

Resonant Bodies: Pauline Oliveros, David Tudor, and Music Mediated, 1950–1980

by

Walker P. Downey

M.A., Art History, Williams College, 2015

B.A., Art History and Studio Art, Wheaton College (MA), 2013

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Signature of Author: _____

Department of Architecture
April 28, 2022

Certified by: _____

Caroline A. Jones
Professor of the History of Art
Thesis Supervisor

Accepted by: _____

Leslie K. Norford
Professor of Building Technology
Chair, Department Committee on Graduate Students

Thesis Supervisor

Caroline A. Jones, PhD

Professor of the History of Art
Associate Dean, School of Architecture and Planning
Massachusetts Institute of Technology

and readers

Timothy Hyde, MArch, PhD

Associate Professor of the History of Architecture
Associate Head of Operations, Department of Architecture
Massachusetts Institute of Technology

Stefan Helmreich, PhD

Elting E. Morison Professor of Anthropology
Massachusetts Institute of Technology

Alexander Rehding, PhD

Fanny Peabody Professor of Music
Harvard University

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ABSTRACT

In this project, I follow the intertwined trajectories of Pauline Oliveros (1932–2016) and David Tudor (1926–1996) to understand how the contemporary genre of “sound art” evolved out of experimental music in the postwar United States. Substantially expanding the scope of Oliveros and Tudor’s legacies, long understood in purely music-historical terms, I argue that their engagements with electronic media—including magnetic tape, do-it-yourself circuitry, and biomedical devices—dramatically shaped their approaches to composition, performance, and listening in the Sixties and Seventies, yielding spatialized and participatory relationships to sound that sat uncomfortably within music’s definitional limits. Through their technological experimentation, Oliveros and Tudor arrived at transformed understandings of what “liveness,” presence, and agency might mean in the context of electronics, and developed new models of embodied sonic experience that resonated with, and contributed to, postwar trends in installation and performance art. As I show, these models of practice carried Oliveros and Tudor into museum spaces circa 1980, exerting a noted influence among younger artists working with sound.

Existing accounts of Oliveros and Tudor have tended to compartmentalize their respective engagements with electronics, relegating this exploration to historically specific arcs of their careers; I argue, to the contrary, that a concern for electronic media and their practical affordances influenced the entirety of these artists’ developmental arcs between 1950 and 1980, serving to shape their philosophies of perception, corporeality, and sonic materiality. I further reposition Oliveros and Tudor relative to one another by emphasizing the significance of their friendship, repeat collaborations, and circuit of mutual influence, which scholarship to date has generally ignored. I intervene into an active yet fraught body of literature around sound art by demonstrating that this ill-defined field of practice did not issue from a coherent and unified point of historical origin but was rather *constructed* in piecemeal fashion from a variety of practices and commitments. Sound art emerged as musicians like Oliveros and Tudor situated themselves in new venues and collaborative networks, as curators and theorists worked to claim and capture their practices, and, most importantly, as mediation restructured the musical work’s associated protocols (of composition, performance, notation, and live presentation), and rewrote its very ontology, such that it could render problematic the boundaries between disciplines, beg new critical vocabularies, and broker its entry into the museum.

Thesis Advisor: Caroline A. Jones
Title: Professor of the History of Art

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Introduction: Music Mediated

1. From the imaginary museum to the art museum

In the fall of 2019, a sundry collection of twenty objects and sculptural assemblages, including a metal barrel, a trio of black plastic buckets, and a welder's mask joined to a wine crate, were lugged into New York's Museum of Modern Art (MoMA) and brought to a sleek new performance space on the museum's fourth floor. There, they were suspended from a lofty ceiling and made to hover, at varying heights, throughout the otherwise empty room, their forms casting off dappled shadows beneath dramatic spot lighting. [Figure 1] Mounted to each of these objects or hybrid constructions was a transducer, a disc-shaped device designed to receive audio input and propagate vibrations through solid materials. At select intervals, these transducers (wired to an out-of-sight computer) fed the objects sounds tailored closely to their resonant frequencies; in turn, the objects *radiated* this sonic material, their material constitution colorfully texturing and transforming it. To walk among these objects upon their public unveiling in October 2019—for indeed, these forms were to be experienced intimately and from all angles—was to experience a glorious cacophony of hums, chirps, rattles, and low metallic purrs. Up close, these noises could be heard directly passing through their unusual host bodies; but microphones affixed to the objects and linked to in-house speakers ensured the sounds' amplification and circulation throughout the room. The overall effect was one of a densely layered sonic canopy.

Together, the twenty resonating objects hung in MoMA's studio comprised a “sound environment” titled *Rainforest V (variation 1)* (1973–2015).¹ The fifth iteration in a series works originally conceived by electronic musician David Tudor (1926–1996), *Rainforest V (variation 1)* was

¹ *Rainforest V (variation 1)* (1973–2015) was on view at the Museum of Modern Art (MoMA) between October 21, 2019, and January 5, 2020. “David Tudor and Composers Inside Electronics, Inc. — Rainforest V (variation 1),” MoMA, accessed February 27, 2022, <https://www.moma.org/calendar/exhibitions/5077>.

realized posthumously by the performance group Composers Inside Electronics Inc., or CIE (John Driscoll, 1947–, Phil Edelstein, 1950–, and Matt Rogalsky, 1966–), which Tudor had helped shepherd into being during his lifetime. In the Seventies and Eighties, in its manifestation as a concert environment entailing the presence of human performers routing sounds through transducers, *Rainforest* had quite literally expanded the parameters of electronic music in live performance, inviting listeners to wander and inhabit an ecology of resonant phenomena; in 2019, reimagined as a self-running installation, it expanded notions of where electronic sound could *belong*, inaugurating MoMA’s Marie-Josée and Henry Kravis Studio—a new, hybrid event space designed for media and performance works.

In 2014, five years before *Rainforest* was strung up from MoMA’s rafters, musician Pauline Oliveros (1932–2016) entered the lobby of New York’s Whitney Museum of American Art and suspended a surround-sound microphone from the ceiling; next to it was placed a video surveillance camera, small and “eye-like,” per one observer.² The microphone and camera fed what they heard and saw to an installation in the nearby lobby gallery, where images of the Whitney’s streaming visitors were projected “floor-to-ceiling” upon the gallery walls; the sounds of those same visitors were routed through a computer-processing system and then sent to a distributed array of speakers.³ Sitting before the projected imagery, Oliveros unpacked a Roland-V accordion from its case and improvised with the lobby soundscape, which was subtly transformed in its journey through Oliveros’s bespoke modification system and amplified at a time delay. [**Figure 2**]

Oliveros’s hybrid performance-installation, which she called the *Deep Listening Room* (2014), effectively served to close out the Whitney’s 2014 Biennial; active for the last five days of the

² Nikki Lohr, “Sound and Vision: Composer Pauline Oliveros Closes Out the 2014 Whitney Biennial,” *Observer*, May 29, 2014, <https://observer.com/2014/05/playing-the-whitneys-lobby-pauline-oliveros-closes-out-the-2014-whitney-biennial/>.

³ Lohr, “Sound and Vision.”

museum-wide exhibition, it drew the activities of the noisy public, some unsuspecting, and many conscious of Oliveros's intervention, into her improvisatory weave. Oliveros termed the audio-processing program that she employed for the occasion the Expanded Instrument System (EIS). She understood the EIS, which behaved unpredictably and according to the vagaries of finely tuned algorithms, as an "improvising partner" pushing her to "expand, listen, and react"; that she could affect the behavior of the EIS made the relationship one of two-way exchange.⁴ She also understood the modification system as a "time machine" layering past and present sounds and carrying them towards a future constructed collaboratively.⁵ Oliveros's EIS had its roots in her pioneering electronic music of the Sixties, which often found her collaborating, live, with reel-to-reel tape-machines that recorded her sounds (whether accordion wheezes, or the piercing tones of Hewlett-Packard oscillators) and drew them into cascading feedback loops with which she could duet in real time; but it also served to embody a performance practice that she had, since the Seventies, developed out of a desire to eliminate the divide between musical performers and audience members.

Scarcely definable as straightforward musical works, at least in any conventional sense, *Rainforest V (variation 1)* and the *Deep Listening Room* were united by their solicitation of a new and active manner of participation in the fabric of sonic experience. Tudor and CIE's installation, which beckoned MoMA's visitors into a dense thicket of chirring, vibrating forms, made sound physical, palpable, and accessible across sensory registers (much to the chagrin of museum staff, touch was encouraged). If something had been *composed* here, it was a situation calling for open-ended exploration and intimate engagement—a dwelling amongst resonant bodies of metal, plastic, and weathered wood. Oliveros's *Deep Listening Room* invited a similarly dynamic and open participation,

⁴ Doug Van Nort, Pauline Oliveros, and Jonas Braasch, "Electro/Acoustic Improvisation and Deeply Listening Machines," *Journal of New Music Research* 42, no. 4 (2013): 304–314, <https://doi.org/10.1080/09298215.2013.860465>.

⁵ Van Nort, Oliveros, and Braasch, "Electro/Acoustic Improvisation," 306.

albeit through different means: here, listeners were inserted into a live circuit of creative collaboration in which, by dancing, talking, or even just walking beneath the watchful eye and ear of Oliveros's EIS, they could shape the unfolding—the composition—of her piece. Via a play of time travel, the sounding bodies of lobby “performers” were wired into a resonant feedback loop with Oliveros and her collapsing, expanding accordion. In both *Rainforest V (variation 1)* and the *Deep Listening Room*, what enabled this expanded participation, and what extended these generous invitations to listening, was technology—transducers, sound-systems, and computer processing—comprising the infrastructure of an expanded sonic embodiment.

The resonances identified, here, between Tudor and Oliveros's embodied experiments with sound, are not the product of coincidence, for while the two musicians were both alive, they enjoyed decades of correspondence, collaboration, and friendship. First molding reputations for themselves in a shared context—the fertile landscape of experimental and electronic music in the American postwar—they exchanged ideas and concerns, and participated in a reciprocal play of influence, ultimately setting off on radically distinct yet parallel paths of evolution. Oliveros and Tudor first met in 1963, at which time they were uniquely positioned to influence one another's trajectories. Tudor, six years Oliveros's senior, had by the early Sixties cultivated international renown as a piano interpreter for America's leading experimentalists and the titans of the European avant-garde. He was most closely associated with musician John Cage (1912–1992), whose work he had tirelessly performed and championed beginning in 1951. By 1963, however, Tudor had grown weary of his role as a virtuoso pianist; he was poised to develop his own compositional language, and a new musical practice oriented around the noisy and unpredictable behavior of do-it-yourself electronics activated in a concert setting.

Upon meeting Oliveros, Tudor found that the younger, Texas-born musician, then conducting her bold experiments with reel-to-reel tape out of the countercultural Bay Area music

studio known as the San Francisco Tape Music Center, was equally invested in the performance possibilities of electronics, and in the capacity of emerging technologies, or media, to model new kinds of musical liveness and presence. Tudor, whose career as an interpreter had shaped him into a consummate and dedicated listener, helped to “confirm” Oliveros’s own belief in the virtues of listening, and provided her with instrumental encouragement at a still-early stage of her developing career.⁶ Commencing live collaborations soon after meeting and remaining in contact for as long as the former was alive, Tudor and Oliveros charted closely entwined trajectories patterned with synchronized creative concerns. In the Sixties and Seventies, they each helped to define the parameters of live (as opposed to recorded) electronic music and broke significant ground in DIY experimentation with new technologies of music making.

As presented in 2019 and 2014, respectively, Tudor and CIE’s *Rainforest V (variation 1)* and Oliveros’s *Deep Listening Room* converged along one other axis equal in significance to their like engagements with embodiment and electronic mediation: both works appeared under the eaves of major arts institutions. MoMA and the Whitney would seem unusual venues for the practitioners’ work when one considers that they self-identified as musicians for the full extent of their careers. But neither is *this* convergence the result of coincidence: Tudor and Oliveros arrived at these institutions (the former posthumously, and the latter actually) via a shared set of historical circumstances, and a shared process of transformation—one whose nature this dissertation will seek to untangle.



In her canonical 1992 text *The Imaginary Museum of Musical Works*, philosopher and musicologist Lydia Goehr speaks of a museum that opened, two-hundred years ago, to house the

⁶John D.S. Adams and Erin Donovan, “Still Listening: Pauline Oliveros Reflects on the Life and Music of David Tudor,” *Musicworks*, May 1998, 35.

musical works of the Western classical tradition. The museum was, and remains, a fictitious one—hence Goehr terms it the “imaginary museum”—and the musical works that populate it are themselves careful fabrications. The historical claim driving Goehr’s text goes something like this: before 1800, there was no sense in which music could be spoken of in terms of discrete “works,” or repeatable expressions of a single musician’s creativity existing independently of its performances.⁷ And if, for centuries, composers did not “individuate works as embodied expressions and products of their activities,” this was because they neither owned the material they wrote in any meaningful sense, nor had firm control over its realization.⁸ Until the mid-to-late eighteenth century, Goehr explains, music was largely a “performance art” practiced in accordance with the whims and needs of extra-musical institutions.⁹ Music was solicited by the church and court, and composers, in their capacity as public servants, were afforded no room for creative decision making. What is more, composers’ music was handed off to performers who truncated, recycled, or otherwise altered what they received, and extemporized, treating their materials as sets of “outlines” to be filled in.¹⁰ This unfixed and unregulated relationship between music’s writing and realization rendered the distinction between composer and performer problematic.

