hammond buyers is outside the scope of this dissertation, it is possible, with the help of additional evidence, to draw a few tentative conclusions here about the makeup of early religious Hammond purchasers. The lists themselves show that roughly half of these customers were groups, including evangelicals, Catholics, and other non-mainstream churches, that, since the mid-nineteenth century, had grown while the formerly uncontested dominance of mainline Protestantism in American public life gradually eroded. This growth generally took place among marginalized communities: Catholic churches swelled with Eastern-European immigrant groups; evangelicalism took root primarily among poor whites in the south and the shifting "frontier" areas in the Midwest and West. The HCC's lists of buyers also reveal that, despite the prominence given to large churches in urban areas in Hammond advertising, churches in smaller cities and towns and rural areas dominated sales. Testimony offered during the FTC hearing by one of Hammond's competitors suggests that most churches that purchased a Hammond during this time had budgeted $2,000 or less for an organ. Many had apparently not been in the market for an organ at all until the Hammond became available.[24] A 1960 study of music in San Francisco Baptist churches that surveyed electronic organ ownership provides further evidence that the Hammond expanded (rather than overtook) the small church market.[25] These observations about denominations and budgets

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[23] "A Partial List of Hammond Organ Purchasers," in *Respondent's Exhibits*.
[24] C. J. Zimmerman testimony, *Report of the Proceedings*, Chicago, March 18, 1937, 1168-88.
[25] William Minter's 1960 survey of music in Baptist churches in San Francisco found that electronic instruments were particularly popular in small churches. In nineteen churches with membership ranging from 40 to 297, fourteen used electronic instruments for services; the remaining five used pianos. Minter found that seven of nine churches with membership ranging from 300 to 600 used electronic instruments, while the remaining two owned pipe organs. W. John Minter, "Church Music in the American Baptist Union of the San Francisco Bay Cities" (Master's thesis,

combined with the HCC's emphasis on cost saving to the religious market suggest that while Hammond ownership cut across religious, socio-economic, and race lines, it did so unevenly. My findings indicate that congregations owning a Hammond in the 1930s were likely to be marginalized by race, class, or place.

Although Hammond sales to churches and individuals (about half and one quarter, respectively, of total sales by 1937) far outnumbered sales to venues that focused primarily on popular music like radio and theaters, the latter groups cast a far larger net in terms of listeners. The instrument enjoyed nearly immediate popularity with radio stations and film studios, in restaurants and clubs, and with famous theater organists like Jesse and Helen Crawford.[26] Many—including its inventor and its critics in the pipe organ world—deemed the instrument particularly suited for popular music, like its predecessor, the theater organ. The Hammond's fast attack was desirable for dance music and jazz, and its drawbar system provided enough timbral flexibility that players could imitate a range of sounds from percussion instruments to the banjo and vibraphone. While the theater organ had been prized for these traits as well, the Hammond's portability, compact size, and lower cost were decided advantages over the earlier instrument. Some of the country's most widely heard stations, like WGN in Chicago and NBC's New York City station**,** as well as three of the "Big Five" major film studios purchased a Hammond (and sometimes two or three).[27]

Despite the instrument's early use as a tool for popular music, references to popular

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Union Theological Seminary, New York, 1960). Minter's study is summarized in Orpha Ochse, *The History of the Organ in the United States* (Bloomington: Indiana University Press, 1975), 374.

[26] The Crawfords were playing the instrument publicly and in recordings by the time the FTC hearing began, and Jesse Crawford published instruction books on the Hammond beginning in 1949. On the Hammond's popularity with popular entertainers in Chicago see: Charles J. Gilchrest, "New Electric Organs Are Making Strides; Leaders in Radio Quick to Get Them," *Chicago Daily News*, August 20, 1935; "Pipeless Pipe Organ," *Chicago Evening American*, September 19, 1935; "Organ for New Dining Place," *Chicago Daily News*, September 19, 1935; "Music Maker at the Bismarck," *Chicago Tribune*, July 28, 1935; "Electric Organ for State-Lake," *Chicago American*, December 21, 1935.

[27] "Memorandum Regarding Nature of Hammond Organ Customers," *Respondent's Exhibits*, HOCR.

cultural forms were almost completely absent from Hammond advertising in the 1930s. Indeed, the Hammond marketing team took care to deemphasize this aspect of the instrument in print advertising and sales strategies, just as it whitewashed its lists of Hammond purchasers. Hammond sales bulletins from 1935 and 1936 explicitly directed demonstrators to avoid allusions to popular music until assured that the potential buyer would not look askance at such music:

> The style in which you play your music is very important. Under no circumstances adopt the movie organ style of exaggerated rhythm and staccato playing. Those prospects who want a complete demonstration of this kind of music will never hesitate to ask you for it, and you should learn how to do it effectively.

This strategy, similar to that taken by Victrola with its Red Seal Records discussed in Chapter 3, took advantage of sales based on popular music but attempted to build a brand based on the prestige of elite art forms explicitly associated with white listeners and performers. The HCC built an advertising strategy, in part, on the erasure of information about the organ's existing connections to popular culture and non-white bodies, organizations, and music.

This strategy seemed to be effective, given the Hammond organ's rapid success. By December of 1935, just seven months after the instrument went on sale, the HCC had built 1,000 organs and shipped 807 of them. In September, the company leased a new prominent space for retail and sales offices in downtown Chicago, taking over the entire thirtieth floor of the American Furniture Mart building on Lake Shore Drive.[28] Just months after the Hammond went on sale Emory Penny, the HCC general sales manager, boasted that the organ had created "a new industry centered in Chicago" and provided employment for more than 300 men at its factories.[29] Sales rose nearly every month during 1935 and continued to increase in 1936. The nearly $40,000 deficit with which the HCC entered 1935 was erased by a net profit in 1936 of almost

[28] "Hammond Organ Co. Gets Space in Tower of Furniture Mart," *Chicago Tribune*, September 15, 1935.
[29] Hammond Organ Co. Gets Space in Tower of Furniture Mart."

$117,000.[30] That figure grew to $364,000 by the end of 1937, the same year that the HCC changed its name to the Hammond Instrument Company and bought a new plant to keep up with orders.[31] These figures were especially impressive given their occurrence during some of the worst years of the Great Depression.

Along with its commercial success, the Hammond organ enjoyed rave reviews by the press in the months and years following its debut. Journalists describing the instrument frequently quoted ad copy verbatim. Even before the Hammond entered the market, the *Washington Post* reported that, "[The Hammond's] tone is understood to be as voluminous as that of a huge pipe organ."[32] Shortly after, *Literary Digest* declared that, "The variety of tones is virtually infinite, and there is duplication of the regular organ diapason, flute-pipe, orchestral string and reed tones."[33] Even the notoriously highbrow *New Yorker* was not immune to enthusiasm for the Hammond. In January of 1936, it reported to its readers, "that the company's product is exactly as wonderful as you have heard. It is quite true that the thing hasn't a pipe to its name, yet can shame the most prodigious pipe organ in the matter of sheer volume…"[34] Another anonymous writer for the *Chicago Daily News* suggested that part of the organ's appeal was populist. Not only was the Hammond a "worthy successor of the majestic medieval pipes," but it, "also harmonizes with mass production and real social democracy—America's two outstanding contributions to world culture."[35] In the same breath, the author nodded to the Hammond's contribution to industrial production in Chicago—300 new jobs for men in 1935 was no small matter—and its accessibility. Now, the article crowed, congregations formerly

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[30] Hartley Rogers & Co., Investment Securities, "An Analysis of the Hammond Clock Company Common Stock," New York, March 1936, HOCR.
[31] *When Electrons Sing*, 19. I will continue to refer to the company as HCC for the sake of simplicity, and because it was the entity named in the FTC complaint and hearing.
[32] "Mystery Organ at Patent Office Embraces Entire Musical Range," *Washington Post*, March 24, 1934.
[33] "New Electric Organ," *Literary Digest*, May 4, 1935.
[34] "About the House, Music in the Home," *The New Yorker*, January 18, 1936.
[35] "Electric Music," *Chicago Daily News,* Friday April 19, 1935.

unable to afford the "majesty" of pipes could have organ music through the democratizing force of electricity.

The Pipe Organ Community

While mainstream journalists reacted to the Hammond with awe and delight, members of the pipe organ community, including builders, historians, architects, and performers, expressed skepticism and even dismay about this new source of competition in the sacred musical instrument market. Their concern was not for the democratization of organ music, but for what they heard as the dilution of quality in organ sound that the Hammond represented. The established nature of the pipe organ community facilitated an organized and consistent response to the new instrument. The pipe organ industry in the U.S. dated back to the eighteenth century, and by the first decades of the twentieth century was a mature field dominated by large companies located in the East like Aeolian, Skinner, Möller, and Austin.[36] The church pipe organist profession predated the advent of the U.S. pipe organ industry, as instruments were shipped to the New World from the Old long before they were built there. By the end of the nineteenth century, a professional network of builders, players, architects, and historians enjoyed the support of longstanding professional organizations, trade journals, and professional schools like the Guilmant Organ School, founded in New York in 1898 to train organists for work in Protestant churches.[37]

The country's two most prominent pipe organ organizations in the mid 1930s, the American Guild of Organists (AGO) and the National Association of Organ Builders (NAOB), were important organizing forces against the Hammond. Founded in 1896, the AGO was and

[36] Aeolean was located in New York, Skinner in Boston, Möller in Maryland, and Austin in Connecticut.
[37] *The History of the Organ in the United States*, 215-16

remains the flagship organization for professional organists in the United States.[38] The Guild acted as a regulatory body of both its members and the instruments they played. It required full "fellowship" members to pass rigorous examinations of performance, aural, and theory skills and, in 1933, published guidelines for the standardized construction of organ consoles.[39] The NAOB was much younger than the AGO, but still wielded significant influence as a representative body for all major U.S. pipe organ firms. Leaders in the industry created the NAOB in response to the National Industrial Recovery Act of 1933, a piece of New Deal legislation that called for the organization of trade and industrial groups to develop labor and production standards.[40] Formed in the months after the act's passage, the NAOB developed a "code of fair competition" and agreed to cooperate with the National Recovery Administration (NRA), the body created to draw up industrial codes.[41]

The NAOB's formation and compliance with the NRA coincided with some of the most abysmal years in the U.S. organ industry's history. Adolph Wangerin, the NAOB's first president, wrote in an essay announcing the group's formation of the "deepening gloom and forlorn decline [of pipe organ building], recorded in the history of the last three years" and a "production shrinkage already in excess of 90 per cent."[42] Wangerin's alarming number was

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[38] The National Association of Organists (NAO), founded in 1908 with an emphasis on more popular art forms, was absorbed into the AGO in 1935, bringing total membership to approximately 6,500. The NAO had been far more friendly to the interests of theater organists than the AGO, and the merger was one sign among many of the rapid decline of the more popular organ profession. Ulselma Clarke Smith, "Reviews History and Outlines a Program for Future of AGO," *The Diapason*, August 1, 1934.

[39] Skills tested ranged from transposition, modulation, and harmonization at sight, to memorization, transcription, composing answers to fugue subjects, and so on. "Guild Examinations for 1931 Announced," *The Diapason*, September 1, 1930; "New Console Design Adopted as Revised," *The Diapason*, July 1, 1933.

[40] Adolph Wangerin, "Organ Industry Sees Hope in the New Deal; To Banish Many Ills," *The Diapason*, October 1, 1933; "Organ Code is Submitted," *The Diapason*, November 1, 1933. The NAOB was not the first organization of its kind in the U.S.: the Organ Builders' Association of America had been formed in 1918 in response to proposed government war taxes. See, "Organ Builders of America Complete their Organization as Division of Music Industries Chamber of Commerce," *The Music Trades* 56, no. 12 (September 21, 1918).

[41] Although the Supreme Court ruled in 1935 that the NRA was unconstitutional, the NAOB continued to exist for several years.

[42] "Organ Industry Sees Hope in the New Deal."

possibly an exaggeration, but it was true enough that the industry was struggling. 1932 saw the merger of Aeolian and Skinner; Austin, liquidated its assets three years later.[43] Leaders at each of these three major companies cited the Great Depression as the source of their troubles, but the general economic decline had only exacerbated industry-specific problems that were a decade old. When the Hammond organ entered the market in 1935, the pipe organ industry was still feeling the effects of declining demand for theater organs, which nearly every existing manufacturer and many new businesses built during the instrument's heyday in the so-called "silent" film era. From 1919 to 1927 the number of organs produced in the U.S. more than doubled, from 1,151 to 2,471. Just a few years later, though, these gains were replaced by losses when sound film became the norm in the late 1920s. By the end of the decade, organ production dropped to 1,695.[44] A few years after this severe contraction, the industry would begin to feel the effects of the depression in earnest.

Although every major pipe organ manufacturer in America built theater organs and many organists left church employment for the theater, the new popular instrument and profession were subjects of intense controversy.[45] Debates over the theater organ, and later the Hammond, are captured in detail in the pages of two trade journals, *The Diapason* and *The American Organist* (hereafter *TD* and *TAO*, respectively). *TD* was the official journal of the AGO at the time.[46] While *TAO* was originally affiliated with the AGO, T. Scott Burnham took sole control of the journal in 1912 following editorial disagreements with Guild leadership.[47] For most of the

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[43] "Austin Company will go out of Business," *The Diapason*, July 1, 1935.
[44] These numbers are from the "NRA Code of Fair Competition for the Pipe Organ Industry," January 16, 1934, (accessed through Internet Archive, April 18, 2014, http://archive.org/stream/codeoffaircompet6050unit/codeoffaircompet6050unit_djvu.txt). See also: "Organs Built in 1933 Valued at $1,291,247: Severe Decline Revealed," *The Diapason*, December 1, 1934.
[45] See John W. Landon, *Behold the Mighty Wurlitzer: The History of the Theatre Pipe Organ* (Westport, Conn: Greenwood Press, 1983) for information about the theater organ industry.
[46] *TD* was also the official journal of the Canadian College of Organists.
[47] Burnham's testimony, *Report on the Proceedings*, Atlantic City, NJ, October 18, 1937, 2016-17.

1920s, the publications devoted roughly equal space to theater and church topics. *TAO*, for example, featured regular "Church" and "Photoplaying" sections and reviewed sacred and secular repertory together in a single column. Yet a hierarchy of value clearly existed. Theater organists regularly complained about the "enmity of the church organist" toward their profession.[48] And although the byline of *TAO*'s "Photoplaying" section declared the journal's commitment to "serious" discussions of a "new art," the theater organist was frequently the target of satire and was regularly accused of incompetence and blind consumerism.[49]

Even more controversial than the theater organists were the theater organs themselves. The instruments were also known as "unit organs," and it was their unit design, first developed by Robert Hope-Jones around the turn of the century, that was at the heart of debates about the instrument. In traditional or "straight" organs, each pipe sounded at a single pitch and was tied to a particular manual. In unit organs, pipes sounded at multiple pitch levels, allowing builders to significantly decrease the number of pipes necessary to create a wide variety of sounds. A straight organ, for example, might have four distinct sets or "ranks" of Diapason pipes at the 2', 4', 8', and 16' sizes, while a comparable unit organ, taking advantage of overlaps in the ranks' respective ranges, would possess only a single rank of Diapason pipes. Thus, some unit pipes performed "double duty," acting, for example, as both a pipe in the Diapason 4' and 8' ranks. This design could cut the number of necessary pipes by more than half. Other aspects of the theater organ came in for harsh criticism, like the range of sound effects that became increasingly available on instruments during the 1920s, but it was the unit design that generated the most vitriol. Denouncements of Hope-Jones and the unit organ were scattered across the pages of *TD*

[48] Quote from: Montiville Morris Hansford, "Changing jobs From Church to Theater?," *TAO* 4, no. 1 (January 1921). Also see Frances L. Davis, "The NAO Convention," *TAO* 4, no. 8 (August 1921).
[49] "Church or Theater? Peace and Poverty, or Aggravation and Affluence, by One Who Took the Leap," *TAO* 6, no. 11 (November 1923).

and *TAO* throughout the 1920s and early 30s, including a "Unit vs. Straight" series that ran from 1921 to 1925 in *TAO*.[50] Organ designer Tyler Turner, summarizing the controversy in a series of essays in 1930, noted that the inventor was known for doing "evil things with organ tone."[51] Under the Hope-Jones influence, Turner wrote, the organ's sound "became thick, opaque, and lacking in clarity."[52]

While debates about proper organ design raged under the banner of timbre, their subtext (and often just their text) was the identity politics of popular music. L. Luberoff, a sales representative for Möller, contrasted the "legitimate" musician's preference for straight organs with the "trick" organist, "who finds his audience highly pleased with 'jazzy,' dramatic, and characteristic playing." The latter preferred the unit organ, Luberoff claimed, only because it pleased the "class of patrons catered to" by the theater.[53] Luberoff was one of many writers in *TAO* to link jazz with theater-goers of a questionable (i.e. lower) class, a move common among social and cultural critics in the U.S. at the time, and one deeply rooted in racist ideology. Ruby Belle Nason's 1921 *TAO* essay on improvising, for example, decried jazz's appeal to the "worse and baser" side of the white race.[54] That not all in the organ community shared Nason's disdain for popular music is evidenced in part by the existence of a regular "Jazz Digest" column in *TAO* at the time of her article. Even proponents of theater organ practices, however, understood music marked as non-white to be especially effective with theater audiences and defined such music against and as inferior to western art music. The introduction to the *Theatre Organist's Secrets* guide for creating sound effects, for example, cautioned performers wont to perform canonical

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[50] These began with Burnham's "Open Invitation" in the November 1922 issue of *TAO* to "any accredited builder of units" to submit specifications for thee organs costing $2,000, $5,000 and $15,000, that would be compared with a comparable straight organ.
[51] Tyler Turner, "A Genius who Failed," *TAO* 22, no. 8 (August 1938).
[52] "A Genius who Failed."
[53] L. Luberoff, "Unit v. Straight," *TAO* 6, no. 7 (July 1923).
[54] Ruby Belle Nason, "Improvising for Picture Work," *TAO* 4, no. 8 (August 1921).

works that "remarks like 'Wasn't that a clever Banjo effect the Organist played for that Negro scene? […] are much more frequent that "Didn't the Organist play that Chopin Nocturne beautifully?"[55]

As the theater organ's popularity declined in the 1930s, gendered notions of sound became especially explicit in discussions about organ timbre, perhaps no surprise in writing produced by a group of musicians and builders who called their instrument "king." Writers linked "feminine" timbres to both theater organs and the rising number of women working professionally as organists in theaters. In one satirical *TAO* segment titled "In Poets' and Peasants' Corner," James E. Scheirer, organist and frequent *TAO* contributor, began a long series of poems as follows:

> The rising tide of feminine dominance is presaged in the next group of poems selected at random from the columns of 'THE LADY ORGANISTE, WHY NOT?' Miss Susie de Floot, noted organiste and still a lady, contributes our next quotation:
>
> *Misstress Mary, quite contrary,*
> *How does your Tibia toot?*
> *With wooly wheeze, and hollow hoot,*
> *And I think that the tone is quite cute.*
>
> *TUTTI FLUTTI*
> *Mary had a little flute,*
> *She called it Tibia Clausa,*
> *And everywhere that Mary went,*
> *T'was said, 'That tone is lousy.'*
>
> *VOX HUMANA*
> *Whaa, whaa, Billy-Goat, can you carry a tune?*
> *Yes, yes, mater, listen while I croon,*
> *A squawk for the Master, a squeak for the Same,*
> *And a bleat for the little Boy that lives in the lane.*[56]

The two types of organ stops named in Scheirer's poems, the Tibia Clausula and the Vox Humana, were frequently criticized by pipe organ traditionalists as overly sweet. Hope-Jones

[55] C. Roy Carter, *Theatre Organist's Secrets* (Los Angeles, c. early 1920s).
[56] James E. Scheirer, "In Poets' and Peasant' Corner," *TAO* 13, no. 2 (February 1930).

himself invented the Tibia Clausula, a stopped wooden flute pipe that was a fundamental element of theatre organs. Writing on the topic indicates that theater organists used the Tibia Clausula regularly, perhaps more so than any other stop; one author satirically called theater organists "Tibia Tooters."[57] The Vox Humana, a reed pipe, dated back centuries in organ construction, but was open to criticism on a number of grounds, including its apparent failure to replicate the human voice and its standard pairing with a tremulant which likely contributed to its characterization as saccharine. Most damning, though, was the Vox Humana's prevalence in theater organs, where its importance was second only to the Tibia Clausula. "The Vox Humana," *TAO* editor Burnham wrote in 1937, "has been the love of the theater and radio organ for so long that little need be said about it. Properly applied, this melancholy freak may find a place in organ music. Used for long passages on which certain kinds of strings and hooty flutes it becomes an instrument of torture."[58] The excessive use of these stops, for writers like Burnham, effectively destroyed the theater instrument's ontological status as an organ. One anonymous author, commenting on a unit organ setup consisting almost entirely of Tibia, Vox humana, and Flute stops, wrote, "Puzzle: find the organ!"[59] As we will see, during the FTC hearing, witnesses consistently identified the Hammond sound as "fluty," a trait that called into question its ability to produce "real" organ sounds.

Yet Vox Humana pipes had been part of pipe organs for centuries, and Tibia Clausula pipes were closely related in construction and timbre to traditional flute organ pipes. Writers grappled with this conundrum in large part by characterizing these and related stops as inferior and feminine sounds, the use of which must be handled carefully by church organists. The

[57] James E. Scheirer, "The Fall and Decline of the Tibia Tooter and What of It," *TAO* 12, no. 1 (January 1929). See also: "Unit v. Straight," *TAO* 6, no. 7 (July 1923).
[58] Burnham, "Our Miss Soosie, etc.," *TAO* 20, no. 12 (December 1937).
[59] "Unit Musing by a one-time Champion," *TAO* 7, no. 1 (January 1923).

fictional author of Scheirer's poems, "Miss Susie de Floot, noted organiste and still a lady," acted as both the embodiment of organ flute tone and a caricature of women organists. She was an especially popular figure in the pages of *TAO*, where Burnham often invoked her in tandem with her comedic foil, "Dr. Pedalthumper."[60] Both were church organists, but their titles denoted the male character as professional and the female as amateur. Susie's naïveté and preference for the "sweet" flute tones of the organ were foils to her masculine counterpart's overconfidence in his abilities and propensity for excessively thick and garish registrations. Characterizing flute sounds as feminine was a simple and powerful way to signal their frivolity and, in turn, the inferiority of the theater organ and, we will see, the Hammond. Indeed, any element of design or sound that the pipe organ community viewed as a threat to their instrument's elite status could easily be denigrated by being feminized. In response to the terrible danger of a "pedalless" organ, one commenter in *TD* declared that, "an organ factory is not a lady's hair shop—'bobbing' up and down as the fashionmongers dictate."[61]

These barbs were not, however, simply rhetorical. While religious pipe organ work had long been dominated by men, and remains so today, during the 1920s voices of professional women theater organists became increasingly prominent in the field's trade publications. Women regularly contributed to *TAO*'s "Photoplaying" section, and male authors like Burnham frequently commented on the growth of women working in the field.[62] Although it is difficult to confirm actual numbers and male organists may have perceived even a small increase in female colleagues as a drastic rise, the increased presence of women in the pages of *TAO* and *TD* indicates that they experienced significant professional gains in visibility if not in number. Throughout the decade, essays by prominent theater organists like Edith Lang regularly appeared

[60] Burnham, "Editorial Comments and Reviews," *TAO* 20, no. 5 (May 1937); "Our Miss Soosie, etc."
[61] Edwin H. Lemare, "'Pedalless' Organ Looms as a Danger in Modern Design," *TD*, January 1, 1931.
[62] Burnham, "They're Reticent," *TAO* 11, no. 5 (May 1926).

in prominent spaces and covered a variety of topics, from improvisation to popular music.[63] Their writing exhibited a range of ideological stances, from defenses of popular music and the average theater-goer to the conservative fear-mongering of Nason, quoted above. The increasing visibility of women within the theater organ profession was likely the motivation for a series of nine articles authored by women in *TAO* on the subject of discrimination against women in church organ jobs.[64]

Despite the growing visibility of the woman organist, writers often observed that the best-paying and most prestigious jobs in large theaters were shut off from women, and gains in the popular arena did not translate into sacred spaces, where women continued to experience widespread discrimination. The decline of the theater organ's popularity also heralded the decline of the women organists, a change that paralleled the widespread erosion of gains made in the 1920s in employment and status for women during the Great Depression. By the early 1930s, men dominated the writing in both *TD* and *TAO*, and the latter limited the contributions of its single woman editor, Elizabeth van Fleet Vosseller, to a small column about children's choirs. During the 1930s, prominent voices in the pipe organ community and leadership in organizations like the AGO were exclusively white and almost exclusively male, despite a seemingly large female membership evidenced in pictures of national and regional AGO meetings. Only a single article on the status of women in the profession appeared in either journal in the 1930s. In it, Laura Louise Bender, organist and AGO fellow, described circumstances in which women were shut out of the most prestigious organ positions on the basis of their sex.[65]

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[63] For example: Frances L. Davis, "The NAO Convention," *TAO* 4, no. 8 (August 1921); Edith Lang, "Cue Sheets: Two Discussions," *TAO* 5, no. 7 (July 1922); Edith Lang, "The Theater Organist," *TAO* 6, no. 2 (February 1923); Katherine Flynn, "Further impressions," *TAO* 6, no. 9 (September 1923).

[64] These ran under the title "Women Organists" in each *TAO* issue from May 1928 to January 1929. Many of the authors wrote anonymously; the only named contributors were Alice Mabel Shepard and Grace Chalmers Thomson.

[65] One of the most common excuses for not hiring a woman, Bender wrote, was because the position required the organist to cross the chancel. Other reasons included women's ostensible weakness and sensitivity to criticism. "The

The decline in the number of female voices in *TD* and *TAO* mirrored the erasure of theater organs, organists, and popular music from the publications in the last years of the 1920s and the beginning of the following decade. By 1935, both journals heavily favored writing devoted to traditional organs and the western art music canon, and the music and instruments of Bach took on increasing importance. The growing prominence of Bach and western art music in the journals also reflected a backlash in the organ industry against the "thick" tone of theater organs. This movement was spearheaded by champions of the so-called "classical" organ design. Designers of U.S. classical organs aimed to achieve the clarity of tone that many argued was essential for the interpretation of the pipe organ's most esteemed music, the polyphonic works of Bach.[66] This backlash was understood in gendered terms. For example, Walter Holtkamp of the Holtkamp Organ Company claimed in a 1936 letter to *TD* that competition from electronic instruments was the natural result of the "decadent tendencies" brought about by the theater organ. He painted the industry's downfall as explicitly sexual: "We have been having a grand time in this substitution of dramatic tone for music and of virtuosity for expression, but the orgy is about finished." With the industry's sexual excesses brought under control, Holtkamp believed that the pipe organ and its music could once again become "straightforward and dominant, as organ music should be."[67]

These conversations showed little regard for actual church music practices. When *TAO* and *TD* authors did discuss such practices, they did so almost exclusively with reference to

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organist wonders," Bender wrote, "if she could not take a course in impersonating a man." Laura Louise Bender, "Women in the Field of Organ Music Must Overcome Prejudice," *TD*, August 1, 1937.

[66] See, for example, Richards, "Bach the Organist: New View of His Work and a Word of Advice," *TD*, August 1, 1933. There was not universal agreement on changing trends in organ design. See J. B. Jamison, "Sees Organ Design Facing a New Deal, Eliminating Faults," *TD*, February 1 1934. Jamison cautions that the current swing towards clarity went too far: "The more progressive organists—it would seem at this time—are willing to accept almost any kind of tone in order to get clarity." He argued that builders should not sacrifice "the weight and nobility of true diapason tone" for clarity.

[67] Walter Holtkamp, "Organ Builder Calls for Introspection by His Profession," *TD*, February 1, 1936.

mainstream, large, and well-funded institutions. Catholic and mainline Protestant denominations like Episcopalians and Lutherans were the only types of organizations ever mentioned. Authors assumed that churches had multiple choirs and a large well-maintained pipe organ.[68] Examples of such institutions were generally located in the northeastern part of the country in urban areas or larger towns. One author, writing in the *TAO* in 1926 deplored this emphasis on wealthy churches and the lack of practical advice available in the journal for organists in rural areas with small organs and choirs.[69]

The journals did not so much as mention the decades of significant change in the makeup of the American religious landscape, including the increasing number of churches founded by immigrant communities, the rise of African American organizations like the African Methodist Episcopal Church, and the growth of evangelicalism.[70] In the 1920s and 30s many evangelist preachers formed what became known as "storefront churches," many of them located in poorer urban areas.[71] Many of these churches created musical traditions that had little to do with mainstream practices and sometimes drew on popular music practices. For example, evangelical revivalists in the 1920s freely incorporated popular and vaudeville sounds and practices into their musical worship.[72] Although authors in *TD* and *TAO* frequently described the pipe organ as *the* instrument of "the church," many churches operating outside the mainstream did not own or use organs and scarcely could have afforded the type of organ featured in the journals. Yet as smaller, non-mainstream churches began buying Hammonds in earnest, writers in *TAO* and *TD* reacted with concern and even outrage that a newcomer was gobbling up a market share that had

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[68] See, for example, " "Episcopal Church music" *TAO* 7, no. 12 (December 1924); "Lutheran Church Music," *TAO* 8, no. 2 (February 1925); and "Catholic Liturgy and Music," *TAO* 8, no. 3 (March 1925).
[69] Paul S. Chance, **"**Organ Music in the Small Town," *TAO* 9, no. 4 (April 1926).
[70] For an overview of this history, see: Martin E. Marty, *Modern American Religion*, vols. 1 and 2 (Chicago: University of Chicago Press, 1986).
[71] William G. McLoughlin, Jr., *Billy Sunday Was His Real Name* (Chicago: University of Chicago Press, 1955).
[72] Email communication with Anna Nekola, August 4, 2013.

previously been of little apparent interest in the mainstream pipe organ discourse.

The Pipe Organ Community Responds to the Hammond

In the early months of the Hammond's entrance to the market, the response to the new instrument was unperturbed. In June 1935, *TAO* ran a balanced essay on the Hammond by Barnes, who pointed out the Hammond's advantages along with its drawbacks and predicted that the new instrument would have little impact on the organ industry.[73] This prognostication rested in part on Barnes' belief that the HCC would market its instrument primarily to theater organists, but probably was also informed by the failure of any other electronic instrument to achieve even a modest commercial success to date. As the Hammond's success became clear in the late months of 1935, Barnes' dispassionate tone gave way to sharp criticism, and plenty of it. An anonymous article published in *TD* at the beginning of 1936 noted that many would remember the previous year as that of "the great electrical disturbance."[74]

The first official response to the Hammond organ by a professional organization came in October 1935 when the NAOB appointed a committee to study the "electronic organ situation."[75] The committee submitted its final report to the AGO, which formally adopted its recommendations and published them in the July 1936 issue of *TD*. The committee placed particular emphasis on careful comparisons between electronic and acoustic instruments, prescribing that those interested in the former should "consult the best experts on organs and tone production within their reach" and listen to electronic and pipe organs in direct comparison

[73] William Barnes, "Hammond Electric Organ: Personal Impressions of the Newest Instrument with Electrically-Produced Tone," *TAO* 18, no. 6 (June 1935). Barnes' piece was typical of previous coverage in *TD* and *TAO* on the appearance of other, less commercially successful electronic organs like the Everett Organtron. See, for example: Richard H. Ranger, "Electric Music as New Supplement to Tone of Organ Pipes," *TD*, November 1, 1932; and Edwin H. Lemare, "Photo-Electric Organ as a Revolutionary Musical Invention," *TD*, September 1, 1933.
[74] "On the Threshold of 1936," *TD*, January 1, 1936.
[75] "Organ Builders Meet to Discuss Problems," *TD*, October 1, 1935.

with one another. The report's appeal to the opinions of musical experts and call for unbiased comparison had, in fact, already been taken up in a series of letters in the *TD* and the publication of results to a survey on the Hammond in the *TAO*.[76] Subsequent pieces in both publications would continue to emphasize these talking points.

At the heart of anti-Hammond rhetoric published in *TD* and *TAO* in the mid 1930s were powerful and longstanding discourses about the mechanical and the natural, embedded, in this context, in class-based definitions of both religion and consumer culture. While the above-quoted *Chicago Daily News* article associated the Hammond's industrial construction with "real social democracy," to its critics the instrument's status as a mass-produced commodity rendered it inferior and artificial.[77] In contrast, the pipe organ's means of sound production were natural and its construction—custom built for specific spaces—was artistic. "Works of art cannot be ground out by the thousands like automobiles," wrote Palmer Christian in the February 1936 *TAO* edition.[78] An anonymous author writing in the November 1935 issue of *TD* described electronic instruments as the unfeeling products of a society enslaved to efficiency standards and machines and declared that, "the tone of a well-placed, natural organ will never be reproduced artificially by a scientific machine and be capable of making music."[79] Such statements sidestepped the facts that many aspects of pipe organ construction were themselves industrialized and that the so-called "king of the instruments" depended on electricity for both blowers and smooth keyboard action.

Regardless, authors in *TD* and *TAO* agreed that the Hammond's electronic means of

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[76] See: "Electricians—or Artists?" *TD*, January 1, 1936; "Now for Facts Only," Barnes, "Appeal to Evaluate Electronic Organs," and George W. Stanley, Jr., "Analyzes Pipeless Organs; Holds They are not Perfected," *TD*, December 1, 1935.
[77] "Electric Music," *Chicago Daily News,* Friday April 19, 1935.
[78] Palmer Christian, "Summarizing 1935 Trends: Excerpts from the Address on Organ and Choral Music delivered before the M.T.N.A. Convention in Philadelphia," *TAO* 19, no. 2 (February 1936).
[79] **"**The Patient Organ Pipe,**"** *TD*, November 1, 1935.

sound production contributed to the artificiality, and therefore inferiority, of its sound. In 1936, *TAO* sent a survey to over thirty organ architects and performers soliciting their opinions on "electrotone" instruments and asked them to describe the quality of electronically-produced sound.[80] Edwin Arthur Kraft, a representative of the Kimball Organ Company, characterized electronic musical sound as "unnatural," "monotonous," and "dull." Barnes, in his response, described electronic sound as possessing the "blatant metallic quality inherent in radio reproduction." Emerson Richards, a prominent organ designer and writer who played a major role in the FTC's Hammond hearing, recast the mechanical/natural dichotomy as one between life and death, describing the "electrical note" as sounding, "hollow, dry, and dead." Barnes also characterized the Hammond sound as without life, the direct result of its electronic means of sound production: "Since there is *no resonance*, the tone is lifeless, dull, and dead. It will not bear direct comparison with the tone of any natural musical instrument."

Even more detrimental to the Hammond's sound than its lack of resonance, Barnes claimed, was the instrument's use of tempered rather than natural harmonics to create timbral contrasts.[81] Both Barnes and Richards, in print and later in testimony during the FTC hearing, criticized this aspect of the Hammond at length.[82] This particular criticism of the Hammond, Barnes emphasized in *TAO*, was "not a matter of personal opinion or prejudice but of scientific fact." He was, he wrote, simply providing "some of the scientific reasons why tones with synthetic harmonics are not the equivalent in *musical* quality of tones with *naturally-produced*

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[80] All quotes in this paragraph are drawn from: "Electricians—or Artists?" *TAO* 19, no. 1 (January 1936).
[81] "Synthetic Tone-Production," *TAO* 19, no. 3 (March 1936).
[82] "Report on Electronic Organs is Submitted; Approved by Council," *TD*, June 1, 1936. The NAOB's above-cited report on the Hammond likewise claimed that tempered harmonics were "inadequate to produce natural musical reinforcement" and lacked the "foundation tone of well varied or truly musical character." Other elements of the Hammond came up for criticism in the report, including its failure to conform to the AGO's standardized console measurements and the "percussive" attack that resulted on initial depression of the Hammond's keys, which starkly contrasted with the gradual buildup of volume characteristic of the pipe organ. But it was the Hammond's lack of natural harmonics that received the committee's most prolonged attention.

harmonics" [emphasis in original].[83] Citing Helmholtz, Barnes held that, "all musical sounds are periodic"—in other words, the frequencies of the harmonics present in any given musical tone could be expressed in whole number ratios. Each pipe on a "real organ," Barnes pointed out, created its own full set of natural harmonics, while mechanical restrictions dictated that all harmonics on the Hammond be adjusted to a tempered scale system. Tempered harmonics, he argued, could not amalgamate or coalesce into a single pitch; instead, such harmonics "stand out and are distinct." Despite his evocation of "scientific reasons," Barnes offered no actual evidence in support of his viewpoint, nor did any appear in the course of the FTC hearing. Further, Barnes and other critics of this aspect of the Hammond failed to acknowledge that pipe organs too utilized tempered harmonics, primarily in the tempered fifths employed in stops known as "mixtures." Regardless, Barnes called for scientific comparisons of the Hammond with pipe organs believing that such study would reveal the inferior quality of the electronic instrument's "synthetic" sound.