Around 1800, this all changed. Goehr cites a confluence of factors: musicians, casting off the shackles of the church and aristocracy, joined an emergent middle class, and increasingly sought ways to assert a creative autonomy unhampered by the demands of “social tutelage”; in their bid for liberation, they were assisted by changes in copyright law that transferred ownership from publishers directly to composers.¹¹ At the same time as desires to individualize and lay authorial claim to

⁷ Lydia Goehr, *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music* (Oxford: Clarendon Press, 1992), 176–204.

⁸ Goehr, *Imaginary Museum*, 218.

⁹ Goehr, 178.

¹⁰ Goehr, 187–188.

¹¹ Goehr, 205–208.

compositions mounted among creators, broader philosophical tides had been shifting: the category of the “fine arts” had germinated under the influence of romantic doctrine, and there had emerged a coarsened distinction between “art and craft,” “aesthetic value and functional utility.”¹² In Goehr’s formulation, the aestheticization of fine art was premised on a “separability principle” whereby the arts could be discussed as “separated completely from the world of the ordinary, mundane, and everyday.”¹³ While the plastic arts of painting and sculpture secured their separation via the art museum, which allowed spectators to encounter them at a reverential remove from the contingency and specificity of place and history, music’s emancipation as a fine art was to be less straightforward. Music sought a “plastic or equivalent commodity, a valuable and permanently existing product” in which it could be reified, and whereby it could be assimilated into a separate sphere of aesthetic contemplation; and as neither performances nor scores offered viable vehicles (both being “worldly or at least transitory and concrete”), “an object was found through projection and hypostasization,” and that object was “the work.”¹⁴ Unable to enter the literal museum, the “work” erected a “metaphorical” or “imaginary” museum in which compositions could take their places, safely given over to the realm of the transcendent.¹⁵

Goehr’s history of the musical “work,” far from irrelevant to modern and contemporary practice, is intended as a history of the present. For it is in accordance with the “work-concept” (*Werktrne*) that we now speak of musical compositions authored by individual composers as immaterial *things* that transcend the conditions of their making, their actualization in performance, and their materialization in the figure of the score, retaining a coherent ontological status while at

¹² Goehr, 151–152.

¹³ Goehr, 157–158.

¹⁴ Goehr, 173–174.

¹⁵ Goehr, 174–175.

once existing everywhere and nowhere.¹⁶ And it is accordance with the work-concept, which has long performed a regulating function, that we expect certain things of musical works and treat them in a certain way: we assume that performers, now subservient to composers, will adhere rigorously to notation so as to preserve the work's identity; and in the live performance setting, it is expected that audiences (subservient to performers as well as composers) will be "literally and metaphorically silent," allowing the "truth or beauty of the work [to] be heard in itself."¹⁷

It is of course true that the regulating force of the work-concept is either nonexistent or problematical outside of what musician and theorist George E. Lewis has termed the "Eurological" tradition of classical music; it cannot account for the fluid notions of authorship and improvisatory spirit of jazz, to say nothing of much popular music.¹⁸ But as Goehr argues, the *Werkstreue* ramifies through even the most "experimental" and avant-garde music of the twentieth century, which, in its strained attempts to negate the "work," has long remained chained to it. Goehr locates a privileged example of this dialectical bind in John Cage's notorious work *4'33"*, premiered in 1952 by David Tudor.¹⁹ In Cage's work, the performer (Tudor) is to sit at a piano for four minutes and thirty-three seconds, playing no notes, but opening and closing the piano lid three times to demarcate three "movements." Ostensibly emptied of the composer's creative intention, the work is designed to call attention to the natural and *unintended* sounds (coughs, rustling pant-legs, the wind outside the concert hall) that flare up amidst a so-called "silence." This gesture of negation, however, leaves

¹⁶ Goehr, 1. Goehr suggests that the concept of "faithfulness/fidelity/truthfulness to the work," which the term *Werkstreue* eventually came to capture, was originally articulated by E.T.A. Hoffman (1776–1822). See, for more on the Hoffman-*Werkstreue* connection, Friedrich Blume, *Classic and Romantic Music: A Comprehensive Survey*, trans. M.D. Herter Norton (W.W. Norton & Company: New York, 1970), 112–113. See also E.T.A. Hoffman, "Beethoven's Instrumental Music," trans. Arthur Ware Locke, *The Musical Quarterly* 3, no. 1 (January 1917): 123–133.

<https://doi.org/10.1093/mq/III.1.123>.

¹⁷ Goehr, *Imaginary Museum*, 236.

¹⁸ George E. Lewis, "Improvised Music After 1950: Afrological and Eurological Perspectives," *Black Music Research Journal* 22, vol. 22, Supplement: Best of BMRJ (2002): 215–46, <https://doi.org/10.2307/1519950>. Georgina Born has discussed the limitations of Goehr's "work-concept" with regard to jazz; see Georgina Born, "On Musical Mediation: Ontology, Technology and Creativity," *Twentieth-Century Music* 2, no. 1 (2005): 26–28,

<https://doi.org/10.1017/S147857220500023X>.

¹⁹ Goehr, *Imaginary Museum*, 264–265.

most of the fences erected in the name of the work-concept safely in place: in its original form, *4'33"* demanded use of blank staff notation, which Tudor, ever the diligent interpreter, insisted upon reading when he performed the work; it was Cage, not Tudor, who received (likely scattered) applause at the work's premiere; and the audience remained consigned to non-participation and—yes—silence.²⁰

One wonders what Goehr would say about a shift that began to occur at the edges of experimental music in 1979–1980, when, under the banner of an ill-defined new field of practice called “sound art,” music began to filter out of the “imaginary museum” and into the art museum. By this time, the fracturing of clearly delimited mediums in the twilight of artistic high modernism, sustained interdisciplinary collaboration, and an ever-growing number of artists crossing into music, and musicians crossing into art, had given rise to hybrid sonic genres that were neither straightforwardly musical nor unproblematically allied to the visual arts: there emerged site-specific “sound installations” involving the spatialized playback of sound in museums, galleries, and outdoor locations, the practice of “sound sculpture,” or the creation of three-dimensional constructions incorporating amplified or simply *implied* sound, and “intermedia” performance practices uniting video, music, and other theatrical trappings.

These sonic hybrids, which found gracious hosts in interdisciplinary performance spaces, and, indeed, museums, were diverse and many-headed, and coming, as they did, from practitioners *across* disciplines (musicians, sculptors, performance artists, and video artists), they challenged

²⁰ Regarding Tudor’s performance of Cage’s *4'33"*, see Martin Iddon, *John Cage and David Tudor: Correspondence on Interpretation and Performance*, Music since 1900 (Cambridge: Cambridge University Press, 2013), 43–45; and William Fetterman, *John Cage’s Theatre Pieces: Notations and Performances*, Contemporary Music Studies, vol. 11 (Amsterdam: Harwood Academic Publishers, 1996), 69–83. Cage gave *4'33"* a “conventional” notational treatment for its 1952 premiere, making use of blank staves (the original score, now lost, was reconstructed twice by David Tudor for performances in 1982 and 1990); however, Cage later developed different scores for the work, variously making use of graphic (proportional) notation and what William Fetterman terms “linguistic” notation. See Fetterman, *John Cage’s Theatre Pieces*, 74–79. See also Liz Kotz, *Words to Be Looked At: Language in 1960s Art* (Cambridge, MA: MIT Press, 2007), 13–57.

attempts on the part of institutions and commentators to consolidate them under any one label.

What appeared to unify them, however, and what, perhaps, motivated the desire to speak of a “sound *art*,” was their rejection, critique, or rigorous redefinition of the tenets Goehr ascribes to the work-concept. Authored by individuals or in collaboration, and thus collapsing the division of labor between composers and performers, this new range of activities often seemed to return music to its roots as a “performance art.” And presented, unlike so much avant-garde and experimental music, outside of the space of the concert hall, with its proscenium stage, and built-in division between performers and audience members, these ambiguously situated practices made music newly available through novel protocols of listener participation and interactivity. Often at odds with the very “event structure” of the performance, they also embedded sound in material forms and navigable environments. What the musical “work” lost in ideality and “transparency” in its gradual, unresolved transformation into *artwork*, it gained in accessibility, tangibility, and a new sensorial richness.

“Sound art” has not left us. In fact, its early anticipation in 1979–80 might, in retrospect, be regarded as a false or incomplete start, for it was not until the new millennium, amidst a vogue of reenergized curatorial interest in sound and music, an eagerness on the part of practitioners and writers to *theorize* the noisy new museum, and a wider “auditory turn” in the literature of the humanities and soft sciences, that “sound art” gained identity as a more self-assured actor’s category embraced with some trepidation, but reliable consistency, by artists, critics, and curators. Sonic hybrids had, of course, continued to proliferate through the Eighties and Nineties, engaging in the same spirited unmaking of Goehr’s *Werktruue*; and recognizing this, art historian Douglas Kahn framed the millennial efflorescence of sound art as a delayed awakening, remarking, in 2002, that

“[sound art] has now crept up to that indeterminate institutional and discursive level where things are discovered, oddly mature at birth, full-born from the hip.”²¹



David Tudor and Pauline Oliveros both participated in sound art’s early anticipations circa 1979–1980, and as *Rainforest V (variation 1)* (1973–2015) and the *Deep Listening Room* (2014) have demonstrated, the work of both practitioners was folded back into the museum following the definitionally fraught genre’s millennial “rediscovery.” Neither figure, however, traces out an especially linear or direct path from the “imaginary museum” to the art museum. And indeed, were this dissertation concerned only with the evolution of sound art in practice and in the art institution, I would have erred in selecting, as my principal subjects, practitioners who regarded themselves as makers of music.

I want, however, to make a broader historical claim in this narrative: namely, that by charting Tudor and Oliveros’s journey from the practice of experimental and electronic music in the Fifties and Sixties to a considerably fuzzier disciplinary space in the late Seventies and early Eighties—an intermediary zone straddling the world of music and the world of art—one can come to better understand how *electronic mediation*, a subject scarcely broached by Goehr in her sweeping history of the *Werktrne*, transformed the nature of the musical “work” and its regulating principles in the postwar period.²² One can thus observe how mediation restructured the musical work’s associated protocols (of composition, performance, notation, and live presentation), and rewrote its very

²¹ Douglas Kahn, “Digits on the Historical Pulse: Being a Way to Think About How So Much Is Happening and Has Happened in Sound in the Arts,” text for “Refresh! The First International Conference on the Histories of Art, Science and Technology,” 2002, accessed February 26, 2022, <https://bit.ly/3v1K5XX>.

²² Georgina Born has discussed Goehr’s relative silence regarding electronic mediation (specifically within the context of *The Imaginary Museum of Musical Works*) and has shrewdly speculated as to its implications for the work-concept. Born, “On Musical Mediation,” 11–15. Goehr herself has addressed this subject at some length in Lydia Goehr, “Three Blind Mice: Goodman, McLuhan, and Adorno on the Art of Music and Listening in the Age of Global Transmission,” *New German Critique*, no. 104, Adorno’s Aesthetic (Summer 2008): 1–31, <https://doi.org/10.1215/0094033X-2008-001>.

ontology, such that it could render problematic the boundaries between disciplines, beg new critical vocabularies and definitional frameworks, and, indeed, broker its entry into the museum.

Following Tudor and Oliveros's respective evolutions between 1950 and 1980, examining them first individually, and then in the context of their repeat collaborations and convergences, I argue that their encounters with media—including magnetic tape, do-it-yourself circuitry, and biomedical technology, or “biofeedback”—dramatically shaped their approaches to, and philosophies of, composition, performance, and listening; I argue that through their intimate engagements with these technologies, they arrived at profound new understandings of what “liveness,” presence, and agency might mean in the context of electronic musical performance; and I argue that their myriad mediations yielded models of embodied sonic experience that pressed them beyond the strict boundaries of the musical discipline, and into the cross-disciplinary terrain out of which “sound art” emerged. It will be seen, ultimately, that these models of sonic embodiment, and the theories of musical mediation inscribed in them, have continued to engender complexly situated sonic practices, and continue to pose generative questions about not only music’s mediation, but also our relationship with technology and the body.

In no way do I want to argue that technology *determined* the trajectories that Tudor and Oliveros took in the postwar decades, acting on them unilaterally to force transformations in their practice and lead them to a place preordained in the hard-wiring of electronics. As I will show, these practitioners’ relationships with media were fraught, complex, and ever shifting; and Tudor and Oliveros related to the technologies they adopted not by passively accepting their surface affordances and advertised uses, as it were, but by engaging them creatively, agonistically, and via back-and-forth exchanges of agency whereby they acted on media, and media acted on them. At one and the same time that they participated in this “dance” of technological agency, to borrow a turn of phrase from Andrew Pickering, they participated in a feedback loop with one another, passing

influence and encouragement back and forth, enabling one another in their respective explorations, and drawing one another into their respective East Coast (Tudor) and West Coast (Oliveros) networks.²³

That Oliveros and Tudor's experiments unfolded in close parallel, and alongside a back-channel dialogue, is not incidental to this narrative, for in the Seventies, as will be seen, the practitioners arrived at strikingly different, yet complementary models of sonic embodiment shaped not only by their highly individualized relationships with technology, but also by their relationship with one another: Tudor, in his move from piano interpretation to live-electronic experimentation, arrived at an understanding of technologies as *bodies* possessed of their own agency and voice; and in her inverse move from electronic experimentation to an ostensibly “unplugged” performance practice oriented around sonic “meditations,” or listening exercises, Oliveros arrived at an understanding of bodies as *technologies* capable of a dynamic, projective new listening. To inquire after the sustained resonances between Oliveros and Tudor’s paths of development is to arrive at understandings of their individual philosophies and practices otherwise consigned to silence.