Others, however, invoked the specter of "science" itself as a signifier for artificiality in criticism of the Hammond. Many writers in the latter category identified science, along with industry, as sources of the electronic instrument problem. In its introduction to the NAOB's June 1936 report, the AGO noted that while it appreciated "the great contributions of science in the field of musical instruments," "the present electronic instruments" took things too far. Even Barnes, who touted the "scientific" basis for the superiority of non-tempered harmonics, emphasized that only a particular kind of listener—one with "cultured" or even "semi-cultured

[83] "Synthetic Tone-Production." The conciliatory tone that Barnes had taken when the Hammond first entered the market is completely absent here. Instead, he paints Laurens Hammond as a ruthless capitalist, writing, "financial profit is the only thing the electrician desires. It is unfortunate that he has been willing to so openly insult the intelligence of the organ world in his mad scramble for money." Despite his contentious tone, Barnes characterized his argument as unbiased and scientific.

ears"—could be trusted to properly differentiate between synthetic and natural harmonics.[84] Barnes and his colleagues were eager to establish themselves as the only authorities fit to properly compare the Hammond with the pipe organ, particularly for churches in the market for an organ. Such decisions were usually weighed by a committee of church members and ultimately approved by clergy, populations frequently portrayed as hopelessly inept in musical matters in the pages of *TD* and *TAO*. In 1936, however, a "group of American builders of pipe organs" (whose names I have been unable to locate) attempted to reach out to church members and leaders in an attempt to staunch the sales that they perceived as streaming to the HCC. Their three-ad campaign, which ran in the February, March, and April issues of *TD*, emphasized the Hammond's inferior artificial status and implored church committees and clergies to turn to experts for counsel.[85]

The ads thus urged consumers to rely on the expertise and authority of organ players, builders, and architects. The first, titled "Something Just as Good As…" lamented that inferior substitutes like "synthetic pearls and synthetic gin, paste diamonds and imitation butter" created unfair competition against the "maker of every genuine article."[86] The second, in March, emphasized that pipe organs were "a hand-tailored art product" and not a "commodity, bought like a bag of peanuts, which will taste equally good wherever you choose to enjoy them," imagery that invoked the street vendors commonly found outside movie theaters.[87] "The hope of every field of art," went the ad copy in "Something Just as Good as,"

> …is in a trained and discriminating group consisting of those who can discern between the real and the synthetic. The man not possessing a knowledge of art can turn to critics and connoisseurs on whose judgment he may rely. The same applies in the musical

[84] "Synthetic Tone-Production."
[85] "Something Just as Good as," *TD*, February 1, 1936; "Opportunity is Knocking," *TD*, March 1, 1936; "A King Glorifies His Reign," *TD*, April 1, 1936.
[86] "Something Just as Good as."
[87] "Opportunity is Knocking."

> world. Thus there are trained ears to which nothing can take the place of a real organ, no matter how good the substitute may be in a class of its own.

The training to which these ads referred, it went without saying, was in the western canon of music literature.

Defenders of the pipe organ frequently invoked the instrument's long association with western music alongside its ostensibly "natural" qualities to establish its authenticity. In these formulations, the music of Bach was of utmost symbolic importance. Bach often acted as a symbol of the "real," as in the following excerpt from an anonymous essay that ran in the November 1935 issue of *TD*:

> God made certain things that can't be displaced with robots, despite all of man's ingenuity. If one is a real lover of good organ music and studies musical history with special reference to the influence and the advance of the organ he will not believe that anything can quite duplicate the instrument any more than he will believe that you can make an imitation Bach who will have Bach's divine inspiration…[88]

Here, Bach's musical achievements are the product not of "man's ingenuity" but the divine, and are therefore authentic.

Others questioned the Hammond's suitability as a vehicle for the western canon, as did Richards in his response to *TAO*'s survey on electronic instruments:

> The works of the great German and French composers for the organ are from a musical standpoint unplayable on electrotones. Many of Bach's and Franck's finest creations can not be played at all; none of their works could be interpreted according to their intentions. Only real pipes in a real organ can give us the beautiful, truthful tones that these great composers demand.[89]

Richards would identify specific aspects of the Hammond that made it unsuitable for western art music during the FTC trial, but what was important in his and others' public-facing rhetoric was that the Hammond's artificially-produced sound could never meet the demands for "truthful tones" that music of the western canon required. Implicit in this rhetoric—and also in the object

[88] "The Patient Organ Pipe."
[89] "Electricians—or Artists?"

of its criticism, the marketing for the Hammond organ—was the assumption that this music was inherently good and morally superior to other, more popular, musics. As previously discussed, Lawrence Levine and others have shown, western art music's increasingly elite status in the U.S. at the beginning of the twentieth century depended in large part upon its sanctification through ritualized behavior in spaces reserved for elite white audiences.[90] In the case of music for pipe organ, this sanctification was explicit.

Given the pipe organ's traditional spiritual home, it is no surprise that Richards and many others tied the instrument's authenticity to "the church." As Richards put it: "The church stands for truth. It can not tolerate synthetic imitations."[91] Yet the pipe organ community's relationship with the church was not uncomplicated. The church music committee was a favorite target of criticism and satire in the pages of both *TD* and *TAO*, and, according to the journals, disagreements between organists and their employers over the quality and type of music performed during worship services was fairly common.[92] Although authors like Richards frequently collapsed all Christian organizations into an abstract monolithic entity, the authority that the pipe organ derived from "the church," sprung, in fact from a specific (wealthy, white, mainstream) kind of religious organization. Some reactions to the Hammond's popularity begin to reveal the artificiality of this single "church." In response to the *TAO*'s survey on the Hammond, prepared, Burnham claimed, solely to evaluate the fitness of electronic instruments for church services, a few respondents admitted that such instruments might be suitable for *some*

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[90] Lawrence W. Levine, *Highbrow/Lowbrow: The Emergence of Cultural Hierarchy in America* (Cambridge: Harvard University Press, 1988); Christopher Small, *Musicking: The Meanings of Performing and Listening* (Hanover: University Press of New England, 1998); Julia J. Chybowski, "Developing American Taste: A Cultural History of the Early Twentieth-Century Music Appreciation Movement" (PhD diss., University of Wisconsin-Madison, 2008).

[91] "Electricians—or Artists?"

[92] See, for example: Lemare, "'Pedalless' Organ Looms as a Danger in Modern Design," *TD*, January 1, 1931; "Frame Ethics Code for Church Organist," *TD*, July 1, 1934; Burnham, "Musicians as Free Men or Slaves?" *TAO* 20, no. 6 (June 1937).

churches.[93] Taylor Turner believed that the Hammond might adequately support congregational singing in a small church. Raymond Nold, director of music at Church of St. Mary the Virgin in New York, less generously wrote that small churches would be more likely to "fall for" the "clever" tone of the Hammond. Most respondents, however, did not even consider the possibility of different kinds of churches with varied needs, but agreed with Richards that the "electrotone" was eminently unsuitable for religious purposes.

For Hammond critics, the pipe organ's connection to dominant religious organizations, along with its ties to western art music, acted as validation of the older instrument's superiority, authenticity, and goodness in part by cordoning it off from popular culture. Critics were often quick to point out that they did not dispute the Hammond's usefulness for certain, namely popular, purposes. The *TAO* survey, for example, leadingly asked respondents whether the "electrotone" reminded them "of the atmosphere of the church or would you say it savored instead of the theater and the broadcasting studio?"[94] Unsurprisingly, many wrote that the Hammond would be best used in the theater, the broadcasting studio, or jazz bands or, as one put it, "for crooning tunes in a restaurant." Barnes, in his December 1935 letter to *TD*, was willing to concede that the Hammond was a "highly ingenious and extremely well-made mechanical and electrical contrivance for producing musical sounds—a radio with manuals and pedals if you will, with a wide and legitimate field of usefulness." This concession was, however, contingent on the Hammond's "field of usefulness" not overlapping with that of the pipe organ.

The implication was that the Hammond's sound, while not worthy of the highest organ arts, was adequate, even appropriate, for music and people that the authors valued less. Hammond advertising tacitly echoed the pipe organ community's disdain for popular music.

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[93] "Electricians—or Artists?"
[94] "Electricians—or Artists?"

While Laurens Hammond openly admitted that he believed his instrument was well-suited to popular music in testimony during the FTC hearing, advertisements for the organ carefully and purposefully avoided such claims.[95] Both Hammond's marketing team and his critics agreed with existing musical marketing strategies like those pursued by Victor that the real rewards lay in a brand associated with the most elite musical arts. These types of music and musical practices were invariably those associated with a specific type of upper-class white citizenship. As we will see, nearly every aspect of the FTC's hearing on the Hammond organ, from the complaint to the final decision, hinged on these exclusionary definitions of "good" sound and music.

The Complaint

Several of the individuals and organizations whose criticism of the Hammond organ I quoted above played prominent roles in the FTC's charges against the HCC and the subsequent hearing. Richards first formally urged the FTC to take action against the HCC as early as 1935.[96] A few months later, a bulletin circulated by the NAOB announced to its members the association's secretary-treasurer had placed an additional request for prosecution before the FTC.[97] The Commission consulted and worked closely with Barnes, Richards, and *TAO* editor Scott Burnham in planning the hearing, and the three men served as expert witnesses during the hearing itself. Richards's voice was particularly prominent—others frequently referred to him as the prosecution's "star witness"—and his testimony stretched over many days.

Richards originally petitioned the FTC to challenge the HCC's use of the word "organ" to describe the Hammond, and the above-mentioned NAOB bulletin directed its membership to

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[95] Laurens Hammond's testimony, *Report of the Proceedings*, Chicago, May 28, 1936, 1641-44.
[96] "Now for Facts Only," *TD*, December 1, 1935.
[97] *Report of the Proceedings*, Chicago, March 10, 1937, 248. This information is from a Bulletin to NAOB members dated October 1935 from which Lynn Williams, the HCC's attorney, read aloud during the FTC hearing.

refrain from referring to the instrument as such.[98] The FTC's complaint and its eventual ruling, though, did not address the HCC's use of the word organ, but rather a series of claims about its sound and comparability to pipe organs. The formal cease and desist notice to Hammond in 1936 named ten advertising claims that it charged were, "deceptive, misleading and false […] with the result that trade has been unfairly diverted to respondent from its pipe organ competitors."[99] The offending advertising claims were as follows:

> A [The Hammond organ] produces the entire range of tone coloring necessary for the rendition, without sacrifice, of the great works of classical organ literature.
> B It covers the entire range of musical tone colors.
> C Any tone that is a sustained tone can be reproduced on this marvelous instrument.
> D An infinite variety of tones, covering the flute, diapason, string, and reed families, are instantly available to the organist.
> E Its introduction means that real organ music of unbelievably beautiful quality is now possible in any home at an expense no greater than that of a good piano. It means that the space limitation has been entirely removed and the cost is only a fraction of what a pipe organ would cost.
> F Organ music at one-tenth the cost formerly necessary.
> G Its price is a small fraction of what another instrument at all comparable would cost.
> H Many organists agree that it is comparable to pipe organs which cost as much as $10,000.
> I and J Said advertising is replete with representations to the effect that the instrument produces 'real organ music,' 'fine organ music,' 'beautiful organ music,' and 'can fill a vaulted church with a thunderous diapason,' that 'there is no sacrifice of quality,' that it interprets 'without sacrifice, the great works of literature,' and that 'there is no sacrifice of quality but rather a noticeable improvement.'[100]

The claims identified in the FTC's complaint can be divided into three broad categories addressing timbre, cost, and aesthetic ideals like "real organ music" and "great works of literature." Although only claims A through D (and part of I, on "thunderous diapason") explicitly referred to the Hammond's sound or "tone"—the term many participants used to refer to timbre—the phrases about cost and musical literature also hinged on the quality of the electronic instrument's sound. The prosecution and defense tacitly agreed that sound quality was

[98] *Report of the Proceedings*, Chicago, March 10, 1937, 248.
[99] The complaint is reproduced in: *Brief of Attorneys for the Commission*, 1-2.
[100] *Brief of Attorneys for the Commission*, 1-2.

the central concern of the hearing, and the topic dominated the vast majority of evidence and testimony. Both sides also agreed that sound itself was not acceptable evidence—neither attorney, for example, attempted to introduce recordings as evidence during the hearing—and therefore required translation and interpretation in forms other than sound. Sound, the participants concurred, required context in order to be evaluated. The defense and prosecution agreed to generate evidence about sound for the hearing through a series of listening tests with human subjects, electrical readings and visualizations of musical notes, and the testimony of musical and acoustic experts.

The Hammond defense also insisted that the abstract musical ideals identified in the FTC's complaint about "real organ music," "beautiful organ music," and the rendition of "great works of literature" required interpretation. As discussed in Chapter 3, words like "real" and "beautiful" were powerful signifiers of moral and cultural good, but were not necessarily easily quantified or defined. The HCC's official response to the complaint stressed that the statements named in the document addressed "primarily the question of artistic and esthetic opinion."[101] During the hearing, the Hammond defense took advantage of these ambiguities by repeatedly emphasizing what they characterized as the subjective nature of the claims cited in the complaint. While witnesses for the prosecution like Barnes and Richards readily agreed that taste played a role in establishing artistic standards, they disagreed with the defense that the standards themselves were arbitrary, or could be established by actors without proper authority.

While the stakes of the trial were, according to the complaint, wholly commercial—the "unfair" diversion of trade—market concerns took up a surprisingly small fraction of testimony. The Commission and its witnesses took as a given that pipe organ companies were losing money to the HCC, a belief not born out by surviving evidence. Only one witness, C. J. Zimmerman, a

[101] *Brief of Attorneys for the Commission*.

secretary for the Wicks Organ Company, testified on the matter during the hearing. Although Zimmerman clearly believed that Wicks was losing sales to the HCC, the evidence he provided—most of it in the form of statements from sales representatives—was contradictory.[102] Many of the statements he collected suggested that most Hammond sales in the mid 1930s went to churches not previously in the market for a pipe organ. The demographics of Hammond purchasers discussed above further supports the hypothesis that the Hammond did not erode the pipe organ's market share so much as expand it. Throughout the hearing, though, the Commission's witnesses assumed that newer, smaller, rural, and non-mainstream churches wanted traditional pipe organs and purchased Hammonds only because they were unable to discern the new instrument's shortcomings. Both the witnesses and those who initiated the FTC complaint failed to consider whether the Hammond might facilitate sacred musical practices other than those the pipe organ community had endorsed for itself. In many ways this failure of imagination was a denial of the validity of competing kinds of religious musical practices, but it also signaled the pipe organ industry's inability to diversify its offerings in order to sustain its growth. In short, the industry's commitment to exclusivity was bad for business.

Preparation for the Hearing

The hearing eventually involved a cast of over twenty people, including witnesses, attorneys, and the trial examiner. Figure 15 lists the most prominent participants and their roles. The lawyers who represented the FTC and the HCC during the hearings were both of some renown. William Chantland, the chief examiner for the FTC, had previously argued cases involving major commercial enterprises like Standard Oil and Wilson & Co., a prominent meat packing company. Hammond's defense attorney Lynn A. Williams was a star patent lawyer who

[102] Zimmerman testimony, *Report on the Proceedings*, Chicago, March 18 and May 29, 1167-88, 1831-41.

counted General Electric and Westinghouse among his clients.[103] Although the two attorneys frequently crossed the line of civility in sparring during the hearing, planning in advance was amicable. Preparations began in late 1936, with a meeting between Chantland and Laurens Hammond, and continued through the spring of 1937 in correspondence.

Participants in the FTC Hearing on the Hammond Organ

Trial Examiner: John L. Horner
Prosecuting Attorney: William Chantland, chief examiner for the FTC.
Defense Attorneys: Lynn Williams and Benjamin Wupper

Witnesses for the Commission:
William Barnes, organ architect and historian
Emerson Richards, organ architect and designer
T. Scott Buhrman, editor of *The American Organist*
Frank Courbin, organist
C. J. Zimmerman, secretary for the Wicks Organ Company

Witnesses for the Defense:
Laurens Hammond, president of HCC
John Hammond, musical advisor to HCC, prominent theater organist
Porter Heaps, prominent organist and Hammond demonstrator

Expert Jurors:
Edgar A. Nelson, piano teacher, Chicago Conservatory of Music
Ebba Sundstrum, conductor of the Woman's Symphony Orchestra, Chicago
D. A. Clippinger, pianist
Barrett L. Spach, organist, Fourth Presbyterian Church, Chicago
William Lester, organist, New First Congregational Church, Chicago
Horace Whitehouse, professor of organ and theory, Northwestern University
Emily Roberts, organist-director, Wilmette Congregational Church, Chicago; instructor, American Conservatory of Music
Arthur Dunham, organist and choir master, First Methodist Episcopal Church, Chicago
Daniel Saidenberg, cellist and conductor

Figure 15. Partial List of Participants in the FTC Hearing on the Hammond Organ

Chantland consulted regularly with Barnes, Burnham, and Richards throughout the planning process; their advice determined and shaped major elements of the hearing. Given

[103] Another attorney from Williams' firm, Benjamin Wupper, took over examination for the part of the hearing that occurred in October.

previous calls among the pipe organ community for "fair" comparisons between pipe and electronic organs, it is no surprise that auditory tests pitting the Hammond against a pipe organ became a key component of the hearing. Laurens Hammond proposed that such tests take place in the University of Chicago Rockefeller Memorial Chapel where the electronic organ would be compared with a large and well-known Skinner pipe organ frequently reported as costing $75,000.[104] The prosecution and defense eventually agreed on three tests, one proposed by the Commission and two by the HCC. The Commission's "Five Test" featured five lengthy excerpts of organ literature, each of which were played on both the Skinner and Hammond organs. The HCC's "Thirty Test" featured thirty short musical excerpts, most lasting fewer than ten seconds, played on only one of the two instruments. The HCC also proposed a test designed to disprove claims about the superiority of natural to tempered harmonics, and built an instrument that could play notes with both types of harmonics explicitly for this purpose. This became known as the "Jack and Jill" test, as it asked listeners to differentiate between pitches labeled "Jack," comprised of natural harmonics, versus those formed by tempered harmonics, labeled "Jill." While ultimately the Jack and Jill Test proved to be of far less import in the hearing than the other listening tests, its title seems to be yet another example of the importance placed on gender as a distinguishing feature of musical sound. Yet the HCC's purpose for the test, to prove that the two types of pitches were indistinguishable, suggests that the labels may well have been arbitrary.