2. Historiographic Rewiring

In grappling with the careers of David Tudor and Pauline Oliveros, I enter two fast-growing streams of scholarship dedicated to the investigation of their respective practices and prolific bodies of work. I want to briefly survey these two veins of literature before clarifying the nature of my intended interventions. For many years, there existed no holistic and authoritative account of Tudor’s split career as a piano performer, in the Fifties and early Sixties, and as a performer-composer of electronic assemblages from the early Sixties onwards. There existed, instead, several

²³ Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science* (Chicago: The University of Chicago Press, 1995), 21–22, 116–119.

rigorous dissertations dedicated to different arcs within his life and work. Musicologist John Holzaepfel's pivotal 1994 thesis "David Tudor and the Performance of American Experimental Music, 1950–59," broke the lengthy silence on Tudor's instrumental role in the development of the American experimental tradition, turning to his interpretive work for the composers of the so-called "New York School" (John Cage, Morton Feldman, 1926–1987, Earle Brown, 1926–2002, and Christian Wolff, 1934); musicologist Eric Smigel's 2003 thesis "Alchemy of the Avant-Garde: David Tudor and the New Music of the 1950s" built on Holzaepfel's account while also clarifying Tudor's relationship with the European avant-garde, or the "Darmstadt School"; and musicologist Matt Rogalsky's "Idea and Community: The Growth of David Tudor's Rainforest, 1965–2006," rigorously documented the evolution of Tudor's *Rainforest*, a project central to this account.²⁴ (An eventual member of the performance group Composers Inside Electronics, Rogalsky became an actor in his own history.) Finally, in 2021, musicologist You Nakai published *Reminded by the Instruments: David Tudor's Music*, a comprehensive first attempt to cross-connect these variable arcs in Tudor's career, and a reclamation effort that painstakingly reconstructs the most well-hidden artifacts of the musician's thinking, from his block diagrams to his spiritual and esoteric concerns.²⁵

Oliveros's long and many-faceted career has been subject to fewer, but no less valuable studies: *The Music of Pauline Oliveros* (1983), an intimate biographical account written by one of Oliveros's own former students, musician Heidi von Gunden, stakes out the major stages of the former's practice, from her electronic music and "theater pieces" of the Sixties, to her meditation practice of the Seventies; musicologist Katherine Setar's 1997 thesis "An Evolution in Listening. . ." casts a more focused analytical eye on compositions drawn from several periods of Oliveros's career;

²⁴ John Holzaepfel, "David Tudor and the Performance of American Experimental Music, 1950–1959" (PhD diss., City University of New York, 1994); Eric Smigel, "Alchemy of the Avant-Garde: David Tudor and the New Music of the 1950s" (PhD diss., University of Southern California, 2003); Matthew R. Rogalsky, "Idea and Community: The Growth of David Tudor's Rainforest, 1965–2006" (PhD diss., City University of London, 2006).

²⁵ You Nakai, *Reminded by the Instruments: David Tudor's Music* (New York: Oxford University Press, 2020).

and musicologist Martha Mockus's 2008 monograph *Sounding Out: Pauline Oliveros and Lesbian Musicality* remains singular, and singularly valuable, in its examination of how Oliveros's lesbian identity, lively network of female lovers, friends, and collaborators, and generatively queer notions of sounding and listening have shaped the full expanse of her work.²⁶ Musicologist David W. Bernstein's 2008 edited volume *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde*, an inexhaustible document, is a sweeping oral history and polyphonic survey of the Bay Area music studio where Oliveros (and, on one occasion, Tudor) experienced enduring breakthroughs brokered by interdisciplinary collaboration and electronic mediation.²⁷

Inasmuch as my study oscillates between its two subjects and narrative anchors, who each left behind formidable trails of work, it is not comprehensive in any neat monographic sense; while I attend closely and individually to my practitioners' early periods of growth (for the elder Tudor, roughly 1950–1960, and for Oliveros, roughly 1958–1963), I adopt a wider, split perspective upon moving into the Sixties (their most sustained period of collaboration), and retain this vantage while progressing through the Seventies. My account of Tudor and Oliveros's own work effectively ends in 1980; by this time, as I will show, the musicians' cascading mediations of the Sixties and Seventies had yielded practical models and media theories that carried them over disciplinary divides, and ensured, already, the longevity of their influence among sound and media artists. What I do hope, however, is that this study's orienting focus on Tudor and Oliveros's changing relationships with (and conceptions of) media and embodiment will draw attention to connections and continuities in the musicians' practices that have gone largely unacknowledged.

²⁶ Heidi Von Gunden, *The Music of Pauline Oliveros* (Metuchen, NJ: Scarecrow Press, 1983); Katherine Marie Setar, "An Evolution in Listening: An Analytical and Critical Study of Structural, Acoustic, and Phenomenal Aspects of Selected Works by Pauline Oliveros" (PhD diss., University of Southern California, 1997); Martha Mockus, *Sounding Out: Pauline Oliveros and Lesbian Musicality* (New York: Routledge, 2008).

²⁷ David W. Bernstein, ed., *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde* (Berkeley: University of California Press, 2008).

As I have mentioned, studies of Oliveros and Tudor have tended to offer windows onto specific moments in their respective evolutions, and particular strands of their practices. This is understandable, for more than just pragmatic reasons: in their lifetimes, Tudor and Oliveros both passed through dramatically different phases of work. Tudor's major passage was, of course, that which took him from piano interpretation to original work with electronics in the Sixties. Oliveros, meanwhile, has claimed that she passed through several "stages" in the Sixties and Seventies that "sometimes overlapped, or blended before ending"; she cites, among her musical stages, "Traditional, Improvisational, Electronic, Theatrical, and . . . Meditational."²⁸ It is not only that these different phases and stages have been tackled by differently inclined, and differently trained scholars working on them relatively selectively; it is more the case, and more significant, that the divisions between Oliveros and Tudor's creative waystations (reinforced, in both musicians' cases, by their own words) have been taken for granted and presumed meaningful. For example, a prevailing narrative long held that Tudor wholly and irreversibly transformed from a "performer" to a "composer" in the mid Sixties; in actuality, as You Nakai insists, the musician never stopped performing the work of others, even when he proceeded to make work of his own.²⁹ Studies of Oliveros, and even those which aim for a fuller representation of her life and work, have similarly siloed her "Electronic," "Theatrical," and "Meditational" work, respectively, failing to heed her own caveat that these stages "overlapped" and "blended."³⁰

I want to intervene into this historiographic situation by arguing that Tudor and Oliveros's careers (at least between the dates of 1950 and 1980) were shaped, in their entirety, by a continued

²⁸ Pauline Oliveros, "Software for People" (1978), in *Software for People: Collected Writings 1963-80*, 2nd ed. (Kingston, NY: Pauline Oliveros Publications, 2015), 180.

²⁹ Nakai, *Reminded by the Instruments*, 141–143. Nakai locates a privileged example of the stubborn "composer to performer" narrative in James Pritchett, "David Tudor as Composer/Performer in Cage's *Variations II*," *Leonardo Music Journal* 14 (2004): 11–16, <https://doi.org/10.1162/0961121043067316>.

³⁰ One finds this sort of faceted approach in Von Gunden, *Music of Oliveros*.

engagement with, and personal theorization of, electronics and their mechanisms of mediation. In Tudor's case, I want to argue that his move from traditional to electronic instrumentation must be understood in view of the nature of the piano music he performed in the Fifties—which, I suggest, was composed under the noted influence of emerging media and their affordances (see Chapter 1). In Oliveros's case, I want to argue that her pivotal experiments with tape in the early Sixties informed nearly all the work she produced in that decade and the next, including her “Meditational” work—long understood as a turn away from the realm of the technological (see Chapter 4).

My chosen approach to Tudor and Oliveros's practices, and my native discipline, have necessitated a somewhat unconventional bricolage of methodologies. It will not escape the readers paging (or scrolling) through this dissertation that my training in art history places me in stark contrast with most of the commentators who have studied these practitioners before me—nearly all of them musicologists. Nor will it escape those readers that my lack of fluency in musicology's theoretical and methodological toolkit has erected certain inescapable barriers between me and my subjects; I may, at many points in this narrative, have the appearance of a traveling out-of-towner lost on some unfamiliar cul-de-sac. It is my hope that my art-historical perspective will clarify certain unrecognized connections and cross-channels of influence patterning Oliveros and Tudor's development, and in Chapter 4 and this project's Conclusion, I address such connections at length while examining the musicians' drift into arts institutions.

Generally, however, I have chosen, throughout this narrative, to call on the frameworks and vocabularies of contemporary media theory. While I do not adhere exclusively to any single media-theoretical doctrine, I have tended generally to ally with the tradition of “German media theory” (a contentious term) that has followed from Friedrich Kittler's influential body of writings.³¹ Kittler

³¹ See, for a concise account of the post-Kittlerian landscape, Alexander Rehding, “Discrete/Continuous: Music and Media Theory after Kittler: Introduction,” *Journey of the American Musicological Society* 70, no. 1 (Spring 2017): 221–228, <https://doi.org/10.1525/jams.2017.70.1.221>. See also Bernard Dionysius Geoghegan, “After Kittler: On the Cultural

provides us with several invaluable concepts, including that of the “discourse network” (in a reimagining of Foucauldian discourse analysis, the historically specific networks of media that determine what knowledge and information can be stored, transmitted, and processed in a given epoch), and that of the fundamental distinction between “technical” or “technological” media and, for example, print media (the former process signals and physical data-streams, and the latter symbols and signs—the stuff of semiotics).³² The latter division is especially useful for a finer understanding of (technical) media’s relationship with practices of musical notation. If Kittler himself is of only limited value in this narrative, it is because in his understanding of media, quite fairly regarded as “determinist,” agency flows in only one direction: from the media that “determine our situation” and work on our thoughts, downward to our bodies and minds, regarded as only phantasmatic reflections of available technologies.³³

One finds a more profitable model for wrestling with Tudor and Oliveros’s relationship with media—shaped by back-and-forth exchanges of agency, technological misuse, and the stubbornness of the (human) body—in the “post-Kittlerian” framework of “cultural techniques.” As represented in the work of Bernhard Siegert, Sybille Krämer, and others, the cultural-technical perspective attends to the space of practice in which media operate, but also take shape in the first place, their contours determined by *already* operative material procedures, embodied routines, and culturally specific ways of knowing and doing.³⁴ Oriented towards more fractious and non-linear exchanges of

Techniques of Recent German Media Theory,” *Theory, Culture & Society* 30, no. 6 (2013): 66–82, <https://doi.org/10.1177/0263276413488962>.

³² Regarding the distinction between “technical media” and “print media,” and for a gloss on Kittler’s “discourse networks,” see Sybille Krämer, “The Cultural Techniques of Time Axis Manipulation: On Friedrich Kittler’s Conception of Media,” *Theory, Culture & Society* 23, nos. 7–8 (2006): 93–94, 97–98, <https://doi.org/10.1177/0263276406069885>.

³³ States Kittler, memorably, at the beginning of his *Gramophone, Film, Typewriter* (1986): “Media determine our situation, which—in spite or because of it—deserves a description.” Friedrich A. Kittler, *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael Wutz, Writing Science (Stanford, CA: Stanford University Press, [1986] 1999).

³⁴ See, for an authoritative introduction to cultural techniques, Bernhard Siegert, *Cultural Techniques: Grids, Filters, Doors, and Other Articulations of the Real*, trans. Geoffrey Winthrop-Young, 1st ed., Meaning Systems, vol. 22 (New York: Fordham University Press, 2015), 1–18.

agency, the cultural-technical model offers a means of grappling with the shifting and uneven “micronetworks of technologies and techniques” around which Tudor and Oliveros’s practices cohered, and out of which a hybrid “sound art” evolved.³⁵ What is more, this media-theoretical perspective posits a permeability between technologies and bodies more complex than the logic of perceptual “extension” that *ur*-media theorist Marshall McLuhan famously discussed in his writings of the Sixties.³⁶

In directing these theories towards the analysis of musical practice, I draw important inspiration from recent work by musicologists and music theorists—among them, Alexander Rehding, Emily Dolan, and Thomas Patteson—that has centered musical instruments as sites of embodied theory and knowledge and situated them in larger (discourse) networks populated not only by musical artifacts, but by scientific instruments and electronic media.³⁷ Patteson’s recent text *Instruments of a New Music* (2016), which richly reconstructs the unfairly neglected evolution of electrical, electromechanical, and electronic instruments in the prewar period, stands as a particularly relevant precedent for this study. In discussing, for example, the theories and experiments of artists Piet Mondrian (1872–1944) and László Moholy-Nagy (1895–1946), who sought to redirect communications media and narrowly “reproductive” devices like the gramophone towards productive musical ends (in effect, *instrumentalizing* them), Patteson observes an expanded conception of “instrumentality” that allows him to understand how media technologies were

³⁵ Siegert, *Cultural Techniques*, 11.

³⁶ See, canonically, Marshall McLuhan, *Understanding Media: The Extensions of Man*, 1st MIT Press ed. (Cambridge, MA: MIT Press, [1964] 1994). Kittler cites McLuhan as a noted influence, although he takes issue with a perceived anthropocentrism in his approach. See, e.g., Friedrich A. Kittler, *Optical Media: Berlin Lectures 1999*, trans. Anthony Enns (Cambridge: Polity, 2010), 29–33.

³⁷ See, variously: Alexander Rehding, “Instruments of Music Theory,” *Music Theory Online* 22, no. 4 (December 2016): 1–22, <https://mtosmt.org/issues/mto.16.22.4/mto.16.22.4.rehding.pdf>; Alexander Rehding, “Opening the Music Box,” *Journey of the Royal Musical Association* 144, no. 1 (2019): 205–221, <https://doi.org/10.1080/02690403.2019.1575596>; John Tresch and Emily I. Dolan, “Toward a New Organology: Instruments of Music and Science,” *Osiris* 28, no. 1, Music, Sound, and the Laboratory 1750–1980 (January 2013): 278–98, <https://doi.org/10.1086/671381>; and Thomas Patteson, *Instruments for New Music: Sound, Technology, and Modernism* (Oakland: University of California Press, 2016).

appropriated and “turn[ed]. . .into instruments for new music.”³⁸ I share Patteson’s interest in the fluid exchange between media and instruments, but I generally do not draw distinctions between these categories of artifacts; nor, indeed, would I seek to differentiate them based on “patterns of use,” as Patteson does. Inasmuch as I am concerned with the capacity of media to, per Bernhard Siegert, “destabilize” and “deterritorialize” music’s procedures and protocols and resituate practices like those of Tudor and Oliveros in more complex and fluid disciplinary contexts, I am after something much different than Patteson.³⁹ In this account, to focus on the collapse of media *into* musical instruments would be to lose sight of how tape, circuitry, and sound-systems brought my practitioners beyond the limits of the strictly musical. I thus attempt, throughout this account, to retain a “media-specific” frame of reference, and otherwise speak of “media,” “technologies,” and “electronics”—categorical descriptors whose capaciousness makes them both useful and, admittedly, inelegant.



Above, I have forecast the ways in which my focus on Oliveros and Tudor’s relationships with media, and my methodological recourse to media theory, might serve to rewire existing histories of the two practitioners. What of “sound art,” that strange stretch of cross-disciplinary terrain that lies at the end of this narrative’s winding road? While the subject of sound art has, per musicologist Brian Kane, sustained a “cottage industry” of historical and theoretical texts in recent years, it would be to severely underestimate things to point out that it remains a polarizing and contentious topic among both commentators and practitioners.⁴⁰ The problem is, in part, one of historicity and anachronism: as a *widely* cited term and a full-fledged “genre” with considerable

³⁸ Patteson, *Instruments for New Music*, 7–8, 87–90.

³⁹ Siegert, *Cultural Techniques*, 15.

⁴⁰ Brian Kane, “Musicophobia, or Sound Art and the Demands of Art Theory,” *Nonsite*, no. 8 (January 20, 2013): <https://nonsite.org/article/musicophobia-or-sound-art-and-the-demands-of-art-theory>.

presence in literature and institutions, “sound art” effectively dates to the turn of the millennium.⁴¹

However, the work it has presumed to name stretches back nearly a century—most often to Italian Futurist Luigi Russolo (1885–1947) and John Cage, who have been regarded as originary or otherwise ancestral sound artists.⁴² Add to this the fact that no two critics, historians, or curators have ever seemed capable of agreeing upon sound art’s definitional parameters. In its conceptual fluidity and its lack of historical mooring, the subject of sound art has tended to inspire texts invested in the guerrilla reclamation and revision of existing historical narratives; and it has, in an adjunct development, inspired intricately engineered philosophical programs designed to sort and sift “sound art” from “music” once and for all. (Brian Kane has shrewdly ascribed this sifting impulse to a “musicophobia” among art theorists.⁴³)

In this narrative, which arrives at “sound art” only in its third act, I try to engage with this fraught genre as an *actor’s category* alone, and in this regard, I hew to that strange moment in the late Seventies and early Eighties when practitioners, critics, and curators began to awkwardly speak its name. As I am concerned with sound art as a *creature* of technological experimentation—as an artifactual, unresolved remainder cast off by the musical work’s mediations—I reject recourse to *a priori* frameworks and definitions. Mine is a history of sound art’s preconditions, and it presumes to offer only one of many paths to its fitful and fractious genesis. I would be remiss not to cite, as an important precedent for my highly cautious historiographic disposition, art historian Douglas Kahn’s canonical *Noise Water Meat* (1999), a history not of “sound art,” but rather “sound *in the arts*” that cuts across the modernist and avant-garde arts of the twentieth century in its search for all manners of engagement with noise, the voice, and, of relevance here, sound technology. Not only is Kahn

⁴¹ Alan Licht, *Sound Art Revisited* (New York: Bloomsbury Academic, 2019), 4–5.

⁴² See, e.g., Christoph Cox, “Sound Art in America: Cage and Beyond,” in *Sound Art: Sound as a Medium of Art*, ed. Peter Weibel (Cambridge, MA: MIT Press, 2019), 676–687.

⁴³ Kane, “Musicophobia.”

willing to admit that there existed no “sound art” before the late twentieth century—he is *interested* in this curious fact; and he offers a productive model for understanding the impoverished conceptions of aurality present in the arts for so many decades.

Borrowing an idea from Dan Lander, an editor, alongside Micah Lexier, of the significant 1990 anthology *Sound by Artists* (in retrospect, an auspicious omen of the millennial turn towards “sound art”), Kahn argues that musical modernism—passing from Russolo, to composer Edgard Varèse (1883–1965), to electronic musician Pierre Schaeffer (1910–1995), and at last to John Cage—developed and sustained itself through a continued “musicalization” of “noise and worldly sound.”⁴⁴ Keeping itself alive by feasting again and again on “extra-musical” phenomena outside of the bounds of “musical materiality,” avant-garde music, per Kahn, stretched itself to the point of boundlessness, refusing to stop until it had “musicalized” silence (recall Cage’s *4’33”*) and leaving no room for the growth of *non*-musical sonic arts.

Kahn has argued that over the course of the twentieth century, avant-garde musicalization lay in ever-mounting tension with the “sociality of sound” brought about by emerging technologies—“phonography and telephony, microphony, amplification, sound film,” among others.⁴⁵ These technologies rendered sound newly promiscuous in its meaning and materiality, subjecting it to “composition, relocation, [and] dispersal,” and making it artistically fungible outside of straightforwardly musical idioms.⁴⁶ This narrative, which extends beyond the historical frame of Kahn’s *Noise Water Meat*, should serve to confirm the soundness and continued resonance of his contentions; for it is media, in my final act, that smuggle sound beyond the reach of musicalization’s long shadow, completing their work of “relocation” begun over half a century before.

⁴⁴ Douglas Kahn, *Noise, Water, Meat: A History of Sound in the Arts* (Cambridge, MA: MIT Press, 2001), 161–165. Kahn credits the notion of “musicalization” to Dan Lander and Micah Lexier, eds., *Sound by Artists* (Toronto: Art Metropole, 1990).

⁴⁵ Douglas Kahn, “Track Organology,” *October* 55 (Winter 1990): 71, <https://doi.org/10.2307/778938>.

⁴⁶ Kahn, “Track Organology,” 72.

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I intend one last intervention in this project—one that concerns friendship. Oliveros and Tudor were friends; and while aspects of this friendship escape the historical record—in part because Tudor's repeat visits to California in the Sixties and Seventies annulled the need for correspondence—the pair's reciprocal influence will figure throughout this project's latter half. The height of the regard in which they held one another, and the depth of their mutual understanding, is clearly registered in recommendation letters they wrote one another some eighteen years apart. Circa 1969, on an upside-down American Airlines comment form, Tudor scratched out a draft letter to a “w.o.” Almost certainly, the initials belong to Will Ogdon (1921–2013), the founding Chair of the Department of Music at University of California, San Diego (UCSD); Oliveros taught at UCSD from 1967 until 1981, and after only two years at the school, she was eligible for a promotion to the rank of Assistant Professor. Wrote Tudor:

I'm sorry this response is so delayed, & hope it is still in time. I am spread all over the map as usual. I'm very pleased that p.o. is being considered for another appointment at UCSD, because* ~~there is no one in her field whose gifts I value more highly~~ *I have always had a special regard for her gifts. ~~In~~ She is one of the people to whom we look for new ideas, & in the past we follow her work as composer with the greatest interest. In e. [electronic] music she is in the forefront. In my professional association with her, I have on every occasion been struck by the faithfulness with which she carries out her obligations, & with her ability to implement a course of action which she has decided upon. In her relationships with students I always notice the calmness & insight with which she meets each person, & I ~~feel~~ believe that these qualities help her to find ~~the~~ the most direct and concentrated ^routes methods in her teaching. In short, I couldn't think of anyone more valuable addition [sic] to your department.⁴⁷

Oliveros received the promotion.⁴⁸ And in 1987, at which time Tudor was seeking a fellowship from the John Simon Guggenheim Memorial Foundation, she had an opportunity to repay the favor. Her confidential report read thus:

⁴⁷ Unlabeled and undated recommendation letter for Pauline Oliveros, c. 1969, Box 108, Folder 9, David Tudor Papers (hereafter Tudor Papers), accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

⁴⁸ Correspondence concerning Oliveros's promotion to Assistant Professor at University of California, San Diego, March 1969, Box 30, Folder 3, Pauline Oliveros Papers (hereafter Oliveros Papers), MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

Why David Tudor has never received a Guggenheim Fellowship is a complete and total mystery to me. Tudor has created the most incredible vocabulary of electronic sounds that I know. Tudor is a consummate craftsman and composer as well as one of the great performers of our time. Tudor is exceptional in his ability to collaborate with other artists as well as scientists, bringing all his skills as an artist and human being to bear on the work at hand. Tudor's results are well documented by recordings, writing and oral history. Because Tudor has been such a sterling performer of others' work perhaps his outstanding work as a composer has not been seriously considered. If this is the case, then a serious error has been committed more than once. I beg your consideration of David Tudor as one of the hidden genius composers who deserves your support as such.⁴⁹

It is unknown whether Tudor received the fellowship, which would have supported his continued work on *9 Lines Reflected* (1986), a collaboration with French-American kite artist Jackie Matisse Monnier (1931–); but Oliveros's lavished praise is highly instructive, in any event.⁵⁰ As I hope to suggest, the qualities named in these brief letters—"faithfulness," "calmness," an "exceptional" capacity for collaboration, and, indeed, "genius"—are precisely those that Tudor and Oliveros recognized in one another upon their initial meeting in 1963. Moreover, their recognition and experience of each other's "gifts" helped propel them forward in the decades following, during which time they pursued highly distinct models of practice, yet remained synchronized in their concerns, which circulated around media, the body, and the virtues of listening. "There was a deep understanding between us," Oliveros explained to John Holzaepfel in 2010, reflecting on her relationship with Tudor: "I don't know what it was. . . . It was more telepathic, I think, or merely that there was something understood."⁵¹ To trace the contours of Oliveros and Tudor's mutual understanding, and to sound out the resonances they exchanged mind-to-mind, body-to-body, is, I hope, to grasp their practices anew.

⁴⁹ Recommendation letter written for Tudor's Guggenheim Fellowship application, 1987, Box 27, Folder 27, Pauline Oliveros Papers (hereafter Oliveros Papers NYPL), JPB 94-5, Music Division, The New York Public Library, New York, NY.

⁵⁰ Regarding Tudor and Jackie Matisse Monnier's *9 Lines Reflected*, see Nakai, *Reminded by the Instruments*, 531–548.

⁵¹ John Holzaepfel, liner notes for *Music from the Tudorfest: San Francisco Tape Music Center 1964*, New World Music 80762-2, 2014, compact disc.

3. Structure of the project

This dissertation comprises four chapters: while Chapters 1 and 2 examine Tudor and Oliveros individually, looking respectively at their periods of early development, Chapters 3 and 4 examine them in parallel, moving between their convergences and collaborations, and their activities carried out independently. Chapter 1 follows Tudor's career as a virtuoso piano performer and interpreter for Pierre Boulez (1925–2016), John Cage, and others between 1950 and 1960. While this period of Tudor's life and work has been examined extensively, I propose a reframing of the musician's early piano repertory oriented towards its latent links with electronic media and their affordances. Looking, for example, at Tudor's central role in the development of Cage's landmark *Music of Changes* (1951), I demonstrate that Cage's work, while composed for piano, bore the impress of the composer's contemporaneous engagements with magnetic tape. I argue that Tudor, in working to interpret and perform this and other works by the “New York School” of composers, was compelled to *technologize* his own performing body and mind so as to better emulate the media lurking behind his repertory. I further argue that a grasp of this transformation, and of the technicity of Tudor's performance practice, enables a better understanding of how and why he gravitated towards electronic instrumentation in the early Sixties upon growing disillusioned with the piano.

In Chapter 2, I chart Oliveros's early development as a composer between 1958 and 1963, focusing primarily on her extended engagement with the medium of electronic tape. Situating Oliveros in a network of Bay Area experimentalists and narrating the establishment of the San Francisco Tape Music Center, the electronic music studio and performance space in which Oliveros closely embedded herself beginning in 1963, I trace out the context for her later development as an electronic musician in the early-to-mid Sixties. While I attend to Oliveros's first and most pivotal compositional experiments with tape, I also examine her works for conventional instrumentation (including a major choral work), arguing that tape's affordances profoundly shaped her broader

musical practice, as well as her approach to (and philosophy of) listening. I insist, however, that Oliveros's relationship with tape in these early years did not unfold in accordance with a logic of technological determinism; I suggest that not merely drawing influence *from* tape, she also impressed her queer subjectivity and embodied experience back onto the medium, engaging in a back-and-forth exchange of agency that came to structure her work with electronics throughout the Sixties and Seventies.