The influence of the pipe organ community was also evident in the selection of musical experts chosen to make up the "jury" who would be asked to differentiate between pipe and electronic organs during these listening tests. Six of the jury were professional organists, many of

[104] "Federal Trade Commission Sponsors Auditory Test—Hammond vs. $75,000 Organ" *Piano Trade Magazine*, April 1937. Richards disputed this number during the testimony. Richards testimony, *Report on the Proceedings*, Atlantic City, NJ, October 19, 1937, 2101.

them at prominent churches in Chicago; the others included conductors and a voice coach. The HCC requested that the FTC also invite "lay" listeners to participate in the tests. Writing to Chantland in February of 1937, HCC Assistant General Manager Cedric Merrill conceded that expert opinions, "carry a certain particular sort of weight. But, after all," he continued, "music is a commodity designed for the consumption […] of the great rank and file of the listening public. Would not the testimony of an impartial cross-section of this listening public therefore, be of even greater importance than the testimony of the experts…." Specifically, Merrill recommended inviting an English class of undergraduates at the University of Chicago to the tests, a group he claimed would represent an ideal and intelligent portion of the public. Chantland replied that, "quite obviously the testimony of such witnesses would be of little or no weight," but acceded to their presence, if their numbers were kept to a minimum.[105] The expert jurors, in contrast, were all subpoenaed and required to testify during the hearing about their experiences in the listening tests. The score sheets on which all jurors, expert and student, recorded their scores were submitted as evidence during the hearing by Chantland and Williams.

In addition to what Chantland called the "human" auditory tests, the prosecuting attorney was also eager to compare electronic and pipe sounds using a "scientific" instrument that transformed sound into visual evidence. Chantland consulted with Richards, Barnes, Burnham, and Hammond about the best type of machine to register differences between the instruments' timbres.[106] While Chantland and Hammond originally agreed to use an oscillator, plans changed when Chantland and Barnes contacted Dr. Charles Boner, a physicist at the University of Texas with an interest in acoustics and pipe organs whose research included phonetics and timbre.

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[105] Cedric Merrill to Chantland, February 25, 1937; Chantland to Merrill, February 27, 1937, HOCR.
[106] Hammond to Chantland, January 4, 1937; Chantland to Hammond, January 6, 1937; Chantland to Hammond January 14, 1937; Chantland to Hammond, January 21, 1937; Merrill to Chantland, February 13, 1937; Chantland to Hammond, February 13, 1937, *Respondent's Exhibits*, HOCR. Burnham, "Tone-Analysis to Continue," *TAO* 21 no. 3 (February 1938).

Boner told the men that a composite analyzer—a type of voltmeter that measured the energy levels of waves—provided a more accurate means of analyzing timbre by identifying and measuring the intensity of each of the various harmonics present in a single pitch.[107] The analyzer used a microphone to convert sound waves from the source of a musical note into electrical impulses. These impulses were carried by wire through an amplifier and then into the composite analyzer, which provided Boner with readings of the amplitude of each harmonic in relation to the fundamental pitch. Timbre, the prosecution averred, could thus be accurately measured by isolating the harmonics present in a given pitch and visually representing each separately.

The tests performed by both humans and machines in advance of testimony for the Hammond hearing generated visual evidence that, unlike the sounds around which the hearing's questions turned, could be submitted to the Commission. Yet, the visualization of this data—made concrete on paper submitted as evidence—did not render it any less contentious than the Hammond's sound itself. The attorneys' and witnesses' interpretations of the various tests' results diverged widely, with each individual spinning results to the advantage of his particular argument. To the Commission's witnesses, Boner's charts were solid evidence of the pipe organ's superior sound; to the Hammond defense they were so misleading as to be meaningless. Both sides argued that the results of the human auditory tests were in their favor, and each accused the other of manipulating results and woeful incompetence in the field of acoustics. The Thirty Test became especially controversial when multiple witnesses accused the HCC's employees of conspiring to "improperly" register the Skinner organ so that it imitated the sound

[107] Barnes testimony, *Recording of the Proceedings*, Chicago, March 18, 1937, 1085. The planned oscillograph tests were to take place at the Riverbank Acoustical Laboratories in Illinois. The Riverbank Labs were founded in 1918 by Wallace Clement Sabine, considered the originator of the field of architectural acoustics, and run at the time of the Hammond hearing by Wallace's cousin Paul Sabine.

of a Hammond. These disputes demonstrate that science was hardly the objective and impartial judge the hearing's participants deemed it to be. Instead, the tests performed for the hearing served to confirm the existing biases of their designers.

Observers and participants at the hearing frequently commented on the acrimonious and lengthy nature of testimony, which occupied over 21 days in March, May, and October of 1937, and took place in Chicago, Washington D.C., and Atlantic City.[108] The attorneys made final arguments in April of 1938, and the Commission finally reached a decision in July that year. Chantland's plans to keep testimony brief were quickly derailed by William's lengthy cross examination of Richards, the FTC's first witness, a pattern that repeated several times during the hearing and quickly dissolved the cordiality that existed before questioning began. The two attorneys sparred with one another throughout the proceedings, each accusing the other of a host of ills including "nastiness," stalling, and suppressing evidence. Several witnesses for the defense argued vehemently with Williams.[109] Although Williams characterized the FTC complaint as little more than frivolous, the extended and impassioned testimony of the Commission's witnesses demonstrates those who initiated the complaint and hearing felt that much was at stake.[110]

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[108] The exact dates were: March 9–12 and 15–18, May 25–29, October 18–22 and 26–28.

[109] See, for example, Williams' lengthy exchange with Barrett L. Spach, in Spach testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 418-61. In *Brief of Attorneys for the Commission*, Chantland noted that the "rather extended record" was due to "lengthy and repetitious cross examination by respondent's counsel, and the necessity for complete rebuttal of certain trick tests and demonstrations by respondent, and of many unsupported and speculative theories advances by Mr. Laurens Hammond." In his own brief, Williams wrote that Chantland, rather than trying sincerely to "elucidate the truth," instead was willing "to win the case at all costs, irrespective of the tactics which he thought necessary to employ," and accused him of practicing, "the chicanery usually associated with the most reprehensible criminal trial." Williams and Benjamin F. Wupper, *Brief for the Respondent*, Docket No. 2930, 1938, HOCR, 24.

[110] *Brief for the Respondent*, 4.

Testimony on the Machine Analyses of Timbre

Boner performed the "machine tests" in the basement of Barnes' home in Evanston the weekend before the hearing, using individual pipes manufactured by the Wicks and Möller organ companies, a blower created by the HCC for the tests, and a Hammond organ. Boner took measurements for fifteen organ pipes representing a range of types including diapasons, a pedal trombone, the viole d'orchestre, and flutes. The procedure was tedious: for each comparison, Boner took readings for the pipe first and then allowed HCC engineers and Hammond to adjust their instrument to the composite analyzer's readings in an attempt to generate similar data. For each analysis, Boner tuned a dial on the analyzer first to the exact frequency of the fundamental pitch of the tone being analyzed and then to each possible other frequency, beginning with the first harmonic and continuing up. He made readings of the strength of each harmonic (if it was present) as he went. Several tones had partials as high as the thirtieth; one diapason pipe registered the 48th partial, and a swell chorus generated the 57th. Because readings could vary depending on the location of the pipe and the microphone in the room, Boner several times took multiple readings for the same pipe with the microphone in different locations.

After taking measurements with the composite analyzer, Boner plotted the results of the readings in 36 charts which Chantland submitted as evidence during the hearing.[111] Two of these are shown in Figure 16. Each chart visually depicted the harmonics present in a given tone and the amplitude of each harmonic, expressed as a percent of the strongest component present, the fundamental. The charts were logarithmic, meaning that the intervals displayed represented orders of magnitude, a standard way of representing acoustical data. Each third of the charts represented a different proportion of the sound measured by the analyzer, so that the top third represented one hundred percent of the sound, the second third represented ten percent, and the

[111] These are in *Commission's Exhibits*.

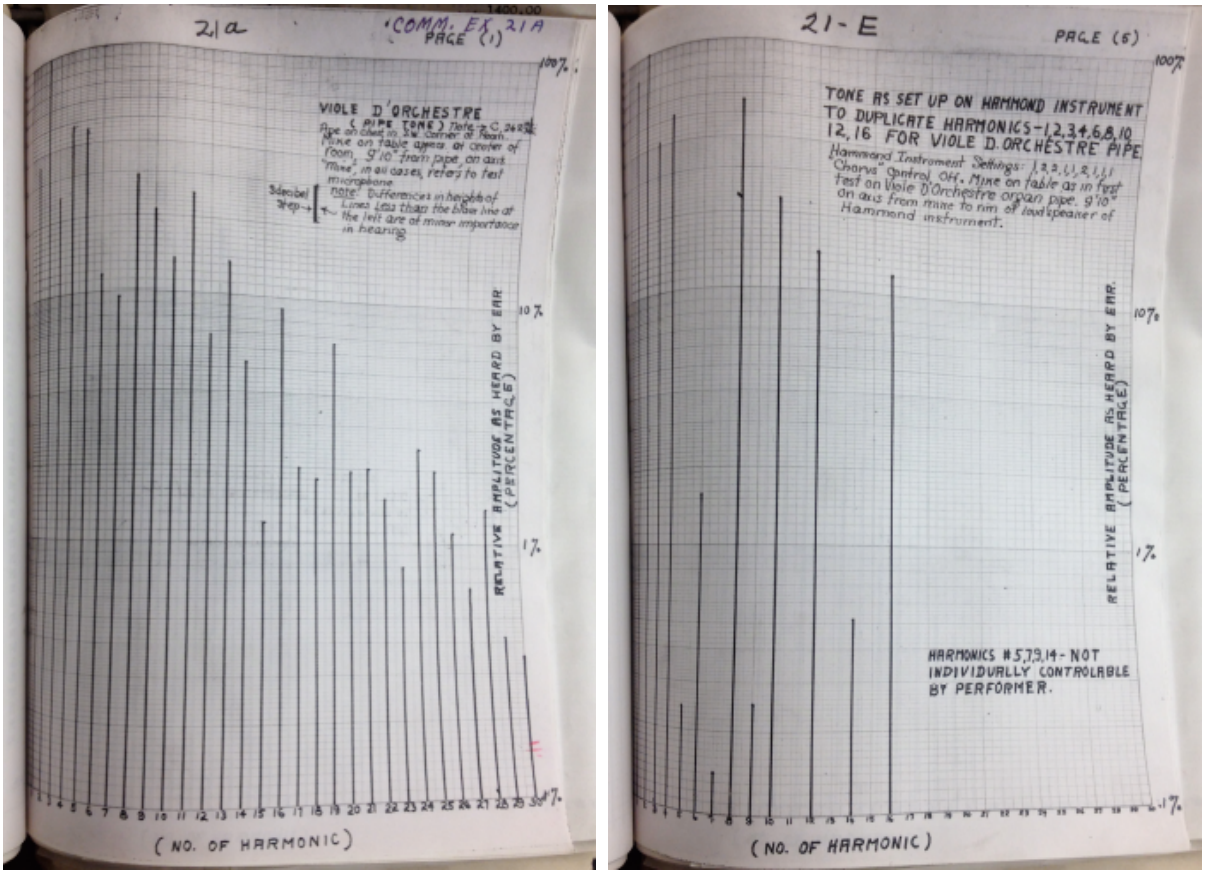

Figure 16. Charts 21-A and 21-E Depicting Viole d'Orchestre Tone as played by an Organ Pipe (left) and the Hammond organ (right). In *Commission's Exhibits*, HOCR.

bottom third just one percent. Boner marked any harmonics that were present in quantities of less than one tenth of one percent with a dot on the baseline of the charts. For Richards and Chantland, these charts constituted definitive, objective, and "incontrovertible physical proof" that the Hammond was physically incapable of producing the type of musical sounds claimed in HCC advertising.[112] Laurens Hammond and his attorneys argued to the contrary that the charts proved nothing and that the Hammond could be judged only by the effect it produced "upon the ears of the listeners."[113]

[112] *Brief of Attorneys for the Commission*, 3; Richards testimony, *Report on the Proceedings*, Chicago, March 17, 1937, 968.
[113] *Brief for the Respondent*, 30.

Disagreements about the significance of Boner's tests and charts turned on questions about acoustics, still a relatively young professional field at the time. In her widely-cited book, *The Soundscape of Modernity*, Emily Thompson notes that acoustics was an established field in the U.S. by around 1930, a year after the founding of the Acoustical Society of America.[114] From its inception, corporate interests, like telephone companies, powerfully shaped the direction of the field; much influential work took place in spaces like the Bell Telephone Labs. In turn, the tools that acousticians developed to analyze sound had widespread impacts on the consumer market, precipitating much consumer audio technology of the twentieth century and facilitating the invention of instruments like the Hammond.[115] Thompson also demonstrates that the act of measuring sound with electrical instruments like Boner's composite analyzer did not just spawn new technologies; it changed how people thought and talked about sound. Tools that converted sound to electricity, Thompson writes, "provided a powerful sense of control, and they stimulated new ideas about what constituted 'good sound.'"[116] In turn, it seems likely that parameters of "good sound" established by the architectural acousticians Thompson studies influenced pipe organ ideals. For example, the new emphasis on clarity in "classical" organs closely followed a growing emphasis in architectural designs that minimized reverberation, which can distort sound. In any case, Chantland and his witnesses expected Boner's charts to show them what constituted "good" organ sound, and it is clear that this visual evidence shaped rhetoric about organ sound during and after the hearing.

Boner's charts and the witnesses who testified about them were particularly concerned

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[114] Emily Ann Thompson, *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900-193* (Cambridge: MIT Press, 2002).
[115] Jonathan Sterne, *The Audible Past: Cultural Origins of Sound Reproduction* (Durham: Duke University Press, 2003).
[116] *The Soundscape of Modernity*, 61. There are other points of connection between the two fields. Acousticians often used organ pipes as sound sources when testing spaces for reverberation. And Barnes testified during the hearing that Paul Sabine, director of the Riverbank Acoustical Laboratories, was a friend. Barnes testimony, *Report on the Proceedings*, Chicago, March 18, 1937, 1085.

about what constituted good timbre, which witnesses variously termed "quality," "tone," "timbre," and "color." Although several witnesses, including Richards, Hammond, and Boner, testified that acousticians did not yet fully understand human perception of timbre, and that as-yet unidentified factors might shape this aspect of hearing, the visual evidence of Boner's charts dominated definitions and evaluations of timbre during the hearing.[117] Boner's measurements could account only for a sustained, unchanging tone, and not the attack or decay of a tone. Elements of sound other than harmonic content appeared throughout the testimony but were ultimately treated as secondary matters of concern. Richards, for example, stressed the importance of the pipe organ's characteristic gradual buildup of tone, and Boner noted that onset and decay were critical perception of timbre.[118] But instruments and processes to measure these aspects and represent them visually did not exist, and the persuasive power of Boner's scientific-looking charts outweighed all other timbral concerns in the recorded testimony. In addition, harmonic content was already a fundamental element of discourse on the Hammond, given its use of additive synthesis and arguments about natural versus tempered harmonics raised by Barnes and Richards.

Boner's charts did not just visualize the harmonic building blocks of timbre; for many participants they helped to define standards of "good" timbre. For Boner, Richards, and Barnes, good timbre became tantamount to the presence of many harmonics—and in particular higher harmonics—at considerable strength. As visually represented on the charts, good timbre was

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[117] Although witnesses used each of these terms to refer to timbre in some way, they disagreed considerably about whether some of these identifiers referred to more specific qualities of sound. Laurens Hammond, for example, claimed that "quality," "tone," and "timbre," each had different "exact meanings." Boner, at the start of his testimony, went on at length about how difficult the term timbre was to define. He pointed out that the American Standards Association, an organization appointed by the Acoustical Society in 1932 to standardize acoustical terminology and measurements, had sidestepped a definition of timbre in its publication the previous year. The best definition Boner could provide for timbre was that, "It is a factor which distinguishes one musical instrument from another, one stop on a pipe organ from another." Hammond testimony, *Report on the Proceedings*, Chicago, May 26 and 28, 1937, 1364, 1645-46. Boner testimony, *Report on the Proceedings*, Chicago, March 12, 1937, 516.

[118] Boner testimony, *Report on the Proceedings*, Chicago, March 12, 1937, 512-17.

equivalent to many lines; the more numerous, the longer, and the farther to the right (representing higher harmonics) the lines appeared on the paper, the better the quality of tone. When testifying about the charts, witnesses frequently used visual metaphors to talk about sound, describing harmonics in terms of size rather than volume, for example by using the word "small" rather than "quiet" or "soft." In testimony about the "musical results" of the charts, Richards, speaking of a specific Wicks Cornopean pipe, pointed out "quite a *little group*" [emphasis mine] of harmonics from the twenty-third to the thirtieth that he said created an "added sheen […] utterly absent in the case of the Hammond."[119] In his brief, Chantland wrote that, "a *glance* at these graphs disclose" [emphasis mine] the inferiority of the Hammond's tone.[120] For Chantland and his witnesses, seeing the charts not only provided information about a particular note's timbre, but offered definitive proof about that timbre's quality. "The results shown by [Boner's] tests have removed the case from the realm of opinion testimony," Chantland wrote.[121] Sound, once visualized, became fact.