In Chapter 3, which is split in its focus between Oliveros and Tudor, I depart from the pair's initial meeting in 1963, and extensively reconstruct their participation in "Tudorfest," a festival that Oliveros organized at the San Francisco Tape Music Center in 1964 in order to celebrate Tudor's career as a performer of experimental music. In my analysis of "Tudorfest," whose program selections were largely determined by Tudor, and drawn from his current repertory, I provide a neat précis of his performance activities between 1960 and 1963 (a key transitional period not covered in Chapter 1); I also discuss Tudor and Oliveros's first duo performance, an elaborately conceived highlight of the festival, at length. Departing from "Tudorfest," I closely track Oliveros and Tudor's activities (both alone and together) between 1963 and 1966; this time period, which, I demonstrate, saw both practitioners searching after new approaches to "live" (as opposed to taped) electronic music, marked Tudor's decisive move to original work with electronics, and Oliveros's move to intricate "theater pieces" making use of innovations such as props, prose notation, and, eventually, live tape-delay. Arriving, at last, at a discussion of the practitioners' contributions to major arts festivals on the East (Tudor) and West (Oliveros) coasts, I argue that their respective searches for models of "liveness" and presence in the context of electronic musical performance productively unsettled the divisions between performer, composer, and audience undergirding Lydia Goehr's *Werktrueue* (work-concept), and anticipated the embodied sonic practices they developed in the late Sixties and early Seventies.

In Chapter 4, another “split” chapter, I turn to these embodied practices in earnest, looking respectively at the development of Tudor’s *Rainforest* project between 1968 and 1973, and at the evolution of Oliveros’s *Sonic Meditations* (1971–73); I meanwhile continue to track the practitioners’ convergences, discussing, for example, their shared participation in PepsiCo’s pavilion at the 1970 world’s fair in Osaka, Japan (Expo ’70). I argue that *Rainforest* and the *Sonic Meditations* proposed transformed conceptions of the musical “work” on the level of its very ontology, grounding it in human and technological bodies, and wresting it from the transcendent space of Goehr’s “imaginary museum”; and I show that these embodied sonic practices, which reflected different strands of contemporary artistic practice circa 1975, precipitated Tudor and Oliveros’s decisive move into art-institutional spaces. In my Conclusion, I assess the consequences of this disciplinary rupture: I examine Tudor and Oliveros’s participation in several early institutional surveys of a so-called “sound art” (or something like it) circa 1980–83; I briefly discuss the metabolization of their influence by collaborators and pupils who extended the implications of their hybrid sonic practices; and, moving onward to the new millennium, I speculate as to Tudor and Oliveros’s longer legacies and continued resonance, proposing that the practitioners leave us with theories and models of musical mediation whose relevance and power is registered in sound art and experimental music of the present day.

Chapter 1: *L'Automate*, or David Tudor and the Techno-logical, 1950–1960

Introduction: From Piano to Electronics

David Tudor was the subject of few major articles during the twenty-five years (1950–1975) coinciding with his most substantial artistic development. There are two welcome exceptions: the first dates to 1960, when music critic Harold C. Schonberg profiled Tudor in a *Harper's Magazine* article titled “The Far-Out Pianist.” An earnest attempt to place the highly but *selectively* renowned pianist on the public stage, and describe the works in his avant-garde repertory in everyday language, the article abounds with quotable bits. It begins: “About the closest thing to a monopoly in the field of music is exercised by a quiet, noncommittal, and uneccentric pianist named David Tudor who plays what probably is the noisiest, brashest, and most eccentric music possible today.”¹ And a little further down in the first column:

Tudor is the world’s outstanding piano specialist in music so arcane and rarefied that it. . . may even leave music far behind. . . . To most listeners it is a haphazard series of single disconnected sounds: a ping in the high treble of the piano, followed a few moments later by a plunk in the bass, interspersed with the unearthly chuckle of a tape recorder. It is the music of John Cage, of Morton Feldman, of Christian Wolff, Earle Brown, Karlheinz Stockhausen, Pierre Boulez, Sylvano Bussotti, and several other experimentalists.²

“Far out” indeed. While Schonberg’s article may have been many readers’ first exposure to Tudor, the profile is in fact something of a mid-career round-up detailing a full decade of extensive activity: since 1950–51, Tudor had been functioning as the premiere performer of what would eventually be called “American experimental music”: a tradition most vocally represented, circa 1960, by John Cage and his fellow composers in the so-called “New York School”: Morton Feldman, Earle Brown, and Christian Wolff.³ Via his New York School ties, and particularly his

¹ Harold C. Schonberg, “The Far-Out Pianist,” *Harper's Magazine*, June 1, 1960, 49.

² Schonberg, “Far-Out Pianist.”

³ On the so-called “New York School” of composers, see David Nicholls, “Getting Rid of the Glue: The Music of the New York School,” *Journal of American Studies* 27, no. 3, American Art and Music (December 1993): 335–353, <https://doi.org/10.1017/S0021875800032060>; and Kyle Gann, ‘John Cage and the New-York School Revolution,’ in

close link with Cage (virtually all of Cage's Fifties output was expressly composed for Tudor, who premiered each and every work with religious devotion), Tudor had become known as a dedicated peddler of "random" and "silent" music—work composed through the flipping of coins and driven below the threshold of audibility. But in the latter half of the Fifties, Tudor had also achieved a virtuoso's stature in the European circles clustered around Darmstadt, Germany's "International Summer Courses for New Music," where composers like Karlheinz Stockhausen (1928–2007) tasked him with the performance of breathtakingly complex work composed in the serialist tradition. Schonberg's profile depicts Tudor as a quietly unstoppable force—but already by 1960, he had begun to grow tired. The weight of his repertory and his sprawling concert schedule were wearing him thin.

Fast-forward twelve years: in 1972, Tudor was interviewed by one Victor Schonfeld for an article in the magazine *Music and Musicians*. Titled "From Piano to Electronics," the piece, in its published form, has been made to resemble a monologue by Tudor, with Schonfeld's questions excised. Effectively a comprehensive autobiography, the article finds Tudor reflecting on his career at his most lucid, and describing a musical practice pitched worlds apart from the activity that occupied him in the Fifties. While Tudor runs through his history as the world's premiere avant-garde piano virtuoso, he abruptly reveals that at some point he "got interested in electronic circuitry," and in the mid-to-late Sixties, began to "think of [him]self as a composer."⁴ Describing his then-current output, Tudor muses on musical works closer in nature to sound installations than compositions, describing recital halls filled with loudspeakers transformed into "individuals" with

American Music in the Twentieth Century (New York: Schirmer Books, 1997), 127–153. The original source of the phrase "getting rid of the glue" is composer Henry Cowell, who allegedly uttered it before a New School concert featuring the New York School composers; it is Cage, however, who popularized it, quoting it in a 1958 article. See John Cage, "History of Experimental Music in the United States" (1958) in *Silence: Lectures and Writings*, 50th Anniversary ed. (Middletown, CT: Wesleyan University Press, 2011), 71.

⁴ David Tudor, "From Piano to Electronics," *Music and Musicians*, August 1972, 25–26.

their own “individual voice[s],” expressing interest in autopoietic feedback systems, and advocating a sort of technological animism marked by the treatment of electronic assemblages as capital-N “Nature.”⁵

What happened between these two articles? More pertinently, what happened between Tudor’s Fifties career as a virtuoso pianist, and his Sixties and Seventies evolution into an electronic musician and (for all intents and purposes) a media or sound artist? While Tudor’s 1972 article is titled “*From Piano to Electronics*,” it reveals remarkably little about the musician’s transition between two related, yet distinct, developmental paths. And although existing scholarship has worked to make sense of Tudor’s metamorphosis, locating the points of practical and philosophical continuity binding the two major arcs in his career, it is also true that the some of the most comprehensive accounts of Tudor’s work are weighted towards either *piano* or *electronics*, respectively. Musicologists John Holzaepfel, Eric Smigel, Martin Iddon, and Austin Clarkson have each made critical contributions to our understanding of Tudor as a performer of postwar music in the Fifties, focusing closely on his relationships with American experimentalism and the Darmstadt school, and methodically picking apart his idiosyncratic approach to piano interpretation. Meanwhile, musicologist Matt Rogalsky, via an intricate dissection of Tudor’s *Rainforest* series and related works, has brilliantly documented Tudor’s activities in the Sixties and beyond, reconstructing his growth as a composer-constructor of electronic circuits and lively feedback systems. You Nakai’s recent, sweeping monograph *Reminded by the Instruments* (2020) is unique in its effort to craft a panoramic picture of Tudor’s development stretching from his adolescence to the end of his life.

As regards Tudor’s transition between piano and electronics, Nakai, Holzaepfel, and musicologist James Pritchett have each raised hypotheses: Holzaepfel and Pritchett feel that Tudor’s turn to composition was inevitable given the nature of the work he chose to interpret and perform;

⁵ Tudor, “Piano to Electronics,” 26.

this music, they observe, was often so open-ended and “indeterminate” (left to performer discretion) that it forced Tudor to assume the role of a co-composer.⁶ Meanwhile, Nakai reconstructs Tudor’s turn to electronics in view of his changing repertory and collaborative network: in the late Fifties and early Sixties, Tudor began working with Cage on the latter’s electronic compositions, and made the acquaintance of several musicians, like eventual friend and collaborator Gordon Mumma (1935–), who were already exploring the world of DIY circuitry.⁷ In what follows, I keep these perspectives close in mind while inquiring further into the preconditions for Tudor’s growth into a highly idiosyncratic electronic composer. For the precise logic underlying Tudor’s transition remains partly opaque, and a key question bears rearticulation: just what about Tudor’s earlier career might have motivated his later re-conception of the musical “work” as an almost sentient technological system or spatial surround? In other words, what, in his engagements with the piano, inspired or made possible his novel path through electronics?

In the following chapter, which begins with Tudor’s adolescent transition from organ to piano and ends with his prolific cross-Atlantic performance career of the mid-to-late Fifties, I offer a reframing of his time as a “far-out pianist” designed to bring yet another layer of continuity to his longer development. Several scholars have highlighted Tudor’s status, among his composer peers, as a sort of human “instrument” for the realization of their work, but here I extend a much more specific and unorthodox argument, claiming that the Tudor of the Fifties did his utmost to transform himself into *technology*, and ultimately, to model and surpass the functional capacities and effects of electronic media (for example, magnetic tape and tone generators) then in early use among both the American experimentalists and the European avant-garde.

⁶ John Holzaepfel, “David Tudor and the Performance of American Experimental Music, 1950–1959” (PhD diss., City University of New York, 1994), 320–321; James Pritchett, “David Tudor as Composer/Performer in Cage’s *Variations II*,” *Leonardo Music Journal* 14 (2004): 11–16. <https://doi.org/10.1162/0961121043067316>.

⁷ You Nakai, *Reminded by the Instruments: David Tudor’s Music* (New York: Oxford University Press, 2020), 107–117, 141–151, 215–221.

As I will discuss, this self-transformation was causally complex. Influenced by the music teachers of his adolescence and several impactful intellectual discoveries, Tudor set himself on a path of technologization as early as his first engagements with the piano. Over the course of the Fifties, however, he found himself drawn inexorably towards composers—notably Cage—who found that they could use him to adapt the lessons and insights of electronics to the realm of “instrumental” (that is, non-electronic) composition. In these relationships, Tudor acted as an agent, not a subjugated instrument. First, in several cases, including that of Cage, I will argue that it was Tudor who made these electronic adaptations and translations fundamentally *available to thought*. Second, Tudor used his collaborations with composers as opportunities for continual *reinvention*, powering his own self-transformation until the moment when, at the turn of the Sixties, he found he could live as technology no more—and sought life in technologies outside of himself. This, then, is an account of Tudor’s engagement with the techno-logical *before* the technological—with techno-*logic* before technologies—and by Chapters 3 and 4, when I turn to Tudor’s electronic work in earnest, I hope this latter practice will have taken on a new legibility and meaning.

I adopt the terms “techno-logic” and “techno-logical” from philosopher of technology Bernard Stiegler. In Stiegler’s helpful framing, these terms seek to describe the process, across history, whereby humans have “exteriorized” and “invented” themselves via the tool or technical support of the moment. In much the same vein as Marshall McLuhan, with his anthropocentric interest in humanity’s mediatic “extensions,” Stiegler pursues how tablets, printed books, indexes and filing systems, and finally electronic media and “audiovisual objects” transmit and shape human knowledge.⁸ As Steigler argues, these technical “conditions for knowledge’s *transmission* are also those

⁸ Bernard Stiegler, *Technics and Time 1: The Fault of Epimetheus*, trans. George Collins and Richard Beardsworth, Meridian: Crossing Aesthetics (Stanford, CA: Stanford University Press, [1994] 1998), 141–142; Bernard Stiegler, “Technologies of Memory and Imagination,” trans. Ashley Woodward and Amélie Berger Soraruff, *Parrhesia* 29 (2018): 32, <https://www.parrhesiajournal.org/index.php/parr/article/view/12/5>.

of its *elaboration*”—i.e., knowledge’s prerequisites for growth—and thus media turn out to be the very things that help make memory, reflection, and interpretation possible in the first instant.⁹ Stiegler’s is not quite the polemically antihumanist media theory of Friedrich Kittler, for whom “technical innovations—following the model of military escalations—only refer and answer to each other. . .progress[ing] completely independent of individual or even collective bodies of people.”¹⁰ Nor is it as comparatively “soft” as Bernhard Siegert and Sybille Krämer’s humanist revision of Kittler’s thought via “cultural techniques,” a theoretical framework intent on seeking out those human practices and concepts (counting, mapping, and so forth) that precede and structure technological invention.

Stiegler’s theoretical gambit most outwardly resembles Jacques Derrida’s proposition of a “supplementary” relationship between speech and the written word—one whereby writing, the “iterable” mark, is not an expedient extension of the voice, but rather its abyssal *ground*. (All communication, Derrida would say, is “telecommunication.”)¹¹ The “techno-logical,” as condition and relation, is thus for Stiegler a mark of human finitude; but the theorist stops short of technological determinism, instead narrating a history of technics in which “the technical invent[s] the human” just as “the human invent[s] the technical.”¹² Thus, to the analytic benefit of the present chapter, Stiegler’s philosophy of co-constitution cuts *across* the human and the technological, allowing one to speak of the continual exchange, between those two spheres, of abilities and possibilities, as well as debts and dependencies. This cross-cut is fully in evidence in the piano music to which Tudor was drawn in the Fifties: as we will see, far from unproblematically “acoustic” or

⁹ Bernard Stiegler, *Technics and Time 2: Disorientation*, trans. Stephen Barker, Meridian: Crossing Aesthetics (Stanford, CA: Stanford University Press [1996] 2009), 78.

¹⁰ Friedrich A. Kittler, *Optical Media: Berlin Lectures 1999*, trans. Anthony Enns (Cambridge: Polity, 2010), 29–30.

¹¹ Jacques Derrida, “Signature Event Context” (1972), trans. Samuel Weber and Jeffrey Mehlman, in *Limited Inc* (Evanston, IL: Northwestern University Press, 1988), 3.

¹² Stiegler, *Technics and Time 1*, 137–138.

“instrumental,” this material was more often than not marked, structurally and conceptually, by the technical affordances of emerging media.

1. Dis-organization (before 1950)

Long before he was a “far-out pianist,” David Tudor played the organ, and played it well. Tudor had taken piano lessons as early as age six, but in 1937, at age eleven, he followed the encouragement of his amateur-organist father and commenced study under William H. Hawke, organist and musical director of Philadelphia’s St. Mark’s Church.¹³ After only a year of organ training, Tudor was hired as Hawke’s assistant, and the elder’s trust in the boy was sufficient that he allowed him to act as his substitute when he vacated Philadelphia in the summer months.¹⁴ In 1943, after several years with Hawke, Tudor—by this point a high-school dropout—was taken on as the organist for Swarthmore, PA’s Trinity Church. He was seventeen.¹⁵

As we will see in Chapter 4, it is hugely significant that Tudor was plunged into the sound-world of the organ during his adolescence, for the organ imprinted itself firmly and uniquely on Tudor’s musical imagination during these early years, leaving deep grooves and valleys that he would explore anew decades later. Indeed, the key distinctions between the piano and the organ warrant a brief discussion here: the prototypical instrument of musical modernization in Europe, the piano exploded in popularity in the nineteenth century because of its ease and adaptability, and its dramatic improvements upon the muted sonic profile of its organological forebears—the harpsichord and the clavichord.¹⁶ Churned out by the tens of thousands between 1850 and 1900, the piano—by this time turned upright—spread fluidly through salons, conservatories, and domestic spaces, its encouraging

¹³ Holzaepfel, “Performance of American Experimental Music,” 1–3.

¹⁴ Nakai, *Reminded by the Instruments*, 24.

¹⁵ Holzaepfel, 4–5.

¹⁶ Michael Chanan, “Piano Studies: On Science, Technology and Manufacture from Harpsichords to Yamahas,” *Science as Culture* 1, no. 3 (1988): 56–59, <https://doi.org/10.1080/09505438809526212>.

simplicity of sound (it “sings at first touch,” per musicologist Michael Chanan) and its relative affordability encouraging its fast assimilation into bourgeois culture.¹⁷

The organ bears a different genealogy. In their modern, *pneumatic* form, pipe organs come from the ancient water organ or “hydraulis,” a towering mass of pistons and pressure-pumps whose “technological splendor” encouraged its use in the Roman coliseum.¹⁸ Around the fourth century, the organ shed its hydraulic functionality in favor of bellows, and in the later Middle Ages, crept into religious settings around Western Europe. By the early-modern period, it had grown into the premiere “aural representative of the Church’s authority”—louder than “any other human agency except gunpowder.”¹⁹ Immensely complex in structure and functionality, uniquely tailored to individual architectural spaces, and requiring, before the age of motors, simultaneous operation by multiple individuals, the organ indeed possesses what Max Weber has described as the “character of a machine.”²⁰ And as with its instrumental anatomy, so with sound: if the piano is distinguished by a wide dynamic range and pointillist palette given to extremely fine modulation and control beneath the fingertips, the organ’s massive volume and more uniform drones are actuated according to the cruder on/off logic of stops; and while the pianist can count on their sounds dying as fast as they appear (unless they should use the sustain pedal), the organist must learn to anticipate and duet with the lengthy reverberation times of churches and cathedrals, which bind the player to space in a circuit of predictive feedback.²¹

¹⁷ Chanan, “Piano Studies,” 68–69.

¹⁸ Michael Chanan, *Musica Practica: The Social Practice of Western Music from Gregorian Chant to Postmodernism* (New York: Verso, 1994), 173–175; Stephen Banfield, *Music in the West Country: Social and Cultural History across an English Region*, Music in Britain, 1600–2000 (Woodbridge, Suffolk: The Boydell Press, 2018), 174.

¹⁹ Chanan, *Musica Practica*, 22–23.

²⁰ Max Weber, *The Rational and Social Foundations of Music*, ed. and trans. Don Martindale, Johannes Riedel, and Gertrude Neuwirth (Carbondale: Southern Illinois University, 1958), 117.

²¹ Leo L. Beranek, *Music, Acoustics, & Architecture* (New York: John Wiley & Sons, Inc., 1962), 13. You Nakai has offered a particularly brilliant characterization of the organ that compares one of its basic mechanisms to the principle of “gating” in electronics: “Unlike the piano key, ‘directly’ coordinated with the hammer that strikes the string whenever it is depressed, the manuals on the organ generate sound only ‘indirectly’ by opening a valve to let pressurized air go through a pipe. In other words, the latter is a *gating* device which does not appear to produce a sound of its own.” Nakai, *Reminded by the Instruments*, 28.

Tudor warmed early to the organ's "machine-like contrivances."²² Late in life, he fondly recalled his introduction to the organ's tracker action—the mechanism that makes pipe-organ keys resistant to initial touch, and requires the forceful assertion of body weight on the part of the organist.²³ And so too was he fond of the music: while Hawke trained Tudor in standards of the church-organ repertory, he also introduced him to current and startlingly modern works for the instrument, including Olivier Messiaen's (1908–1992) *Apparition de l'église éternelle* (1932), in which a slow, swirling cloud of discordant chords rises to jarring intensity before lapsing into silence.²⁴ Nevertheless, Tudor would soon find himself returning to the piano, partially on the urging of Hawke, who felt his pupil could benefit from exposure to more contemporary musical literature (more abundant in the world of piano than in the organist's dusty enclave).²⁵ If Tudor was awaiting a sign that might prompt his fateful switch, he found it in pianist Irma Wolpe (1902–1984, *née* Schoenberg), the first of several friends and mentors who would broker his comprehensive musical evolution in the late Forties and early Fifties.

Born in Bucharest, Irma Schoenberg had carved out a pianist's standard educational trajectory before finding herself drawn to the theories of composer and pedagogue Émile Jaques-Dalcroze (1865–1950), whose young "eurythmics" movement stressed a kinesthetic approach to musical education rooted in the supreme importance of gesture.²⁶ We will later return to Dalcroze for insight into Tudor; for now, it suffices to say that the pedagogue was convinced that the body, as a spectacle of "living plastic," harbors a "silent music," and sought in its coordinated movements a

²² Weber, *Rational and Social Foundations*, 117.

²³ David Tudor, interview by Jack Vees, July 12, 1995, OHV 241 r, transcribed tape recording, Major Figures in American Music, Oral History of American Music (OHAM), Irving S. Gilmore Music Library, Yale University, New Haven, CT, 2, https://archives.yale.edu/repositories/7/archival_objects/3185381.

²⁴ Tudor, interview by Vees, 6.

²⁵ Holzaepfel, "Performance of American Experimental Music," 4–5.

²⁶ Austin Clarkson, "David Tudor's Apprenticeship: The Years with Irma and Stefan Wolpe," *Leonardo Music Journal* 14, Composers Inside Electronics: Music After David Tudor (2004): 5–6, <https://doi.org/10.1162/0961121043067325>.

seamless synchrony between music and mute corporeality.²⁷ Irma's dedication to eurythmics was such that she eventually signed on to teach at the Dalcroze Seminar in Berlin, and it was at the city's Hochschule für Musik, with which the seminar was associated, that she met composition student Stefan Wolpe (1902–1972), who had commenced his diploma program in 1920.²⁸ Wolpe's training had included the usual conservatory stint, but also an “unofficial”—yet deeply impactful—mentorship under Italian composer and teacher Ferruccio Busoni (1866–1924), another figure who will weave throughout this chapter, and Tudor's early imaginary.²⁹ Irma and Stefan first met in 1927, and they rapidly grew close: fleeing a mounting Nazi presence in Germany, they traveled to Jerusalem in 1934, married, and in 1938, left a turbulent Palestine for the United States.³⁰ In 1939, they found work as musical instructors at Philadelphia's Settlement Music School.³¹

Irma found work at Swarthmore as well, and it was at a 1943 Swarthmore faculty gathering that Tudor first heard her perform; Tudor recalls that she was playing Stefan's music, and he was “thunderstruck” by what he heard. “[A]lmost instantly,” he would later say, “[I decided] that I would study with her.”³² It was not just what Tudor heard that so struck him—although Wolpe's *Toccata in Three Parts* (1941), with its disarticulated rhythms and dizzied flights from tonality, was surely a crash-course in musical modernism—it was also what he saw. As late as 1995, he could recall with vivid clarity Irma's command of corporeal “gravity,” and the degree to which she “was very conscious of her bodily movements at the keyboard”: “She threw her *physical apparatus* completely into her playing.”³³ In a 1993 interview with Austin Clarkson, Tudor suggested that he recognized, in Irma's

²⁷ Daniel Albright, *Untwisting the Serpent: Modernism in Music, Literature, and Other Arts* (Chicago: University of Chicago Press, 2000), 101–102.

²⁸ Clarkson, “David Tudor's Apprenticeship,” 6.

²⁹ Clarkson, 6.

³⁰ Clarkson, 6.

³¹ Clarkson, 6.

³² Holzaepfel, “Performance of American Experimental Music,” 5.

³³ David Tudor, interview by John Adams and Jack Vees, July 19, 1995, OHV 241 a–l, transcribed tape recording, Major Figures in American Music, Oral History of American Music, Irving S. Gilmore Music Library, Yale University, New Haven, CT, 9, https://archives.yale.edu/repositories/7/archival_objects/3185377 (my emphasis).

playing, the impress of Dalcroze; whether he was aware of eurythmics before meeting Irma is unknown—at any rate, Irma likely exposed him to Dalcroze’s doctrine shortly thereafter.³⁴ What matters is that Irma demonstrated, for Tudor, the possibility of unqualified physical mastery of the “mechanism of the piano”: an ear for the calculated collisions of hammers upon strings affording the pianist “absolute control” over dynamics and tone.³⁵

As an organist, Tudor had learned to grapple with a fundamentally *machine-like instrument*. Irma’s playing revealed to him the piano’s rather different invitation towards a *mechanization of the self*: an imperceptible merging of “physical apparatus” and musical apparatus, flesh and ivory, yielding the possibility of breathtaking virtuosity.³⁶ Under Irma’s tutelage, Tudor flowered as a pianist, showcasing a taste for “big, difficult, complicated things,” and revealing himself as an especially gifted sight-reader (this will become relevant a bit later).³⁷ Not long after Tudor’s urging, Irma began to teach him some of her husband’s music; concurrently, Tudor began studying composition and analysis with Stefan.³⁸ Tudor has remarked that he found his early experiments in composition unconvincing; already, he was steering away from the construction of a unique authorial voice, instead finding rewarding challenges in the interpretation of others’ work.³⁹

Tudor’s acquaintance with the Wolpes was transformative. By the mid Forties, Tudor had begun commuting to and from New York, where the Wolpes had a second home, and where performance engagements were more forthcoming. In 1947, he moved to New York permanently,

³⁴ Austin Clarkson, “Composing the Performer: David Tudor Remembers Stefan Wolpe,” *Musicworks*, 1999, 28.

³⁵ Tudor, interview by Vees and Adams, 9.

³⁶ As You Nakai observes, in Tudor’s recollections of this transitional moment, and Irma’s “revelation” of the piano’s distinct sound world, Tudor would almost seem to elide Irma and the piano, describing both in terms of “dynamism” and “dynamics: “the difference between the instrument and the instrumentalist appeared to blur.” Nakai, *Reminded by the Instruments*, 29.