Or did it? Barnes, Richards, and even Boner all admitted to Williams during cross examination that the machine tests might not provide the best evidence for the perception of timbre. When asked whether he could describe a sound by looking at his own readings, Boner told Williams that he could not.[122] Richards told Williams, "I prefer in the end to trust to my ear rather than to the scientists because the scientists tell me one thing today and then tomorrow call me back and tell me something else."[123] Barnes similarly noted that the charts "appear to me to interpret visually, as drawn on paper, what the ear hears. My contention is that I hear these things, and if these charts bear out what my ear hears, they are right. If they don't, I think I trust

[119] Richards testimony, *Report on the Proceedings*, Chicago, March 17, 947.
[120] *Brief of Attorneys for the Commission*, 22.
[121] *Brief of Attorneys for the Commission*, 21.
[122] Boner testimony, *Report on the Proceedings*, Chicago, March 12, 1937, 593.
[123] Richards testimony, *Report on the Proceedings*, Chicago, March 9, 1937, 113.

my ear."[124] Such declarations strongly suggest that Boner's tests functioned not to discover new information but to confirm the prosecution's existing biases. In his own testimony, Hammond seized on the statements as support of his argument that the perception of sound depended on a number of psychological factors that Boner's tests had no way of measuring.[125] Hammond was particularly adamant on this point, repeatedly emphasizing that Boner's charts only measured sound physically, in what he called its "objective" sense. But it was sound's "subjective" sense, as a sensation registered by the ear, that the hearing ought to examine, he argued.[126] "Definite physical vibrations on the air," he said, "can be analyzed, measured, computed, everything you want. Just what you will make out of that message as it were, that it sends to you, that is not absolutely a foregone conclusion."[127]

Given the striking visual differences between the Hammond and pipe organ charts, it was certainly not to the HCC's advantage for the charts to be interpreted as the prosecution and its witnesses did. Hammond's frequently contradictory testimony on the subject suggests a certain level of insincerity, at best, and a deliberate attempt to mislead, at worst. He claimed, for example, that the charts were plotted in a "highly unusual" manner that bore no relationship to their importance in terms of perception, but later admitted during cross examination that logarithmic plotting was standard procedure for acousticians.[128] He maintained that the bottom two-thirds of Boner's charts depicted data that was "useless" for describing a note's timbre, a claim which Boner vigorously denied. Hammond also attempted to challenge the visual definitions of good timbre that Boner's charts generated by introducing a chart of his own, made

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[124] Barnes testimony, *Report on the Proceedings*, Chicago, March 18, 1035.
[125] Hammond testimony, *Report on the Proceedings*, Chicago, May 27, 1937, 1578.
[126] Hammond testimony, *Report on the Proceedings*, May 25, 1937, 1341-42.
[127] Hammond testimony, *Report on the Proceedings*, May 26, 1937, 1364.
[128] Hammond testimony, *Report on the Proceedings*, May 26, 1937, 1435; Boner testimony, *Report on the Proceedings*, Washington D.C., October 26, 1937, 2638.

using the same procedures, that visualized the sound of a buzzer from a Hammond alarm clock. Hammond claimed that if the presence of more harmonics on one of Boner's charts was equivalent to a higher quality musical timbre, then the buzzer's sound would be the best of all.[129] The trial examiner, however, sustained Chantland's objection to the introduction of this evidence, and all testimony about the buzzer and its charts was struck from the record.

Despite questions about the relationship between Boner's charts and human hearing, it is clear that the visual evidence the charts provided shaped at least some participants' ideas about instrumental sonority. This is particularly evident in commentary published in *TAO*, where the striking visual differences that the charts drew between the Hammond and organ pipes made Boner something of a hero. The journal published a series of half a dozen articles explaining and reprinting many of his charts beginning in May of 1937 and running through the FTC's final decision.[130] Burnham claimed that he was originally," "shocked and grieved" at Chantland's insistence on "machine tests": "music, I told him, was an art, not a science; it had to please ears, not machines." Yet the visual evidence that the tests produced won him over: "By the time I had finished looking at Dr. Boner's charts I knew that Colonel Chantland's name had earned its right to go down in organ history and here's the record for that purpose."[131] Science only wanted the correct results to gain Burnham's favor.

In his editorial introduction to *TAO*'s series on Boner's work, Burnham scarcely mentioned the Hammond, instead focusing on what he believed the charts indicated about the characteristics of different organ pipes. Burnham was particularly interested in measurements of

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[129] Hammond testimony, *Report on the Proceedings*, Chicago, May 26, 1937, 1465-69.
[130] Richards, "Analysis of Organ Tones: Evidence from Record at the Trial of Federal Trade Commission Affording Accurate Analysis of Tonal Quality," *TAO* 20, no. 8 (August 1937); Boner, "Synthetic Organ Tones," *TAO* 21, no. 1 (January 1938); Burnham, "Tone-Analysis to Continue: Done by Dr. C. P. Boner," *TAO* 21, no. 3 (February 1938); Burnham, "Technic of Sound-Wave Analysis," *TAO* 21, no. 5 (April 1937); Boner, "Tone-Analysis of Six Wicks Pipes" *TAO* 21, no. 9 (September 1938); Boner and Gale White, "Effect of Mouth-Width on Diapasons," *TAO* 21, no. 6 (June 1938); Boner and Newman, "Effects of Four Variables on Tone," *TAO* 21, no. 6 (June 1938).
[131] "Tone-Analysis to Continue."

flute pipes, which witnesses for the Commission consistently testified were the only pipe organ sounds that the Hammond could successfully imitate. Barnes, for example, noted that the Hammond and pipe charts corresponded closely on "the dull-tones flutes, such as the stop flute, gross flutes, and some of the milder string qualities."[132] Burnham described this pipe type as possessing a "loveliness which we all recognize," yet prone to overuse. Boner's charts, Burnham wrote, showed that the "mellow charm" of flute pipes was the result of their "dullness," a revelation gained not by listening, but by looking. Like the Hammond organ, the flute pipes' lack of visual interest, as rendered on Boner's charts, confirmed and further defined their inferiority. Burnham capitalized on this discovery by offering the fictional "Miss Soosie"—and, presumably, all women organists—a bit of advice on organ registration. Addressing her with a tone of fatherly condescension, he wrote:

> I'd like to warn her against flutes. The ladies fall victim to them much oftener than the gentlemen. Their smoothness makes them lovely to hear if we don't hear them often. Therefore beware of them. Stick to strings for the steady diet, with a dash of Diapason now and then, and plenty of wood-winds (Oboes, Clarinets, Fagottos) and, when we want to bring it up with a bang, the brass (Tubas, Trumpets).[133]

Burnham's advice suggested a "proper" method of organ registration that minimized the use of the feminized sounds of flute stops. It went without saying that the Hammond's apparent ability to create *only* flute tones rendered its sound feminine and inferior and raised serious questions about its classification as an organ.

Testimony on the Human Listening Tests

On the evening of March 10, two days after Boner concluded his series of tests in Barnes' home, the expert and student jurors, attorneys, and several other participants gathered at the

[132] Barnes testimony, *Report on the Proceedings*, Chicago, March 18, 1937, 1053; also see Richards testimony, *Report on the Proceedings*, Chicago, March 9, 1937, 77.
[133] Burnham, "Our Miss Soosie, etc." *TAO* 20, no. 12 (December 1937).

Rockefeller Chapel, an imposing neo-gothic structure on the University of Chicago campus. Before the tests began, Chantland read the full FTC complaint to the jurors. The jurors then received score sheets on which they marked whether they heard the Hammond or Skinner organ during the Five and Thirty Tests, or a "Jack" or "Jill" note, in the case of that test. During the Five Test, Porter Heaps, a prominent Chicago organist and frequent and later famous Hammond demonstrator, played the Hammond, while Edward Eigenschenk, likewise a well-regarded Chicago organist, played the Skinner. The five excerpts that both men played were drawn from J. S. Bach's Prelude and Fugue in D Major and the Choral Prelude to the cantata movement "Jesu, Joy of Man's Desiring," the Toccata from Charles-Marie Widor's Fifth Symphony for organ, Choral No. 1 in A Major by César Franck, and the "Old Hundredth" hymn tune. Barnes described these selected works as, "pieces which […] should be in the repertoire of practically every organist" and should, therefore, "demonstrate whether or not the Hammond could play standard organ music without compromising one way or the other…"[134]

The Thirty Test excerpts, in contrast, featured a mix of transcriptions and organ literature "proper." John Hammond (no relation to Laurens), musical adviser to the HCC organ sales department and former prominent theater organist, compiled the list of works for this test.[135] These included excerpts from a few works of organ literature including Widor's Fourth Symphony for organ and several hymns and Bach chorales. Hammond drew the bulk of excerpts for the test, though, from transcriptions of works like Dvořák's New World Symphony, Tschaikovsky's Fifth Symphony, and an unspecified piano piece from Schubert's *Impromptus*. John Hammond played the electronic instrument for this test, while Heaps played the Skinner.

While the Hammond defense attempted to downplay the significance of the machine

[134] Barnes testimony, *Report on the Proceedings*, Chicago, May 25, 1937, 1225-27.
[135] Hammond was the first president of the Society for Theater Organists and for many years played a famous Austin organ at the Eastman Theatre in Rochester, NY.

tests, it was obviously pleased with the results of the listening tests, compiling the results in a large spreadsheet that is preserved in the Hammond archives. As the result sheet shows, the expert jurors performed best on the Five Test. Two had perfect scores, while five others correctly identified the instruments for four of the five selections.[136] Hammond interpreted these results as "absolutely marvelous," because more than half of the expert jurors were wrong at least once, and, because the selections for the test were played on both instruments, errors meant that experts had decided, "that the Hammond organ sounded more like the pipe organ than the pipe organ itself."[137] Chantland, on the other hand, pointed out that with one exception, all of the experts' errors occurred in identifying the second selection, "Jesu, Joy of Man's Desiring," which, because it was a "soft flute-like" piece, allowed the Hammond to imitate the organ.[138] (Chantland failed to mention that he did not submit Daniel Seidenberg's presumably poor test results to the Commission, an act that Williams characterized in his own brief as an "outrageous" attempt to deceive the examiners.[139]) These results, Chantland argued, demonstrated what the prosecution openly admitted: that the Hammond could successfully imitate flute timbres at soft volumes, but *only* those types of pipe organ sounds.

As for the listening tests proposed by the defense, the Thirty and Jack and Jill Tests, questions raised by the prosecution about the manner in which the tests were conducted undermined the seemingly favorable results for the defense. As Richards pointed out, the defense provided little information about the instrument the HCC created specially for the Jack and Jill test, making it difficult to extrapolate meaningful conclusions from the results.[140] His propensity to dismiss that test's results was likely also influenced by the experts virtual inability to

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[136] The students' answers were not recorded for this test.
[137] Hammond testimony, *Report on the Proceedings*, Chicago, May 27, 1937, 1524-25.
[138] *Brief of Attorneys for the Commission*, 25.
[139] *Brief for the Respondent*, 60.
[140] Richards testimony, *Report on the Proceedings*, Chicago, March 17, 1937, 986-87.

distinguish between "Jack" and "Jill" tones. The Thirty Test became the subject of a heated controversy during the hearing. The test proved far more difficult than the Five Test for the experts, who were, on average, incorrect or uncertain nearly a third of the time. Some experts did as poorly as the students, who guessed or were incorrect on nearly half of their answers. Chantland, though, argued that the results of the Thirty Test ought to be thrown out entirely, given accusations that Hammond and his employees deliberately attempted to deceive listeners by registering the Skinner organ to imitate the Hammond's sound. Chicago organist William Lester told Williams the day after the tests that he felt the Skinner had been registered to imitate the Hammond in, "a definite attempt to confuse the listeners' ears."[141] Heaps, who set up the Skinner registrations during the test, and John Hammond, who planned the registrations in advance, consistently denied that the setups were unusual when Chantland cross examined them on the matter. John Hammond described the registrations as "one of a hundred" and insisted that there was "no criterion" for a "proper setup." When Chantland pressed him about whether the registration for a particular excerpt was "usual," Hammond replied, "It would be for some organists. It would not be for others."[142] Responding to criticism that the registrations utilized only a small part of the organ stops, Heaps emphasized his use of the crescendo pedal for the nineteenth selection, a snippet identified only as "Handel Concerto," noting that the pedal gave, "almost everything in the organ."[143]

Chantland subpoenaed two additional witnesses for the hearing sessions in October of 1937 in Atlantic City, NJ, Burnham and internationally-known organist Frank Courbin, and brought Richards back to the stand to testify about the suspect registrations. With descriptions of the Thirty Test registrations provided by Heaps in hand, the witnesses pointed out what they

[141] William Lester testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 403-4.
[142] John Hammond testimony, *Report on the Proceedings*, Chicago, May 25, 1277.
[143] Heaps testimony, *Report on the Proceedings*, Chicago, May 25, 1290.

described as abnormalities. Their consensus was that nearly all of the registrations were overly "fluty." For example, each of these witnesses cited as "unusual" Heaps' use of the Flauto Mirabilis stop in the horn solo from the second movement of Tschaikovsky's Fifth Symphony, claiming that it overpowered the "correct" French Horn stop.[144] Burnham described this particular registration as a "deliberate perversion of the great Tchaikovsky's own registration" and a "debasement" of the Skinner organ.[145] After critiquing each of the Skinner registrations for the Thirty Test, Courbin concluded that the test was unfair due to the overuse of flute pipes and overall diminishment of the organ's sound.[146] In his brief, Chantland, drawing on Richard's testimony, emphasized that Heaps used only 31 of the Skinner's 94 stops during the test and used reed, string, and diapason pipes normally only when, "their character could be successfully disguised by a dominant overlay of flute tone."[147] The result of these apparently excessive flute tones, the Commission's witnesses agreed, was to distort and diminish the sound of the Skinner organ until it more closely resembled the Hammond than itself. The test therefore, Chantland argued, showed only "that the [Skinner] organ was capable of being so registered as to imitate the Hammond," and not the other way around.[148]

Whereas the pipe organ community tended to describe flute organ tones in gendered terms like "charming" and "naive" that implied weakness, in the case of the Thirty Test registrations, these types of sounds seemed to pose a threat to the masculinity of the pipe organ. When testifying about the controversial registrations, witnesses characterized flute sounds not simply as inferior to other organ sounds, but as non-organ "others" capable of destroying

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[144] Courbin testimony, *Report on the Proceedings*, Atlantic City, NJ, October 18, 1937, 1975; Richards testimony, *Report on the Proceedings*, Atlantic City, NJ, October 19, 1937, 2092-94.
[145] Burnham testimony, *Report on the Proceedings*, Atlantic City, NJ, October 18, 1937, 2030.
[146] Courbin testimony, *Report on the Proceedings*, Atlantic City, NJ, October 19, 1937, 1990.
[147] *Brief of Attorneys for the Commission*, 54.
[148] *Brief of Attorneys for the Commission*.

"proper" or "normal" organ sound. Richards repeatedly used violent imagery to describe the effects of what he termed the "deadly flute quality of tone," and insisted that flute tones "disguised" organ tones during the test.[149] The result of a Harmonic Flute stop used in the fourth excerpt on the test, the horn solo from Tchaikovsky's Fifth Symphony, was, Richards said, to "destroy the characteristic tone quality of the English Horn" stop.[150] Only a skilled "trick organist" like John Hammond, who was well-known for creating sound effects in the theater, Richards said, could have devised the "devilishly ingenious" registrations that fooled so many of the expert jurors.[151]

In the abstract to her paper, "Electric Organology: How Hammond Fooled the Federal Trade Commission," Tiffany Ng argues that the Thirty Test revealed the "dependence of the pipe organ's sonic authority on conventional constructions of sound."[152] Yet the testimony summarized here demonstrates that no such "revealing" actually took place. Rather, the witnesses for the Commission would likely have agreed with Ng that the pipe organ's "sonic authenticity" depended on conventional constructions of sound. They said as much themselves in their testimony. When they compared the "unusual" registrations used during the Thirty Test with established parameters of the artistic tradition of pipe organ registration, their point deviated from Ng's only in semantics. The sound of a pipe organ sound was legitimate only when properly registered.

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[149] Richards testimony, *Report on the Proceedings*, Atlantic City, NJ, October 18 and 19, 1937, 2072, 2101.
[150] Richards testimony, *Report on the Proceedings*, October 19, 1937, 2083-84.
[151] Richards testimony, *Report on the Proceedings*, 2094, 2115-16.
[152] "Electric Organology: How Hammond Fooled the Federal Trade Commission" (paper presented at the conference "From Bone Flute to Auto-Tune: On the Long History of Music & Technology," University of California, Berkeley, April 24, 2014, abstract accessed August 12, 2014, http://cstms.berkeley.edu/current-events/bone-flute-to-auto-tune/).

Performance Practice and the Importance of Registration

Conventional registrations standards were, in fact, the subject of much debate during the hearing. Williams repeatedly challenged the legitimacy of traditional registration techniques, part of his larger strategy to call into question the fixity of concepts like "real organ music" and "the rendition, without sacrifice, of the great works of classical organ literature" that were named in the FTC's complaint. Williams argued that what constituted a performance "without sacrifice," was a matter of taste, not fact. Existing performance standards, he insisted, were essentially arbitrary and subject to change at the hands of performers. Most witnesses were willing to agree with the attorney that individuality shaped performances, but only up to a certain point. They emphasized instead the importance of traditions and standards, citing in particular the "Bach tradition" of organ registration. Juror Lester, for example, denied that personal taste shaped his own registration techniques, claiming that his study with "pupil after pupil" of Bach's dictated his registration choices.[153]

Invocations of Bach and other composers acted as a defense against Williams' accusations of caprice. Juror Roberts, an organist and instructor at the American Conservatory of Music, told Williams that an organist chose registrations based, "on the strength of what he knows about Bach's tradition, of what Bach wanted."[154] Roberts' point about "what Bach wanted" was critical. Bach's tradition was not, the witnesses insisted, an empty set of standards, but rather the true expression of the composer's artistic conception of a musical work. The tastes and moods of the performer were always subservient to the intentions of the composer. Good music, Barnes said, "can only be played in accordance with the composer's intentions."[155] Williams repeatedly called these claims into question, emphasizing that Bach did not include

[153] Lester testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 386.
[154] Roberts testimony, *Report on the Proceedings*, Chicago, March 15, 656.
[155] Barnes testimony, *Report on the Proceedings*, Chicago, March 18, 1047.

registration in his scores and characterizing claims about long-deceased composers' wishes as hearsay, but he failed to sway the witnesses. When Juror Barrett Spach told Williams that the performance of Bach organ works on the Hammond "falsified" the composer's intentions, Williams asked, "You mean Bach told you what his thoughts were and they were not carried out?" Spach's response was often quoted in *TD* and *TAO*: "I believe I have studied enough to know what the tradition of Bach is. I believe you have traditions in law. There are traditions in music as in the law. Did [influential eighteenth-century lawyer William] Blackstone tell you what his intentions were?"[156]

Williams' failure to make headway in dismantling the notion of composer intention can be attributed, in large part, to the centrality of "great" western art music in the FTC's complaint against the Hammond. The notion of composer intention was a critical component of the ideological framework that constructed musical greatness. Even today, after many scholars have critiqued this ideology, the idea of composer intention remains important to many prominent musicians and continues to inform listening practices.[157] By calling into question the validity of composer intention, Williams, perhaps inadvertently, implied that idealized compositions separate from the materiality of performance did not actually exist. This critique of the work concept was something that none of the hearing's participants, not even the witnesses for the defense, was prepared to accept. Even Hammond, who questioned whether Bach himself "would have the right" to determine whether a particular performance of his music was "without sacrifice," noted that, "The merit of what the composer puts in is a little bit different from what is performed." A Wagner opera, he said, would still be "great music" even given a poor

[156] Spach testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 445.
[157] For just two of many examples of musicological discussions of the work concept see: Lydia Goehr, *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music* (New York: Oxford University Press: Clarendon Press, 1992); Lawrence Kramer, *Interpreting Music* (Berkeley: University of California Press, 2011).

performance.[158] Williams had little hope of convincing anyone in the hearing that the "real music" to which the FTC complaint referred was anything other than the realization of a composer's artistic intentions.