³⁷ Holzaepfel, “Performance of American Experimental Music,” 7.

³⁸ Holzaepfel, 7–8.

³⁹ Clarkson, “Composing the Performer,” 28. Tudor’s thoughts on his early compositional efforts warrant quotation in full: “I wasn’t serious about it. The compositional studies that I made with Stefan. . . I didn’t find that my work was convincing. I think I found his classes in analysis even more fruitful. . . . And it was years after that I realized that I was doing work that I could call my own.”

finding work accompanying choreographers (notably Jean Erdman, 1916–2020, and Merce Cunningham, 1919–2009) and serving as an instructor at Stefan’s Contemporary Music School.⁴⁰ Writing of Tudor’s time in the “Wolpe circle,” John Holzaepfel and Austin Clarkson have rightfully emphasized the significance of one particular Wolpe composition that Tudor wrestled with during this period: the mammoth *Battle Piece* (1943–47), a stormy and richly expressive work in seven movements begun in the “darkest days” of Second World War.⁴¹ *Battle Piece* was not quite the kind of interpretation-turned-collaboration that Tudor would become known for in his later work with Cage and others—the pianist was young still—but Tudor indeed had a powerful hand in its completion. As Wolpe struggled with the work’s final four movements, Tudor worked closely with the composer in his studio, honing his performance of the three finished sections and, per Clarkson, generatively “reflecting back [to Wolpe] his musical ideas in living sound.”⁴²

Battle Piece is less decisive for this particular account than the inspiration Tudor turned to upon feeling an “inadequacy in [his] handling of the piano”: the writing of Wolpe’s former teacher Ferruccio Busoni. Seeking to “understand what virtuosity was about” and acquire a finer grasp on Wolpe’s “sound imagination,” Tudor tracked down “everything [he] could [find] about Busoni.”⁴³ Certainly, Tudor read Theodore Baker’s 1911 translation of Busoni’s *Sketch of a New Esthetic of Music* (1907) cover to cover, and Tudor’s notes from the Forties contain scattered translations of shorter articles, bibliographic references to Busoni biographies, and a seemingly comprehensive list of Busoni’s musical repertory and recital history.⁴⁴ Tudor’s records from this time evidence a voracious imagination and a spectrum of intellectual interests extending far beyond Busoni alone—Friedrich

⁴⁰ Holzaepfel, “Performance of American Experimental Music,” 8–9.

⁴¹ Austin Clarkson, “A Creative Collaboration: Stefan Wolpe’s and David Tudor’s *Battle Piece*,” *Musicworks*, Spring 1999, 35; Holzaepfel, “Performance of American Experimental Music,” 8–18.

⁴² Holzaepfel, “Performance of American Experimental Music,” 34.

⁴³ Clarkson, “A Creative Collaboration,” 32.

⁴⁴ Tudor’s notes, for example, contain a passage from Busoni’s 1922 article “An Attempted Definition of Melody,” attributed to the Austrian journal *Die Musikblätter des Anbruch*, and a reference to Dutch composer Bernard van Dieren’s (1887–1936) essay collection *Down Among the Dead Men* (1935), which contains a substantial study of Busoni. Box 2,

Hölderlin (1770–1843) poems and snatches of language from Danish writer Jens Peter Jacobsen (1847–1885) mingle with the densest strands of piano and organ instruction—but the Italian composer is a frequent and conspicuous presence in these materials.⁴⁵ Tudor has cryptically remarked that “a lot of things happened” because of his exposure to Busoni’s thought, and indeed, he went on to quote or otherwise mention the composer for the rest of his life, bestowing on him a significance accorded to very few of his philosophical or spiritual “sources.”⁴⁶

Out of all the ideas circulating through *New Esthetic*, it is undoubtedly Busoni’s reflections on interpretation and “transcription” (a term used interchangeably to refer to arrangement, performance, and notation in the abstract) that pressed Tudor onward through the gauntlet of Wolpe’s *Battle Piece* and helped launch him into the following decade. A proponent of the arch-Romantic doctrine of “absolute music,” which holds that music must free itself of all convention, “content,” and reference, Busoni radically proposed that classical instruments, conventional notation, and the twelve tones of the chromatic scale were all unnecessary vise grips—cumbersome “expedients”—blocking access to the *infinite* spectrum of sound, and the “primordial essence” of music, purely present in “Nature.”⁴⁷

Folders 7 and 11, David Tudor Papers (hereafter Tudor Papers), accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA. As John Holzaepfel as pointed out, Tudor has made numerous allusions or references to passages from *Sketch of a New Esthetic of Music* (1907). Holzaepfel, “Performance of American Experimental Music,” 13. Holzaepfel points particularly to Tudor’s repeat statements, later in life, to the effect that “notation [is] an evil separating musicians from music,” (see, e.g., Tudor, “Piano to Electronics,” 24), which would seem to loosely invoke Busoni’s thoughts on notation represented in *New Esthetic*; Busoni notably speaks of “how strongly notation influences style in music, and fetters imagination.” Ferruccio Busoni, *Sketch of A New Esthetic of Music*, trans. Theodore Baker (New York: G. Schirmer, [1907] 1911), 17–18. Nakai also refers to a drafted letter written by Tudor, extant in his archives and datable to 1946–47, in which he states, “For me music exists as a spiritual reality which will continue to exist after every composer and every page of notes and dynamics are destroyed, and every performer must struggle to make the positive facts of this reality audible to a listener.” While Nakai makes no mention of Busoni in connection to this letter, it seems clear to me that Tudor is here paraphrasing Busoni’s remark that “the musical art-work exists, before its tones resound and after they die away, complete and intact. It exists both within and outside of time.” Busoni, *New Esthetic*, 17–18.

⁴⁵ These references and sources can all be found in Box 2, Folder 4 (“Music notes, early”) of the Tudor Papers.

⁴⁶ Clarkson, “A Creative Collaboration,” 32.

⁴⁷ Busoni, *New Esthetic*, 6–7, 17–18. Regarding “absolute music,” see Mark Evan Bonds, “Aesthetic Amputations: Absolute Music and the Deleted Endings of Hanslick’s *Vom Musikalisch-Schönen*,” *19th-Century Music* 36, no. 1 (July 1, 2012): 3–23. <https://doi.org/10.1525/ncm.2012.36.1.003>.

As concerns this problem, Busoni ascribed to the interpreter or performer a double significance: on the one hand, he tasked the interpreter with the reawakening of the spirit slumbering behind each composition's prison-like staff-lines ("it is for the interpreter to *resolve the rigidity of the signs* into the primitive emotion").⁴⁸ on the other hand, leveling the composer/interpreter hierarchy, he placed these figures at an *equal remove* from the underlying essence of musical works. In other words, interpreters could hear things in works that might remain obscure to composers themselves, and by acting as "mediums," not mere mediators, they could broker privileged access to musical works in their "natural," pre-compositional state.⁴⁹ It would be some time before Tudor, already a dutiful and painstaking transcriber, would take to heart Busoni's thoughts on the suffocating grip of notation. For the time being, however, Busoni's incandescent praise for interpretation solidified his resolve to dedicate himself to the work of others. Oriented towards the spiritual plane anterior to composition, he simply had to decide just what sort of *medium* he wished to be.

2. Automatisms (1950)

By the spring of 1950, Tudor had premiered Wolpe's *Battle Piece* at Columbia University, coronating his first real contribution as an interpreter, and, in a sense, rounding out his time in the "Wolpe circle."⁵⁰ He had also, by this point, met John Cage, who had arrived in New York a little

⁴⁸ Busoni, *New Esthetic*, 17. Busoni continues, pertinently: "What the composer's inspiration *necessarily* loses through notation, his interpreter should restore by his own."

⁴⁹ Busoni gestures towards this idea in *New Esthetic*, but he speaks most extensively to the issue of musical "transcription" and performance in a 1910 text, "The Value of the Transcription," collected in his 1922 volume *The Essence of Music and Other Papers*. "It is only necessary to mention J.S. Bach in order, with one decisive blow, to raise the rank of the transcription to artistic honour in the reader's estimation. He was one of the most prolific arrangers of his own and other pieces. . . . From him I learnt to recognize the truth that Good and Great Universal Music remains the same through whatever *medium* it is sounded. But also the second truth, that different mediums each have a different language (their own) in which this music again sounds somewhat different. . . . The performance of a work is also a transcription, and this too—however free the performance may be—can never do away with the original." Ferruccio Busoni, *The Essence of Music and Other Papers*, trans. Rosamond Ley (London: Rockliff, 1956), 85–88 (my emphasis).

⁵⁰ Holzaepfel, "Performance of American Experimental Music," 358.

less than a decade prior via Chicago. Fourteen years Tudor's senior, Cage had already traced out a richly patterned professional history and passed through a number of creative paroxysms. Between 1934 and 1937, the Californian Cage had, in a string of good fortune, established a relationship with the San Francisco-based experimentalist Henry Cowell (1897–1965), studied harmony and composition with Adolph Weiss (1891–1971), former student of serialist forefather Arnold Schoenberg (1874–1951), and secured a place in counterpoint classes taught by Schoenberg himself.⁵¹ Cage was emboldened by Schoenberg, but had no thoroughgoing desire to extend early, superficial flirtations with twelve-tone composition. During a subsequent stint at Seattle's Cornish school between 1938 and 1940, he transformed himself into a percussionist, providing musical accompaniment to a dance class led by Bonnie Bird (1914–1995), a Martha Graham (1894–1991) protégé, and spearheading a percussion ensemble featuring dance students, including a gifted young pupil named Merce Cunningham (1919–2009).⁵² It was at the Cornish school that Cage, tasked with a dance's accompaniment, and restricted, by space, to use of the piano alone, first “prepared” the piano by stuffing screws and weather stripping into its strings to recast it as a quasi-percussion instrument of alien tones and timbres.⁵³

Following a move to New York in the early Forties, Cage found himself in an unraveling marriage, but a fruitful new partnership (creative and personal) with Merce Cunningham, with whom he reconnected via choreographer Jean Erdman (1916–2020), one of Tudor's local professional contacts. Circles were intersecting, and Cage and Tudor were placed on paths destined to cross; and yet the circumstances that first connected them were more workaday than climactic. As the story goes, Cage, referred by Erdman, arrived unprompted at Tudor's door in 1949 (likely late in the year)

⁵¹ James Pritchett, *The Music of John Cage* (Cambridge: Cambridge University Press, 1996), 6–13; Richard H. Brown, *Through the Looking Glass: John Cage and Avant-Garde Film*, The Oxford Music/Media Series (New York: Oxford University Press, 2019), 6–10.

⁵² Pritchett, *Music of John Cage*, 10–13; Brown, *Through the Looking Glass*, 33–35.

⁵³ Pritchett, *Music of John Cage*, 22–24.

and extended a request: Cunningham, for whom Cage had been writing accompaniments, had received a piece from composer Ben Weber (1916–1979) for which he was choreographing a dance; Cunningham needed a recording of the piece to rehearse to, and Cage found Weber’s music too challenging to play himself. Asked if he might perform the work for the rehearsal recording, Tudor obliged.⁵⁴ This, then, is the probable moment of first contact between Tudor and Cage—but there is another “origin story” that compels our attention.

It begins Spring 1949 in Paris, where Cage was studying on a Guggenheim Fellowship. Having been encouraged to connect with a young French composer named Pierre Boulez, Cage knocked on his door.⁵⁵ A talented former student of Messiaen whose work had not yet resonated beyond his local Parisian network, Boulez had already begun to publish patricidal screeds calling for a violent and thorough reset from the “opposed neoclassicisms” of Schoenberg and Igor Stravinsky (1882–1971): a musical *Stunde Null* well-tailored to a craterous, bombed-out Europe.⁵⁶ Boulez was born into a postwar generation of European composers (including Karlheinz Stockhausen and Luciano Berio, 1925–2003) who followed from the example of Schoenberg and his “Second Vienna School” pupils (Alban Berg, 1885–1935, and Anton Webern, 1883–1945), but sought to break clean from twelve-tone composition’s residual conservatism—specifically, its traces of “symmetry” and “expressionism.”⁵⁷

The symmetrical and the expressive were precisely those musical qualities that Boulez was working to annihilate wholesale at the time he met Cage, and his weapon of choice was rhythm (or

⁵⁴ Holzaepfel, “Performance of American Experimental Music,” 22–25; Martin Iddon, *John Cage and David Tudor: Correspondence on Interpretation and Performance*, Music since 1900 (Cambridge: Cambridge University Press, 2013), 4–5.

⁵⁵ Jean-Jacques Nattiez, ed., *The Boulez-Cage Correspondence*, trans. Robert Samuels (Cambridge: Cambridge University Press, 1993), 3–5.

⁵⁶ David Gable, “Boulez’s Two Cultures: The Post-War European Synthesis and Tradition,” *Journal of the American Musicological Society* 43, no. 3 (Autumn 1990): 27, <https://doi.org/10.1525/jams.1990.43.3.03a00030>; Paul Griffiths, *Modern Music and After*, 3rd ed. (New York: Oxford University Press, 2010), 4–11.