Real Organs

A somewhat more productive line of questioning for Williams related to whether the Hammond was a "real" organ. Despite the fact that the HCC's right to call the instrument an organ was not up for debate as part of the hearing, testimony several times wandered into this territory. Hammond himself claimed that he felt the "essence" of the hearing was whether, "this thing is in reality an organ."[159] Williams based most of his questioning on this topic on comparisons to other instruments, focusing on what he characterized as the non-fixed nature of the organ as a category of musical instrument, and arguing toward a broad definition of the "real organ music" named in the complaint. Drawing on the importance of Bach as a symbol, Williams questioned Richards at length about the construction of Bach's organs, attempting (with no success) to lead the witness into a statement that might imply the Hammond's superiority to eighteenth-century organs.[160] For his part, Richards was quite happy to compare the Hammond to pipe organs, because he had a number of criticisms on this point. The Hammond, he noted, could not play more than two tone colors at once or imitate the spatial effects created by pipe ranks; its pedal board was inadequate in range and its keys were neither concave nor radiating, as the AGO's console requirements dictated.[161] Finally, because the Hammond's sound came through a loudspeaker, Richards proposed that the instrument could not

[158] Hammond testimony, *Report on the Proceedings*, Chicago, May 28, 1667, 1676-77.
[159] Hammond testimony, *Report on the Proceedings*, Chicago, May 28, 1937, 1667.
[160] Richards testimony, *Report on the Proceedings*, Chicago, March 10, 194-212.
[161] Richards testimony, *Report on the Proceedings*, March 9, 1937, 90-96.

properly be compared with a pipe organ at all, but was in fact more closely related to the radio. He frequently referred to the Hammond as a "radio with keys," a comparison that cast doubt on the Hammond's status as a musical instrument.[162]

In his attempts to demonstrate that the Hammond was a real organ, Williams several times turned to the controversial subject of theater organs. His apparent goal was to demonstrate the flexibility and breadth of the term "organ," by showing that many controversial elements of theater organ design were regularly incorporated into pipe organs.[163] Williams questioned Richards at length on this topic, going into great detail about organ construction, and especially the unit design used in theater organs. Ultimately, Richards maintained that, "…to a real organ there ought to be a real pipe to each note and each stop." Yet he admitted that he incorporated unit elements in his own organ designs, and only perhaps half a dozen organs in the United States had a one-to-one pipe-rank-to-stop ratio.[164]

Williams may have successfully demonstrated that the line between "real" pipe organs and theater organs was a blurry one, but he in no way persuaded the Commission's witnesses to admit that theater organs were "real" organs capable of playing "real" organ music. Again, witnesses turned to the notion of intentionality to counter Williams' arguments, this time also invoking the purpose of design. Richards, for example, held that Wurlitzers were "not artistic" because they were constructed to play "ditties" in theaters rather than western art music in churches.[165] Lester told Williams that he could "get all the notes" on a small pipe organ, but it, "would not be the same thing unless I did it with the effects the composer called for."[166] When questioned about the effect of playing "real organ music" on a small reed organ, Richards told

[162] Richards testimony, *Report on the Proceedings*, 67.
[163] Richards testimony, *Report on the Proceedings*, 173.
[164] Richards testimony, *Report on the Proceedings*, 175.
[165] Richards testimony, *Report on the Proceedings*, March 10, 244.
[166] Lester testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 389.

Williams that while this might work "to a certain extent," the tones would not be "altogether truthful."[167] When Williams asked whether Richards himself had ever produced "real" organ music on the type of reed organ that was once in "everybody's parlor" Richards said, "No, I never got organ music out of them. I got the kind of music you get out of those kinds of instrument, that is all, just like as if you were playing a bagpipe, you would get bagpipe music out of them, that is all."[168] Spach similarly told Williams that he had personally created "artistic lies" by playing "real" organ music when he worked as a theater organist in Paris.[169]

The Hammond Organ's Sound

Questions about whether the Hammond was capable of playing "real" organ music ultimately hinged on the quality of its sound, particularly in comparison to an idealized "good" pipe organ sound. Among the witnesses for the Commission, there was some agreement that the Hammond's sound could approach that of the pipe organ's in certain situations. As already demonstrated, witnesses agreed that the Hammond successfully imitated flute stops during both the "human" and "machine" tests. Many of the expert jurors also noted that the Hammond sounded best in small spaces, like homes and modestly-sized churches and auditoriums, and played at low dynamic levels. Nelson testified that the Hammond was "very agreeable" up to dynamic levels of about *mezzo forte*; Sundstrum found it difficult to distinguish between the Hammond and the Skinner for "soft combination of tone"; and Whitehouse even described the Hammond as "wonderfully beautiful" when played quietly.[170]

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[167] Richards testimony, *Report on the Proceedings*, Chicago, March 16, 1937, 853-54.
[168] Richards testimony, *Report on the Proceedings*, March 9, 1937, 157.
[169] Spach testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 461.
[170] Nelson testimony, *Report on the Proceedings*, Chicago, March 15, 697-98; Sundstrum testimony, *Report on the Proceedings*, Chicago, March 15, 764; Whitehouse testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 477.

In contrast, witnesses found the Hammond's sound deficient when played loudly, or when imitating pipe organ sounds other than flute tones. Whitehouse testified that when played at high volumes the Hammond, "took hold of my ear pretty roughly."[171] Sundstrum likewise described the Hammond sound as "harsh" and "jarring to the ear" when played at full strength, qualities not true, she said, "[of] good organs played right."[172] Richards testified that when played, "with any degree of amplitude" the Hammond, "sounded to me as if there was a cat and dog fight going on up there in the upper part of that chancel towards the roof. You could almost visualize the whirling of the dogs and cats in a sort of hurricane of sound."[173] Richards claimed that the Hammond's harsh tone at high volumes was the result of its "quarreling" or "screaming" tempered harmonics.[174] These harmonics, he said, produced beats, the result of which was a "very coarse, raucous, dead sound, in which the disagreement among the harmonics was so obvious that there was a part of a periodic blat, blat, blat, blat going on in it."[175]

Unsurprisingly, witnesses frequently framed the Hammond's success with "soft" and "fluty" sounds and its failure with loud and more harmonically "interesting" sounds in gendered terms. Positive descriptions of the Hammond's sound offered by the Commission's witnesses were almost without exception for explicitly feminized qualities. Dunham, for example, maintained that, "the Hammond organ up to a mezzo forte is extremely pretty, is charming."[176] Barnes described the Hammond's, "absolutely purity of both the tone and the pitch [as being] like the young lady who was pure as the driven snow…," a comparison that referenced the instrument's purportedly monotonous sound.[177] In contrast, juror Whitehouse qualified the

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[171] Whitehouse testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 481.
[172] Sundstrum testimony, *Report on the Proceedings*, Chicago, March 15, 755, 764.
[173] Richards testimony, *Report on the Proceedings*, Chicago, March 16, 1937, 791.
[174] Richards testimony, *Report on the Proceedings*, 788-89.
[175] Richards testimony, *Report on the Proceedings*, March 17, 1937 1002.
[176] Dunham testimony, *Report on the Proceedings*, Chicago, March 11, 331.
[177] Barnes testimony, *Report on the Proceedings*, Chicago, March 17, 1937, 1149.

Hammond's sound in opposition to stereotypically masculine personality traits to (some) male composers. When asked whether the Hammond could produce "beautiful" music, Whitehouse responded:

> …many people, when you say a thing is beautiful, [think that this means] oh, so very gentle, so very tender and so very quiet. I suppose we should use other words, heroic or magnificent for greater effects […] you cannot sell me on the idea of an organ by just giving me a little bit of the Swan of Saint-Saëns, or a little of Grieg, or music of that type which is very beautiful on the Hammond organ. I want to hear the finale to César Franck's Symphony, I want to hear the finale played last night of the César Franck's Choral in E-major. I do not want to stop at the pretty melody alone all of the time.[178]

For Whitehouse, popular notions of beauty—represented by popular "light" classical melodies like "The Swan"—were not properly masculine. Richards similarly defined good organ sound in terms of "truthfulness," embodied in the personalities and music of male composers and defined explicitly in opposition to personified feminine "tones":

> [A truthful tone is] a different thing from being an agreeable tone. Some ladies I know […] are very agreeable, but I would not consider them either truthful or particularly virtuous. These two men particularly—I had this in mind, both Bach and César Frank were men of very great spirituality in their make-up. Their music is just filled with a great aura of high and lofty feeling.[179]

As these quotes show, gendered hearings of the Hammond hinged not only on its purported "fluty" sound, but also on associations between that sound and certain types of music. The Hammond's fitness for creating timbres understood to be feminine both linked the instrument to popular tastes and called into question its suitability for the performance of "art" music.

Long-standing associations between flute tones and theatre organs discussed earlier in this chapter reinforced the symbolic links between the Hammond, flute-like timbres, and popular music. Williams was keenly aware of this symbolic matrix, at one point describing the flute-like Vox Humana stop as a "somewhat abused girl" among the pipe organists, saying to a witness, "It

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[178] Whitehouse testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 495-96.
[179] Richards testimony, *Report on the Proceedings*, Chicago, March 16, 1937, 845-46

appeals to the lower tastes. The masses like it in movies and stadiums, but it is not so hot in church right?"[180] Unfortunately for Williams, the testimony for the hearing reveals that in the minds of the Commission's witnesses, the Hammond's sound was indelibly linked, like the Vox Humana stop, to popular music. Evidence generated in the course of the hearing including Boner's charts and the registrations for the Thirty Test confirmed the witness's preexisting conviction that the quality of the Hammond's sound was not just different from a pipe organ's sound, but of an inferior quality and therefore suitable only for inferior music.

Witnesses several times answered questions about the Hammond's suitability for "real" organ music by drawing comparisons with jazz ensembles—to them the equivalent of a musical slur. Barnes, for example, told Williams, "If the duet for kettle-drum and saxophone, or other strange combination of instruments of that character can be said to give as adequate an interpretation of a Beethoven Symphony as a great orchestra of one hundred experienced players, then the Hammond can produce, without sacrifice, the great works of organ literature."[181] Whitehouse similarly declared, "you can play the notes, yes. You can play symphonic work with the jazz band too […] but if you want the effect of real symphonic work to register in your soul, you want a symphony orchestra to do it."[182] The implication was clear enough: orchestration, and by extension registration, was a critical component of a musical work's "realness," and it was especially absurd to contemplate the performance of such works by popular ensembles.

These comparisons were all the more valid to the Commission's witnesses given the Hammond's widely acknowledged capacity for playing popular music. Laurens Hammond seemed to understand that his instrument's purported suitability for popular music made it suspect in the area of sacred and secular western art music. He testified that those with "a

[180] Spach testimony, *Report on the Proceedings*, Chicago, March 11, 1937.
[181] Barnes testimony, *Report on the Proceedings*, Chicago, March 18, 1937, 1068.
[182] Whitehouse testimony, *Report on the Proceedings*, Chicago, March 11, 1937, 493-94.

highbrow interest" in the pipe organ did not like the Hammond because its rapid attack and range of timbral effects bore resemblances to theater organs.[183] In contrast, he claimed that the Hammond was more popular with the average person because, "their children don't always want to play slow going church music, they would like to use the organ to take the place of a piano and play jazz on it, to get effects, to do all of these things that the organist frowns on as being funny business."[184] Yet he insisted that the Hammond organ was suitable for both popular and "highbrow" music:

> When you play an instrument that has a fast attack in some places, well Senator Richards said that this was good for a night club. Well, it is good for a night club. If you play this in a night club with dancers all around, there is no reverberation there and you play it very fast and it sounds fast and very snappy. Now, you move it into a church, and the bigger and finer the church the more it sounds like the conventional pipe organ, because the church, the big building slows the sound down even more than the pipe itself does.[185]

While its detractors insisted that the Hammond was inherently flawed in the production of "classical" music, for its inventor the instrument's capacity for different musical styles depended on both space and context.

To the Commission's witnesses and prosecuting attorney, however, Hammond's assertion of his instrument's suitability for popular music was itself evidence that the instrument could not possibly do all its maker claimed it could in its advertising. Chantland wrote in his brief that when Hammond "boasted of his instrument's fitness for night clubs and dancing" he demonstrated "how completely [… he] fell from his high Olympus or Parnassus of devotion to the 'artistic and esthetic' […] into the mart of commercialism for his instrument."[186] Chantland further elaborated on Hammond's apparent fall from grace:

The extent to which this was carried is indicated by the sales instructions to sell the

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[183] Hammond testimony, *Report on the Proceedings*, Chicago, May 27, 1937, 1534-35.
[184] Hammond testimony, *Report on the Proceedings* May 28, 1937, 1644.
[185] Hammond testimony, *Report on the Proceedings*, May 27, 1937, 1535.
[186] *Brief of the Attorneys for the Commission*, 4-5.

> Church first, and then jump down to the night club. Thus does Mr. Hammond abandon the high ground of his answer that it is a matter 'primarily' 'of artistic and esthetic opinion.' In such descent he is well within his rights. But, let him no longer step over the bounds of fairness in his representations in invading the classical organ field.[187]

Chantland's caricature of Hammond as a greedy capitalist intent on invading a sacred musical realm was not only a reaction to the inventor's testimony, but also to the advertising strategy for the Hammond organ. Hammond's company, Chantland implied, tacitly admitted the inferior and infectious nature of popular music when they excluded all overt references to it in their advertising and sales strategies. For the hearing's prosecution, popular music and the church and art music held sacred by the Commission's witnesses existed in realms as disparate as heaven and hell. These opinions betray not only an aesthetic prejudice but also a fear of the open marketplace. Even as pipe organ industrialists made their profits in a free market, they were quite willing to impose aesthetic and cultural conditions on perceived threats.

Further, according to the hearing's participants, only certain kinds of people were fit to determine which types of instruments were appropriate for which musics. Those identified as "experts" in the context of the hearing could do so, but church committees and leadership who purchased Hammonds and many church musicians who played them could not. The exclusivity of this type of expertise is illustrated starkly by two final "hearings" of a Hammond and a pipe organ that took place in Atlantic City, NJ. Richards and Chantland claimed that the purpose of these tests, just days before testimony concluded, was to provide rebuttal for various claims made by Laurens Hammond about his organ's capabilities, including that the instrument could produce flute and string tones at the same time. On October 20, 1937, Richards gave a short demonstration on a Hammond organ at St. Augustine's Episcopal Church, an African American church, and a pipe organ—one designed by Richards himself—at the Atlantic City Convention

[187] *Brief of the Attorneys for the Commission*, 5.

Hall. St. Augustine's was, according to the Chantland, the only church in Atlantic City that owned a Hammond organ. There, Richards played a series of scales and chords using the preset sounds of the Hammond organ; he repeated this process, playing registrations that corresponded to the Hammond's presets, in a workshop space in the Convention Hall specially set up for the hearing, as the hall's main space was in use.

Those present at St. Augustine's, according to the record, were the attorneys, trial examiner, Courbin, the church's Rector, Rev. C. Canterbury Corbin, and, "a young colored man," who Richards said, "sometimes plays the organ" at the church.[188] For a few brief moments then, the hearing's participants encountered a musician who played the Hammond for church services and—unlike Porter Heaps and John Hammond—was not employed by the HCC. Here was someone who might have provided unbiased testimony on whether the Hammond could create "real organ music" fit for a church. But the lived musical experience of this unidentified organist was, for all intents and purposes, entirely irrelevant to the questions deemed worth asking in the course of the hearing. His body registered in the official record of the proceedings, but his opinions—and his name—did not. The utter disregard for the man's presence is perhaps most legible in Richards' description of him as someone who occasionally played the organ, rather than as an organist. The unnamed organist's skin color officially marked him in the record as different from and lesser than the hearing's other participants; his was the only race identified in testimony. His body was one that the hearing's white participants would have identified with the popular and jazz music traditions they vocally disdained. Just as the Hammond's capacity for popular music lay outside the parameters of the FTC's complaint against the instrument, so too did St. Augustine's organist and his musical practices fail to register as matters of concern. Still, the organist's presence in the record is silent testimony to uses for the Hammond unimagined in

[188] Richards testimony, *Report on the Proceedings*, Atlantic City, NJ, October 22, 1937, 2543.

the context of the FTC hearing.

The Decision and its Impact

In July of 1938 five Commissioners met in order to rule on the Hammond organ.[189] In addition to the recorded testimony and evidence, the group had in their possession the final arguments of the defense and prosecuting attorneys, preserved in briefs, and Trial Examiner Horner's "Report Upon the Facts" to aid them in arriving at a decision. At first glance, the ruling appeared to be a decisive loss for Hammond. The FTC ordered the company to cease and desist making claims that the instrument could produce a range of tone colors and harmonics equivalent to the pipe organ's, properly render "the great works of classical organ literature," and create "the entire range of musical tone colors." Also off-limits were claims that the Hammond made "an infinite variety" of diapason, string, and reed sounds available, that its tones were an improvement over those of the pipe organ, and that the instrument was comparable to an "ordinary $10,000 pipe organ."[190]

In their "Findings as to the Facts," issued in explanation of the ruling, the commissioners agreed with prosecuting attorney Chantland and his witnesses on nearly all points.[191] They cited Boner's timbral analyses at length, claiming that his charts were definitive proof that the Hammond could only duplicate flute tones accurately, and could not produce the harmonics necessary for reed, string or diapason tones. The commissioners also referenced what they described as "deficiencies" in the Hammond's construction, including its use of loudspeakers to

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[189] "Federal Trade Commission Decision: Official Findings and Order," *TAO* 21, no. 8 (August 1938). The commissioners were: Garland S. Ferguson, Chairman; Charles H. March, Ewin L. Davis, William A. Ayres, and Robert E. Freer.

[190] "Federal Trade Commission Decision: Official Findings and Order" The order also stated that the HCC must file report with FTC within 50 days detailing "the manner and form in which it has complied with this order."

[191] All quotes in this paragraph from, "Findings as to the Facts," printed in full in "Federal Trade Commission Decision: Official Findings and Order."

produce sound and its rapid attack, as important to their decision. Finally, they concluded that Porter Heaps and John Hammond had used "unusual and improper registration" in the Thirty Test. Doing so, the commissioners observed, confused witnesses and demonstrated only that the Skinner could be registered to simulate the flute tones of the Hammond.

Both the pipe organ community and Laurens Hammond interpreted the FTC's ruling as a decisive victory in their favor. Hammond, however, proved to be far savvier in spinning the story to his advantage in the mainstream press. The *New York Times* ran part of a statement in which Hammond claimed that the hearing was a "victory" for his company, "in that it had vindicated the company in its designation of this instrument as an 'organ.'"[192] The same article reported that Hammond's company had not used the advertising phrases in question for three years. No statement representing the prosecution or the pipe organ industry appeared. It mattered little that the hearing never addressed Hammond's use of the word "organ"; indeed, his interpretation of the outcome is evident in continuing confusion about the constraints of the hearing.

While Hammond's declaration of victory was certainly a calculated one in terms of marketing strategy, it seems true that the decision had little impact on his company. Hammond's law firm assured him that "the order is relatively innocuous."[193] Indeed, the Commission's decision made few value judgments about claims other than those which directly compared the Hammond to pipe organs. While the ruling made clear that the commissioners considered the Hammond's sound "deficient" to that of the pipe organ, they did not prohibit the HCC from making relatively broad claims about the instrument's sonority. The HCC's attorneys deemed acceptable, for example, ads claiming that, "any tone that is a sustained tone can be reproduced (produced) on this marvelous instrument" and that the Hammond could make "beautiful" and

[192] "Sees Use of 'Organ' Vindicated," *New York Times*, July 14, 1938.
[193] Williams, Bradbury, McCaleb & Hinkle to Hammond, July 20, 1938, HOCR.

"real" organ music.[194]

Nor did the hearing have any appreciable impact on either Hammond or pipe organ sales. The former continued to experience growing sales until the advent of the second world war, when the company shifted much of its operations to accommodate the demands of the U.S. military-industrial complex.[195] The lack of a measurable impact on pipe organ sales in the years following the Hammond's market debut provides further confirmation that most Hammonds went to churches that were never in the market for a pipe organ. After a low point in 1935, when the pipe organ industry produced only 479 instruments, a slow recovery began. By1942, when the pipe organ industry too converted to wartime operations, both sales and the total number of pipe organ firms were up, the latter from a low of 28 in 1935 to 34.[196]

The actual impact of this lengthy battle is difficult to assess. Despite the intense and lengthy coverage of events in the pipe organ trade journals, mainstream news outlets largely ignored the hearing. The *New York Times* ran just two brief articles on the hearing's outcome on July 13 and 14, including the one quoted above and another that briefly summarized the decision of the commission; both were buried deep in the paper on pages 28 and 39.[197] I have yet to uncover any other reference to the hearing in the mainstream press. The *Etude*, a popular publication devoted to the piano that featured a regular two-page section on organs during this time, did not once mention the hearing. The *Piano Trade Magazine* ran a single article early in the hearing, in April of 1937, reporting, somewhat gleefully, that the Hammond had fooled the "experts" a third of the time on the listening tests that took place in the University of Chicago

[194] Williams, Bradbury, McCaleb & Hinkle to Hammond, July 20, 1938, HOCR.
[195] Sarah Deters Richardson, "Instruments of War: The Impact of World War II on the American Musical Instrument Industry" (master's thesis, University of South Dakota, 2011).
[196] *The History of the Organ in the United States*, 366.
[197] "Organ Company Cited," *New York Times*, July 13, 1938; "Sees Use of 'Organ' Vindicated."

chapel.[198] The only publications to report on the hearing in any kind of detail were *TD* and *TAO*.

The lack of public interest and market impact of the hearing might be attributed to the limited scope of the complaint and the concerns of the pipe organ community who initiated it. Witnesses like Barnes and Richards and organizations like the AGO and the NAOB were concerned with only a very few elite organ practices. These practices dominated the discourse in their trade journals, but did not reflect the majority of uses for the Hammond either in popular music or even in churches, the market over which the hearing was fought. In fact, the extent to which the topic of sacred musical practices were nearly absent from testimony is one of the most remarkable aspects of the event. Other than a few scattered references to the practicalities of organ technique and a single brief conversation about choirs and congregational singing, the attorneys and witnesses scarcely considered the desires and needs of the musicians and congregations who used Hammond organs. Conversations about "good" organ tone and "real" music took place largely on abstract terms, with little to no concern for the embodied practices of organists or congregants. As they deployed abstract ideals of "good" music, witnesses like Richards, Barnes, and Burnham normalized elite western art music and large, expensive pipe organs as ideal. In contrast, these witnesses and the pipe organ industry ignored other, less exclusive musical practices, at great expense, both literally and in their ability to command the public's attention.

Conclusion

The FTC hearing on the Hammond organ holds interest for scholars today because it

[198] "Federal Trade Commission Sponsors Auditory Test—Hammond vs. $75,000 Organ," *Piano Trade Magazine*, April 1937.

shows us how a particular group of people made sense of a new instrumental sonority. Although the hearing was, on the surface, an attempt to evaluate this new sound based primarily on a comparison with the traditional sounds of pipe organs, testimony ranged far afield of a simple comparison. Each participant in the hearing drew on complex networks as they assessed the Hammond's sound for the benefit of the Commission, referencing theater organs, jazz, and acoustic theories. The networks of people and objects that the witnesses invoked demonstrate not just the degree to which their hearing of the Hammond was contingent on ideologies, objects, other sounds, and so on, but also the "extreme plasticity" of the participants' sense of hearing.[199] As I argued earlier in this chapter, visual renditions of the instrumental sonorities in question provided witnesses with new ways of articulating the properties of "good" timbre, subtly shaping how the participants perceived the timbres of both organ pipes and the Hammond.

Visual evidence held sway during the hearing in large part because such evidence carried with it the ostensibly objective and impartial stamp of science. The hearing's controversies about the proper role of science in judging musical sounds provide insight into the complicated relationship between the field of acoustics and music at the time, a relationship I first discussed in the context of the Telharmonium and one that continues to shift today. As many historians of science have noted, science is inherently social—it is, after all, a human pursuit—and its goals and findings depend not on an idealized pursuit of truth but rather are contingent on the social, economic, and cultural lives of its practitioners.[200] This is not to say that everything is relative and that no such thing as reality exists, but rather to acknowledge that science is a human

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[199] Jonathan Sterne and Mitchell Akiyama, "'The Recording that Never Wanted to be Heard' and Other Stories of Sonification," in *The Oxford Handbook of Sound Studies*, eds. Trevor Pinch and Karin Bijsterveld (New York: Oxford University Press, 2011), 546.

[200] Just a few examples include: Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (New York: Pantheon Books, 1971); Stephen Jay Gould, *The Mismeasure of Man* (New York: Norton, 1981); and *Science in Action*.

endeavor subject to human strengths and weaknesses. When musical communities call on science as justification of certain practices or proof of certain beliefs, they can hardly escape this aspect of science. Georgina Born has shown, for example, how the philosophical and aesthetic discourse of modernism dictated scientific and technological approaches to composition at IRCAM.[201] In the case of the Hammond FTC hearing, science seemed capable of proving anything, for either the prosecution or the defense. The debates among participants about the proper methodologies for the analysis of timbre outlined above show the extent to which both defense and prosecution used science to confirm, not to question, their beliefs. For all the expense and time lavished on listening and machine tests, none of the participants learned anything that they did not already know.

The Hammond FTC hearing also reminds us of the extent to which musical boundaries are defined by markets. Opponents' primary objection to the Hammond was that the instrument's sound did not meet the needs or expectations of the sacred pipe organ market. Yet most sacred buyers did not purchase a Hammond *instead* of a pipe organ, and presumably did not expect the electronic instrument to perform like an acoustic one. Even as critics used complaints about the Hammond's sound to police the pipe organ's market boundaries, they failed to recognize that those very boundaries limited the pipe organ's salability. The parameters they defended—of western art music, traditional pipe organ sounds, and mainstream practices—drastically limited the potential market for the pipe organ. This devotion to certain types of instruments, sounds, and repertory limited the pipe organ industry's ability to recognize areas of expansion where other kinds of music, whether secular or sacred, were valuable.

Finally, the FTC hearing on the Hammond organ demonstrates that although timbre has

[201] Georgina Born, *Rationalizing Culture: IRCAM, Boulez, and the Institutionalization of the Musical Avant-Garde* (Berkeley: University of California Press, 1995). See also: Tara Rodgers, *Pink Noises: Women on Electronic Music and Sound* (Durham: Duke University Press, 2010).

not captured the interest of most music scholars, historically, this element of musical sound has been a matter of major concern. This observation echoes Emily Dolan's argument in *The Orchestral Revolution* that musicological understandings of the "work concept" have mistakenly excluded timbre as an essential and defining element of a musical work.[202] Timbre was particularly important to pipe organists because its manipulation, through the art of registration, was a fundamental component of their performance practice. As we have seen, this element of performance was, to the pipe organists who testified during the hearing, essential to the identity of the musical works that they held most valuable. Control over definitions of good timbre was a way not only for the pipe organ industry to police market boundaries, but also for pipe organists to cordon off their discipline from new instruments, practices, and repertories. For the traditionalists who argued against the Hammond in the FTC hearing, new sounds were not fit for old music.

[202] *The Orchestral Revolution*.

Chapter 5

Conclusion

"Electronic music is the mainstream," historians tell us.[1] It is also the underground and the background, an integral part of music ranging from Brian Eno's ambient works to independent acts like Vampire Weekend and Imogen Heap. Musicians working in all kinds of musical genres today, from hip hop to pop to freak folk, use electronic musical sound on a regular basis. At the time of this writing, on March 19, 2015, the vast majority of Billboard's top 40 singles incorporate sounds clearly identifiable as electronic (to say nothing of synthesized sounds that imitate acoustic instruments).[2] These sounds run the gamut from Ellie Goulding's obviously Auto-Tuned voice in "Love me like you do" to the synthesizer in "Uptown Funk!" (Mark Ronson featuring Bruno Mars) that recalls the "Ghostbusters" theme song. Today, digital synthesizers and software dominate the world of electronic musical sound, but both the Hammond organ and the theremin contributed to the popularization of such timbres. Just a few of the many influential Hammond performers include Jesse and Helen Crawford, James Brown, Keith Emerson of Emerson, Lake & Palmer, Elbertina Clark, and Fats Waller. The theremin's use in films like *Spellbound* and *The Day the Earth Stood Still* introduced the instrument's sound to a broad public in the middle of the twentieth century.

Electronic musical sound has become so pervasive that we hardly notice the ways in which it saturates our sonic lives. As Nick Collins and Julio d' Escrivan Rincón write in *The Cambridge Companion to Electronic Music*, "electronic music is now so well accepted and

[1] Collins and d' Escrivan Rincón, eds., "Introduction," in *The Cambridge Companion*, eds. Collins and d' Escrivan Rincón, 1.
[2] See: http://www.billboard.com/charts/pop-songs.

integrated into contemporary practice that it is transparent to the observer."[3] Audiences, historians, critics, and musicians all seem to take the ubiquity of electronic music as a matter of fact: one is hard-pressed to find much analysis of its dominating presence. Electronic music thus seems to have become what Latour would call a "black box," a fact or technology so universally accepted that it is difficult to discern the complicated processes that led up to its establishment.[4] And yet occasionally, a new electronic sound or process emerges that creates controversy, causing the black box to fall open and allowing us to examine why electronic music is so very popular.[5]

One recent instance in which the black box of electronic music fell open was the controversy over Auto-Tune in the late aughts of the twenty-first century. Engineer Andy Hildebrand first conceptualized Auto-Tune technology while using audio to map layers beneath the earth's surface, seeking oil for his employer Exxon. Years later in 1997, after leaving the oil industry and founding the software company Antares Audio Technology, he put Auto-Tune on the market as a plug-in for the recording software Pro Tools.[6] The plug-in works by gradually adjusting an out-of-tune vocal pitch level over time to match the closest semi-tone. Hildebrand intended recording engineers to use Auto-Tune to correct poorly intonated vocals after singers had left the studio, and to do so without the digital fix being recognizable to listeners.

Within a year, though, artists began using Auto-Tune in audible ways for expressive purposes, the first high-profile instance being Cher's 1998 hit "Believe." Studio engineers

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[3] "Introduction," in *The Cambridge Companion*, 1.
[4] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge: Harvard University Press, 1987), 2-4.
[5] See Latour's example of this happening with the diesel engine in *Science in Action*, 104-6.
[6] Hildebrand first named Antares Jupiter Systems, which he created for his first audio product, Infinity, a recording tool for seamless looping. Auto-Tune is also available now as a stand-alone unit for live performance and in instruments like the Peavey AT-200 guitar. Sasha Frere-Jones, "The Gerbil's Revenge," *The New Yorker* June 9, 2008; "A Brief History of Antares," Antares Commercial Website, http://www.antarestech.com/about/history.php (accessed March 22, 2015).

achieved the effect in this song and in countless others since by setting Auto-Tune so that rather than gradually correct the intonation of a pitch, creating a "natural" portamento sound, the software makes the pitch adjustment instantaneously. The audible results are rapid switches from one perfectly-tuned note to the next that effectively change the timbre of the singer's voice to something robotic or even "gerbil"-like. Since Cher, hundreds of musicians and the studio engineers with whom they collaborate have put Auto-Tune to use in this way, from Kanye West to Daft Punk to Bon Iver. None, however, have used it more, or more infamously, than rapper and vocalist T-Pain, who crafted a unique vocal sound for himself using the tool, one that dominated the airwaves in the late aughts.[7] In his wake, many hip hop and pop artists as well as musicians working outside those genres adopted Auto-Tune in similar ways, and in the mid 2010s the Auto-Tune-inflected voice remains a common sound on popular radio.

The increasingly audible presence of Auto-Tune generated a backlash among critics and musicians around the same time that T-Pain's popularity soared. Most grounded their criticisms of Auto-Tune on notions of authenticity and skill but frequently laced their attacks on the technology and musicians who used it with the kind of identity politics I have traced throughout this dissertation. Robert Everett-Green, writing for *The Globe and Mail* in 2006, for example complained that Green Day's recent use of auto-tune made punk seem "as tidy as a golf green," and worried that as "dead-centre pitch" became the new norm, "a lot of popular music's expressive capacities may wither away."[8] For Everett-Green, Auto-Tune threatened to destroy the emotional capacities of all pop music and turn punk's anti-authoritarian stance on its head, making it the sonic equivalent of a symbol of upper-class white privilege, the golf course.

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[7] During the week of Dec 8, 2007 T-Pain was featured in 4 of Billboard's top ten singles: "Kiss Kiss" by Chris Brown, "Low" by Flo Rida, "Good Life" by Kanye West, and "Baby Bash" by Cyclone. In 2009, he released an iPhone app, "I Am T-Pain," with auto-tuner that allows users to record and modify their own voices.

[8] Robert Everett-Green, "Ruled by Frankenmusic," *The Globe and Mail*, October 14, 2006, http://www.theglobeandmail.com/technology/ruled-by-frankenmusic/article1107312/ (accessed March 22, 2015).

Singer-songwriter Neko Case, in a profanity-laden interview with *Pitchfork* writer Ryan Dombal, denied that artists used Auto-Tune as an affective tool, declaring that its purpose was, "so you don't have to know how to sing. That shit sounds like shit! It's like that taste in diet soda, I can taste it—and it makes me sick."[9] Auto-Tune, for Case, is a sort of sonic falsity, used to mask the inadequacy of the performer who uses it.

The most famous critique of Auto-Tune, however, is undoubtedly Jay-Z's "D.O.A. (Death of Auto-Tune)," which opens with the lyrics:

> This is anti auto-tune, death of the ring-tone
> This ain't for iTunes, this ain't for sing alongs
> This is Sinatra at the opera, bring a blonde
> Preferably with a fat ass who can sing a song

Later, he admonishes Auto-Tuned singers to "put your skirt back down, grow a set man," "get back to rap you T-Paining too much" and equates his words with physical violence ("This is practically assault with a deadly weapon"). There is much to unpack here. In "D.O.A.," Auto-Tune-inflected singing is not simply inauthentic, it is a sign of feminine weakness. Jay-Z uses the tool's inherent link to singing—itself strongly associated with women and femininity in the world of hip hop—to mark Auto-Tune as feminine. When men like T-Pain use this feminized tool, they are, according to "D.O.A.," displaying feminine weakness in ways both artificial—a skirt—and bodily—castration. By means of contrast, Jay-Z offers symbols of both black and white authenticity (rap, opera, and Sinatra), aligning himself and his craft with western high art in the process. Much more could be said about these lyrics, but the main point here is this: in the three critiques quoted above, Auto-Tune does not simply signal artistic falseness but threatens to destroy the political, racial, gendered, and socio-economic identities of the music it inhabits and the musicians who use it.

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[9] Neko Case interview with Ryan Dombal, *Pitchfork*, April 10, 2006, http://pitchfork.com/features/interviews/6306-neko-case/ (accessed March 22, 2015).

Yet some music critics argue that rather than sap music of its authenticity and emotional capacity, Auto-Tune actually heightens and complicates the expressivity of the voices it inflects. While many credited Kanye West's pervasive use of Auto-Tune on the 2008 album *808s and Heartbreak* to Kanye's poor singing skills, Oliver Wang wrote that the result was "a melancholy, intimate and decidedly quirky effort." According to Wang, Kanye's "ghostly, mechanical vocals enhance the album's already despondent atmosphere."[10] Indeed, artists often pair Auto-Tuned vocals with heartfelt sentiments, as Kanye does in "Love Lockdown,": "I'm not loving you, way I wanted to, what I had to do, had to run from you." The effect is not simply melancholic, but expressive of a loneliness so acute it is painful. Musicologist James Gordon Williams argues that T-Pain's use of Auto-Tune troubles "the binary between racially authentic sound and technologically manipulated sound," and creates a unique and personal vocal sound.[11] T-Pain frequently makes his use of Auto-Tune most recognizable at points of vocal virtuosity or of musical or lyrical importance, for example to emphasis a particular word or melisma. The result is a vocal style that sounds both playful and plaintive.

Conflicting interpretations indicate that the Auto-Tuned voice registers as both deeply expressive and deeply troubling by turns. My point here is not to settle the debate, but rather to highlight that such disagreements are as old as electronic musical sound itself. In fact, since the Telharmonium, one of electronic music's weaknesses has been its apparent hyper-expressivity. As I argued in Chapter 2, the Telharmonium's expressive tools may have been responsible for its substandard renderings of ragtime and other popular musics. In Chapter 3, we saw that critics

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[10] Oliver Wang, "Kanye's Latest a Deeply Personal Departure," *NPR*, November 25, 2008. http://www.npr.org/templates/story/story.php?storyId=97451806 (accessed March 22, 2015). For an opposing opinion see: Patrick Jarenwattananon, "Kanye West, Auto-Tune Crooner," *NPR*, November 30, 2008, http://www.npr.org/blogs/sundaysoapbox/2008/11/kanye_west_autotune_crooner_1.html (accessed March 22, 2015).

[11] James Gordon Williams, "Crossing Cinematic and Sonic Bar Lines: T-Pain's 'Can't Believe It,'" *Ethnomusicology Review* 19 (2014).

often lambasted the theremin for the excessive sentimentality they detected in its sound. Of course, this dynamic does not play out in consistent or stable ways: the Hammond's critics discussed in Chapter 4 attacked the instrument for sounding dead, while, as I discuss below, gospel musicians and congregants heard something voice-like in its timbre.

These debates beg a fascinating question, namely *why* electronic musical sonority—across time, instruments, and users—has consistently sounded so human to so many. Is it perhaps that such sounds remind us that our contemporary lives would be completely unbound without technology? That technology is, in modern experience, a large part of the human condition? Does Auto-Tune so frequently create a melancholic effect because such reminders are uncomfortable? Undoubtedly, the human qualities so many hear in electronic musical sound cannot be explained by any one factor or phenomenon. Rather, such sound functions differently in different contexts, depending in large part on how a particular performer or engineer chooses to use it. What is clear, however, is that American audiences and musicians have long heard electronic musical sound as expressive.

This observation about the human sonic qualities listeners and performers locate in many different electronic musical sounds points to a larger issue, namely, the need for more nuanced ways of talking about electronic musical technology and its impact on musical life. Scholars often represent the emergence of new musical technologies as points of rupture and revolution. Barbara Hanning, for example, in the *Concise History of Western Music*, writes that "The advent of recording technology […] completely revolutionized the way we experience and share music as listeners, performers, or composers."[12] Thom Holmes, in *Electronic and Experimental Music*, writes that "the explosive development of new musical ideas and materials during the last

[12] Barbara Russano Hanning and Donald Jay Grout, *Concise History of Western Music* (New York: Norton, 1998), 588.

hundred years is a direct result of explorations with electronic instruments and recording technologies. Composers now *think* differently about the music they make. […] The audience now *listens* differently to music."[13] Even scholars like Mark Katz, who recognize that influence does not flow one way from technology to users, tend to emphasize the transformative effects of technology over other kinds of uses. Katz, for example, focuses his study of sound recording on what he calls the "phonographic effect," that is the ways in which recording, "has profoundly transformed modern musical life."[14]

This approach potentially obscures the many ways in which humans use technology to continue doing things they have always done. Claude Fisher, for example, notes that the telephone did not radically alter contemporary ways of life in the early twentieth century; rather people used it "to more vigorously pursue their characteristic ways of life" and assimilated the device into daily practice quite easily.[15] This is not to say that technology does not change us, or what we do, or how we do it. Indeed, I have argued in this dissertation that technology does have a measurable impact on us—it acts on us by making us do things. It is critical, though, that we not mistake the acknowledgement that objects can act on humans for some totalizing concept of technological change, in which new tools sweep away existing values and activities.

Work that approaches music and technology in more nuanced ways demonstrates the type of insights we stand to gain when we do not expect revolution at every technological turn. Hans-Joachim Braun observes in *Music and Technology in the Twentieth Century* that for new technologies like the Hammond organ to succeed, "the step between the old and the new should

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[13] Thom Holmes, *Electronic and Experimental Music: Technology, Music, and Culture* (New York: Routledge, 2008), 1

[14] Mark Katz, *Capturing Sound: How Technology Has Changed Music* (Berkeley: University of California Press, 2004), 2-3.

[15] Claude S. Fischer, *America Calling A Social History of the Telephone to 1940* (Berkeley: University of California Press, 1992), 5, 28.

not be too large."[16] R. Anderson Sutton, writing of Javanese uses of western technology stresses that such uses do not westernize musical culture in Java, but rather open "a range of possibilities and may instead reinforce indigenous values."[17] Scholars like Bonnie Gordon who study relationships among technologies, music, and musicians that occurred long before the twentieth century also remind us that technology has been part of our musical traditions for as long as they have existed.[18]

This dissertation, too, has demonstrated that musicians often use new technologies to enable or enhance existing practices and goals. The Telharmonium, for example, facilitated the performance of existing repertory while providing a new way for music to enter homes and businesses. Performers like Clara Rockmore similarly used the theremin for the performance of old repertories, blending new techniques with existing performance practices. Church musicians across the U.S. quickly adopted the Hammond and its familiar organ interface to make music for and with their congregations, joining new sounds with old repertory. These are not examples of rupture or revolution, but rather of negotiations between performers and new instruments. In many cases, the musical means—the techniques and timbres—were new but the ultimate ends—musical expression and participation—were very old indeed.

To recognize the non-revolutionary nature of electronic musical performance is not to devalue the labor of such performers, but rather to better understand the purpose and function of that labor in its musical and social worlds. The value of such labor becomes more apparent when we carefully consider the material practices involved, as I did in Chapter 3 using the notion of the script to guide my investigation of theremin practices. This way of understanding technology

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[16] Hans-Joachim Braun, ed., *Music and Technology in the Twentieth Century* (Baltimore: Johns Hopkins University Press, 2002), 12.
[17] R. Anderson Sutton, "Interpreting Electronic Sound Technology in the Contemporary Javanese Soundscape," *Ethnomusicology* 40, no. 2 (Spring-Summer, 1996): 250.
[18] Bonnie Gordon, "The Castrato Meets the Cyborg," *The Opera Quarterly* 27, no. 1 (Winter 2011): 94-121.

reveals that electronic instrumental practices like the ones studied in this dissertation resonated with listeners because they performed emotional, expressive, and cultural work that audiences understood.

The Limits of Studying Sound

This dissertation has also demonstrated the importance of taking a holistic approach to sound and sound studies. In particular, we should not let the emphasis on the *sound* of sound studies obscure what this dissertation has demonstrated over and over: that musical sound alone does not create musical meaning and value. For the listeners, critics, and musicians studied here, looking has often been just as important as listening. While many scholars have positioned sound studies as a corrective to traditional history's emphasis on the visual, we ought not let this reaction against visual culture's dominance obscure the complex ways in which culture functions. When we do allow sound to become our sole focus, it is relatively easy to allow human bodies, and sometime human actors along with them, to fall out of our narratives. Yet this dissertation has shown that the vision of human bodies—whether bodies in the act of musical performance or unwanted bodies simply present in the same city as a new musical instrument—are often critical to the formation of musical meaning and value.

Jonathan Sterne and Mitchell Akiyama have argued that:

> Scholars in the humanities and social sciences still too often treat particular technologies or cultural forms as if they are predestined for or determined by a single sense. If we take the proposition of the plasticity of sound seriously, it is no longer possible to maintain such assumptions. Recent decades of sensory history, anthropology, and cultural studies have rendered banal the argument that the senses are constructed. However, as yet, sound scholars have only begun to reckon with the implications for the dissolution of our object of study as a given prior to our work of analysis.[19]

[19] Jonathan Sterne and Mitchell Akiyama, "'The Recording that Never Wanted to be Heard' and Other Stories of Sonification," in *The Oxford Handbook of Sound Studies*, eds. Trevor Pinch and Karin Bijsterveld (New York: Oxford University Press, 2011), 546.

Sterne and Akiyama argue that we cannot bound our disciplines around a single sensory category, because we do not experience the world in that way. Musicologists and sound studies scholars therefore ought not to draw boundaries based on "sound" as a category, because most of us do not experience sound in a solely aural way. We look and listen and move. We cannot separate the visual, spatial, or tactile aspects of any musical performance from its aural elements. This is not to say that we should not pay close attention to sound. On the contrary, in order to do so, we must acknowledge all of the sensory experiences that accompany any given sound.

This multidimensional approach to studying sound can contribute to the growing body of musicological work on timbre. This dissertation has shown that electronic music can be a particularly fruitful area for the study of timbre in part because its introduction can and often does spark controversy that in turn generates records for historians to study. In the three case studies presented here, we have seen debates about electronic musical sonority that were in dialogue with pressing social concerns like immigration, race, gender, and changing religious practices. These connections become most clear when we study discourse with an eye for the material world that produced it. Nina Sun Eidsheim's work on race and vocal timbre, for example, shows that in the context of contemporary western vocal training, teachers often correlate "healthy" and "honest" vocal timbres with students' visible races.[20] As was the case with the timbral analyses of the Hammond organ discussed in Chapter 4 and the rhetoric of purity surrounding the Telharmonium studied in Chapter 2, Eidsheim traces ideology about vocal timbre and race to scientific discourse. She shows that although vocal pedagogues in the nineteenth century believed that knowledge about the human voice stemmed from objective

[20] Nina Sun Eidsheim, "Race and the Aesthetics of Vocal Timbre," in *Rethinking Difference in Music Scholarship*, eds. Olivia Bloechl, Melanie Diane Lowe, and Jeffrey Kallberg (Cambridge: Cambridge University Press, 2015), 342.

medical and scientific research, that research itself was embedded in colonial geopolitics and frequently used to justify colonial activities.[21]

Eidscheim's work is yet another reminder that when we seek to understand how science or technology impacts music, we must not lose sight of the ways in which those fields circulate within and emerge from human networks in which power is distributed unevenly. As histories of the Telharmonium and Hammond organ show us, science is malleable. It can be and often is made to speak on opposite sides of a debate, as was the case in the FTC hearing on the Hammond organ. Actor Network Theory provides historians with one way to avoid treating scientific ideas or musical technology as "black boxes"—objective truths or simple tools—by looking closely at the work, motivation, and impact of actors. Musicologists seeking to understanding how technology and scientific thought have informed musical life and practice must acknowledge and grapple with the complex social forces that created and sustained these fields.

Further Research

This dissertation is, in many ways, a reaction against the dominance of a narrow canon of western art music in electronic music historiography. It suggests some ways in which scholars might bridge the schism that currently exists between compositional activity and performance in this area of study. We might do this by examining how composers have reacted to new electronic musical performances practices, as I did in my examination of the theremin's reception history. This approach, however, frequently involved looking at the practices of performers from a negative perspective. Other possibilities exist. One might instead look for instances in which composers and performers interacted with one another. For example, I might have placed

[21] "Race and the Aesthetics of Vocal Timbre," 355.

theremin historian Albert Glinksy's discussions of compositions for the theremin in dialog with performance practices. A study like this might consider how composers worked with or against scripts for new electronic musical instruments. Did performers and composers collaborate? Did the popular musical sounds and practices associated with an instrument influence a composer's work for it? Studies asking these questions could tie our existing narratives of electronic music history to a more diverse set of practices and music.

The case studies in this dissertation also suggest further research paths related to the specific instruments studied here. The Telharmonium's brief existence limits the possibilities for future study far more than is the case for either the theremin or the Hammond organ, yet my work in Chapter 2 suggests a few additional paths of inquiry. I only briefly discussed the labor of factory workers who built and maintained the Telharmonium, but this is a potentially rich field of study. We might ask, for example, how early twentieth century labor practices and immigration laws interacted with not only the construction of the Telharmonium but also of other musical technologies like player pianos and phonographs. Chapter 2 also reveals—but only scratches the surface of—a rich strain of rhetoric about tuning systems, society, and notions of purity. The chapter also indicates that further study might be done on timbre and meaning in the work of Hermann von Helmholtz and other acousticians.

I concluded my reception history of the theremin in Chapter 3 in the middle of the 1940s, but the instrument has had a rich history since then, which I have discussed elsewhere.[22] Perceptions of the instrument's sound as overly sentimental and feminine would change over time as performers and hobbyists used the theremin in different settings, from film to do-it-yourself electronic projects, to experimental and independent rock genres since the 1990s. From

[22] Kelly Hiser, "From 'Cloying' to 'Cornerstone': Changes in Meanings and Contexts for the Theremin," Paper Presentation at the Joint Meeting of the American Musicological Society, Society for Ethnomusicology, and Society for Music Theory, New Orleans, November 1-4, 2012.

the mid-40s to the end of the 50s composers and studio arrangers incorporated the theremin's sound into dozens of films, most famously using the instrument's timbre as a sonic representation of aliens, in science fiction movies like *The Day the Earth Stood Still* (1951) and *The Thing from Another World* (1951), and as a signifier of diseased mental states, as in *Spellbound* (1945). The theremin's slippery chromaticism mapped onto filmic representations of the neurotic and alien, symbols easily extended from earlier characterizations of the theremin's timbre as excessively feminine.

The theremin's popularity in film kick-started a new era in the instrument's production which began in 1949 with instructions for a build-it-yourself theremin by Ernest Schultz printed in *Radio and Television News*, a magazine for electronic hobbyists. Five years later the same journal published Robert Moog's plans for the instrument.[23] These articles were, like performance practices for the theremin, scripts, these ones written instructions and schematics that directed a particular group of people—the largely white, male, middle-class readers of *Radio and Television News*—to perform a series of tasks—wiring, soldering, and so on—that required special knowledge of electronics and access to specific tools. These new scripts for the theremin were part of a DIY culture that scholars like Keir Keightly and Steven Gelber have shown appealed to a growing number of male hobbyists in the post-war United States who used hobbyist activities in part to create masculine enclaves like basement workshops within larger domestic spaces that were perceived as overly feminine.[24]

The theremin's presence in films and activities intended largely for male audiences helped lay the groundwork for a revival of the instrument that began in the late 1990s and

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[23] Ernest Schultz, "A Simple Electronic Musical Instrument: The Theremin" *Radio and Television News* 42, no. 4 (October 1949): 66-67; Robert Moog "The Theremin" *Radio and Television News* 51 (January 1954): 39.
[24] Keir Keightley, "'Turn it down!' She Shrieked: Gender, Domestic Space, and High Fidelity, 1948-59," *Popular Music* 15, no. 2 (May, 1996): 149-177; Steven M. Gelber, *Hobbies: Leisure and the Culture of Work in America* (New York: Columbia University Press, 1999).

continues to this day. This revival was fueled, for the most part, by musicians in bands that ranged from internationally-acclaimed acts like Nine Inch Nails and Wolf Parade to local groups like Madison Wisconsin's indie-Klezmer band Yid Vicious. Although the theremin's tone did not change significantly—most Hollywood recordings featured Victor Theremins, and new models were designed to sound like the original—with no performers in view and with new connections to masculine cultural worlds the instrument shed its ties to the feminine and the sentimental and became instead an object for the electronic connoisseur. Tracing the changing meanings of the instrument and its timbre over time allows us to see how mutable such meanings can be.

Undoubtedly the largest lacuna in electronic music studies to which this dissertation points directly is the role of the Hammond in American religious practices since the 1930s. Whole histories of electronic musical practices are, perhaps, waiting to be written on this topic. Such histories would offer an entirely different perspective on the instrument than the one I discussed in Chapter 4. The pipe organ community's hearings of the Hammond's timbre as lifeless, jarring, and monotonous could hardly differ more sharply from descriptions offered by African-American congregations just a year or two later, who experienced the sound as voice-like, expressive, and literally moving.[25] Moreover, the practices of Hammond organists—black and white—could prove to be a fascinating area of study in electronic music techniques and collective music-making.

Historian Ashon Crawley is currently at work on a book on the role of the Hammond in Black Pentecostal churches, where he notes that the instrument's sound has been taken up as the

[25] Robert M. Marovich, "Chicago Gospel Music Timeline," http://www.chicagofestivals.net/music/gospel-music/chicago-gospel-music-timeline (accessed August 4, 2014); Ashon Crawly, "Nothing Music: The Hammond B3 and the Centrifugitivity of Blackpentecostal Sound," a paper originally presented at the EMP Pop Conference 2014 and posted on April 20, 2014, http://ashoncrawley.com/2014/04/30/nothing-music-the-hammond-b3-and-the-centrifugitivity-of-blackpentecostal-sound/ (accessed August 5, 2014).

sound of the movement itself. According to Crawley, the perception of Hammond's sound as being voice-like made the instrument an ideal tool for the "emotionally demonstrative" worship style of the church's musicians. Given the church's associations with the gay night scene in Chicago, Crawley argues that "the proliferation of the sound of the B-3 in Black Pentecostal spaces emerged from a queer sociality, from underground and otherworldly friendships and erotic relationships." Additionally, he notes that descriptions of the Hammond's sound as human offer, "a way to think about the breakdown between human and machines."[26] The Hammond's use in the religious spaces Crawley studies is, of course, only one part of the instrument's history; much work could be done on its use in genres ranging from rock to soul to jazz.

There are many other electronic instruments with rich histories of performance practices whose study could further deepen and complicate our understanding of electronic musical history. The Moog synthesizer comes immediately to mind; Trevor Pinch and Frank Trocco's ground-breaking work on the instrument still leaves plenty of room for future studies.[27] A range of other technologies with varying levels of commercial success have also shaped our electronic musical world, from the Rob Wave Organ to Hammond's Novachord and Wurlitzer's Electric Piano. This is not to mention the range of digital synthesizers and software available to musicians today, whose sounds permeate our musical lives. Recent work on the San Francisco Tape Center and Daphne Oram's work for the BBC also offer promising new avenues for future research that expand our histories of electronic music beyond academic and government-sponsored studios like those at the Columbia-Princeton Electronic Music Center and IRCAM.[28]

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[26] "Nothing Music."
[27] Trevor Pinch and Frank Trocco, *Analog Days: The Invention and Impact of the Moog Synthesizer* (Cambridge: Harvard University Press, 2002).
[28] David W. Bernstein, ed., *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde* (Berkeley: University of California Press, 2008); See ongoing work on the Daphne Oram Collection at http://daphneoram.org/ (accessed March 22, 2015).

As this dissertation shows, retellings that take into account the material practices of electronic music history can reinvigorate tired narratives with new social and cultural significance. By tracing descriptions of the Telharmonium's sound as "pure" to their political and social sources, we can understand the ways in which electronic musical sound participates in racial and gendered discourse. By attending to performance practices like Rockmore's, we see that players create musical meaning not simply through "the music itself" but rather by acting out their beliefs and desires in complex negotiations with the material world and its sounds. And by examining the backlash against the Hammond among the pipe organ community, we can see how disparagements of new electronic timbres are apt to act as ciphers for other—commercial, industrial, religious—concerns. When we pay close attention to electronic musical practices and their reception, we are not only reminded, yet again, of the ways in which identity and power shape our musical worlds, but we also stand to gain new understanding into the ways in which musical sound comes to mean so much to us.

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