⁵⁷ Gable, “Boulez’s Two Cultures,” 426–428; Henri Pousseur, “The Question of Order in New Music,” trans. David Behrman, *Perspectives of New Music* 5, no. 1 (Autumn–Winter 1966): 99–100, <https://doi.org/10.2307/832389>.

rather, its painful dislocation). Eric Smigel notes that Boulez admired Messiaen and Stravinsky for their earlier experiments in rhythmic “asymmetry” and the “shifting superimposition of rhythmic cells,” and in the work of Webern, he located the worthiest contemporary example of metrical “breakdown” through such tactics as “cross-rhythms [and] syncopation.”⁵⁸ While Cage was then exploring a different domain of musical territory, Boulez found in him a fast friend and worthy peer, and helped to broker performances of the prepared-piano work *Sonatas and Interludes* (1946–48) during the remainder of Cage’s stay in Paris.⁵⁹ Boulez himself gave a glowing introduction to the work before one concert, marveling at the prepared piano’s challenge to “acoustic ideas received in the course of the evolution of Western music,” and its fracturing of pure tones into “complexes of frequencies.”⁶⁰ The respect was mutual, and Cage returned to the United States intent on securing American premieres of several new Boulez works, including the latter’s Second Piano Sonata (1947–48).⁶¹ This is where the second Tudor origin story comes in.

As the often-told story goes, following his return from Europe, Cage enlisted local New York pianist William Masselos (1920–1992) to study Boulez’s Second Sonata and perform its United States premiere; Cage reported Masselos’s intention to “work on” the Second Sonata in a letter to Boulez dated June 5, 1950.⁶² A little over six months later, on December 18, 1950, Cage wrote to Boulez to inform him, *post-facto*, what had transpired:

Yesterday evening, we heard your Sonata; David Tudor played it (magnificently, too) instead of Masselos. . . . [Tudor] is an extraordinary person and at the concert (as I was turning pages for him) I had feelings of an exaltation equal to that you had introduced me [*sic*] to 4 rue Beaufreillis.⁶³

⁵⁸ Eric Smigel, “Alchemy of the Avant-Garde: David Tudor and the New Music of the 1950s” (PhD diss., University of Southern California, 2003), 83–87.

⁵⁹ Nattiez, *Boulez-Cage Correspondence*, 5–6.

⁶⁰ “Pierre Boulez’s introduction to Sonatas and Interludes for prepared piano by John Cage at Suzanne Tézenas’s salon” (probably June 17, 1949), in Nattiez, 27.

⁶¹ Nattiez, 7.

⁶² John Cage to Pierre Boulez, January 17, 1950, in Nattiez, 48.

⁶³ John Cage to Pierre Boulez, December 18, 1950, in Nattiez, 77–78.

What happened? By all accounts, Masselos choked. Cage was fortunate, then, to have been linked to Tudor through composer Morton Feldman. Cage met Feldman in Carnegie Hall's lobby following a January 26, 1950 performance of Webern's *Symphony, Op. 21* (1927–28). As Masselos struggled with Boulez's Second Sonata, it was Feldman, with whom Cage had quickly grown close, that suggested that a young pianist named David Tudor might be best equipped to premiere Boulez's work.⁶⁴ Feldman had been acquainted with Tudor and his gifts via the "Wolpe circle" (he had also studied composition with Stefan), and in fact had passed a copy of Boulez's Second Sonata along to Tudor at some point in 1950, having been lent it by Cage. "Feldman told me," Cage writes Boulez in the December 18 letter, "that Tudor had already devoted three months of study to the work. . . . From that it was obvious to choose [him]."⁶⁵

Boulez's work presented Tudor with the second major gauntlet of his performance career (Wolpe's *Battle Piece* had been the first). Moreover, Boulez precipitated his second major *philosophical* breakthrough following his encounter with Busoni's writings. Indeed, in studying the Second Sonata, Tudor must have quickly learned to appreciate Masselos's position, for in his 1972 interview-article "From Piano to Electronics," he reflected upon the piece's demand for a fundamental "change of musical perception":

[A]s I worked on Boulez's score, I kept noticing a very strange fact. I'd always been well known for my ability to handle complex scores. . . . but this time I found a sort of constant breakdown in the continuity. I had three months to study the piece, and after two months I became vitally concerned that it would be full of lapses and holes. . . . [T]here was nothing leading, *nothing in which the music centered itself*. Then I realised I was now in a different situation, in the presence of a different type of musical continuity than I was used to.⁶⁶

A "constant breakdown [in] continuity" was precisely what Boulez had sought in the frighteningly unmetrical Second Sonata, which he would later describe as having an "explosive,

⁶⁴ Holzaepfel, "Performance of American Experimental Music," 22–26, 28–29.

⁶⁵ John Cage to Pierre Boulez, December 18, 1950, in Nattiez, *Boulez-Cage Correspondence*, 77–78.

⁶⁶ Tudor, "Piano to Electronics," 24 (my emphasis).

disintegrating and dispersive character.”⁶⁷ In a 1948 article titled “Proposals,” Boulez identifies a likely influence upon the Second Sonata’s disjunct and feverish character, declaring that “music should be collective hysteria and spells, violently of the present time—following the lead of Antonin Artaud.”⁶⁸ We may be surprised to meet Artaud here.

A poet-turned-actor-turned-(aspirational) stage director who was ever passing in and out of mental institutions, Artaud had dedicated much of his short life (1896–1948) to the production of disturbing and visionary writings on *theater*, not music. Boulez’s reference is doubly curious, for only in his final years did Artaud garner even the slightest institutional recognition in his native France or elsewhere. But from the mid Forties onward, Boulez had enjoyed a direct conduit to Artaud’s ideas in his capacity as music director for Jean-Louis Barrault’s (1910–1994) *Theatre Marigny*. A mime by training, Barrault encountered Artaud in the mid Thirties and thereafter grew close to him, molding aspects of his own theater company in Artaud’s image.⁶⁹

With rehearsal time ticking, and as he stared down a music whose center failed to hold, Tudor was encouraged, as with *Battle Piece*, to research the ideas motivating the work’s aesthetic disposition—and Boulez’s article “Proposals” (not yet in translation) was among those he quickly located. Upon seeing Artaud’s unfamiliar name, Tudor’s curiosity was further piqued, and either through a dancer, or New York’s local Gotham Book Mart (accounts differ), he obtained a copy of Artaud’s now-canonical (but then-obscure) tract *Le Théâtre et son Double*, published in limited quantities by Gallimard in 1938.⁷⁰ Ever the methodical transcriber, Tudor typed up a duplicate of the

⁶⁷ Paul Griffiths, *Modern Music and After*, 3rd ed. (New York: Oxford University Press, 2010), 12.

⁶⁸ Pierre Boulez, “Proposals” (1948), in *Notes of an Apprenticeship*, ed. Paule Thévenin, trans. Herbert Weinstock (New York: Alfred A. Knopf, 1968), 71.

⁶⁹ Eric Smigel, “Recital Hall of Cruelty: Antonin Artaud, David Tudor, and the 1950s Avant-Garde,” *Perspectives of New Music* 45, no. 2 (Summer 2007): 176–177, <https://doi.org/10.1353/pnm.2007.0006>.

⁷⁰ It is Holzaepfel who suggests that Tudor purchased the book at Gotham Book Mart, and the specificity of this suggestion indicates that perhaps Holzaepfel was told this by Tudor himself. See Holzaepfel, “Performance of American Experimental Music,” 31–32. However, poet and artist Mary Caroline (M.C.) Richards (1916–1999), with whom Tudor commenced a long-term relationship in the early Fifties, recalls that a “dancer lent it to [Tudor].” Mary Caroline

entire work and pored over it with a French-to-English dictionary at his side.⁷¹ French conjugation charts, still filed among Tudor's notes, testify to the seriousness of the endeavor.⁷² Whatever Boulez had seen in Artaud, Tudor *wished* to see, on the chance that it might vault him over the Second Sonata's gaps and caesurae; yet what Tudor ultimately took from Artaud was highly idiosyncratic, his reading determined by a performative disposition already engaged with the body as a component of a techno-logical circuit.

While far from programmatic, Artaud's *Le Théâtre et son Double* does express a clear and unflinching goal: the immolation of "Western" theatre and the highly textualized, *representational* paradigm that had leeched from it its lifeblood. Artaud attacks everything that carried theatre into the modern age—scripts, authors, directors, forms, signs, and *thoughts*—and narrates "progress" and "Enlightenment" as the slow snuffing out of a primal flame. "Civilized man," despairs Artaud, is nothing more than a "monster who [derives] thoughts from actions instead of making actions coincide with thoughts."⁷³ What are Artaud's proposed solutions? In the main: "Burn down the library at Alexandria."⁷⁴ And on the stage: 'Break theatre's subjugation to the text and rediscover the idea of a kind of unique language somewhere in between gesture and thought.'⁷⁵ In place of dialogue and soliloquies, Artaud sought "vibratory action," "incantation," and "true hieroglyphs" affecting "every organ and on all levels."⁷⁶ Artaud's attacks on "fossilized" and "straight-jacketed" words would sharply echo Busoni's campaign against notation if they were not so *violent*.⁷⁷

Richards, *Opening Our Moral Eye: Essays, Talks & Poems Embracing Creativity & Community* (Hudson, NY: Lindisfarne Press, 1996), 20–22.

⁷¹ Richards, *Opening Our Moral Eye*, 20–22.

⁷² Undated conjugation charts, Box 2, Folder 4, Tudor Papers.

⁷³ Antonin Artaud, "The Theatre and Its Double," *Collected Works*, trans. Victor Corti, vol. 4 (London: John Calder, [1964] 1999), 2.

⁷⁴ Artaud, "Theatre and Its Double," 3.

⁷⁵ Artaud, 68.

⁷⁶ Artaud, 68–69.

⁷⁷ Artaud, 90.

From *this* Artaud, whose “impossible,” visceral, and fundamentally unrealizable theatre would fire the imaginations of Jacques Derrida, Gilles Deleuze, and countless other postwar philosophers, Tudor took little—or so his interviews would seem to indicate.⁷⁸ Indeed, the only section of Artaud’s work he has repeatedly mentioned—and per You Nakai, the only one extant in his archive in duplicate form—is the strange text-within-a-text entitled “An Affective Athleticism,” originally intended for publication in the magazine *Mesures*.⁷⁹ In effect a how-to guide for the *actor*, not the director (as Nakai notes, the text is unique in *Le Théâtre* in this respect), “An Affective Athleticism” draws on esoteric Kabbalist respiratory exercises in its proposal of a method by which the actor—an athlete of the “heart”—might hope to train their “affective organism” and increase their impact upon the emotions of the audience.⁸⁰ Artaud’s method calls for both a tight command of breathing—cyclical plays of inhalation and exhalation, expansion and contraction—and a studied familiarity with the folds and pockets of one’s musculature in which feelings—*affects*—localize and congeal. For Artaud, breathwork is the tool by which one can travel and chart his or her affective topography, and the secret weapon capable of “throwing the audience into a magical trance.”⁸¹

In his keen interpretation of Tudor’s reading of Artaud, Nakai stresses the importance of breath control—a topic that would cryptically reappear in the musician’s notes for a lecture decades later. What Tudor so struggled with in Boulez’s Second Sonata was the evacuation of rhythmic or temporal *logic*, and Nakai offers that Artaud’s discussion of the tempo of breath, and its connection to feeling, suggested to Tudor the possibility of “creating temporal continuity, which instead of being grounded in the psyche of the performer, composed the psyche as an effect of bodily

⁷⁸ Derrida’s early, canonical engagements with Artaud are “La Parole Soufflée” and “The Theater of Cruelty and the Closure of Representation,” both collected in Jacques Derrida, *Writing and Difference*, trans. Alan Bass (Chicago: University of Chicago Press, 1978), 212–316. Deleuze drew on Artaud in both his own writings, and his collaborations with Félix Guattari; see, e.g., Gilles Deleuze, *Difference and Repetition*, trans. Paul Patton (London: Continuum, [1968] 2004), 146–147, 205, 219.

⁷⁹ Nakai, *Reminded by the Instruments*, 85–86.

⁸⁰ Artaud, “Theatre and Its Double,” 100–101.

⁸¹ Artaud, 106.

action.”⁸² Crudely, the explanation goes like this: Boulez’s discontinuity bothered Tudor because it went against his normal way of thinking, so from Artaud, he learned to decouple his performing body from his brain and make the former the seat of the latter. “By un-coordinating his physical continuity from his psychological continuity,” Nakai explains, “Tudor operated as a machine—as a musical instrument.”⁸³

Cage already spoiled the end of this story in his letter to Boulez: Tudor successfully premiered the Second Sonata on January 17, 1950 in New York’s Weill (formerly Carnegie) Recital Hall, playing it “marvelously.”⁸⁴ And in a recollection to Austin Clarkson in 1993, Tudor describes his Artaudian break beyond Boulez’s imposing arrhythmias in terms that resonate with Nakai’s argument: “My musical consciousness . . . changed completely. . . . I put my mind in a state of non-continuity, *not remembering what had passed, so that each moment is alive.*”⁸⁵ Tudor’s invocation of willed amnesia and pure immediacy is positively striking; but to my mind, save for its emphasis upon changed (suspended) continuity, it points to something slightly different than a schism of the “physical” and “psychological”—an “un-coordination.” What Tudor instead seems to hint at is a *different* type of mind-body coordination affording a new relationship to music in the context of performance. No mere matter of semantics, Tudor’s passage through Artaud is critical for all that follows, and thus I want to propose a careful reframing of this moment without departing from Nakai’s general point. The crux of this reframing is to be found in a single, key word in Nakai’s formulation: “machine.”

Nakai speculates that Tudor might have found in Artaud a reflection of the musical-theoretical ideas of anthroposophist Rudolf Steiner, whose writings on rhythm and respiration

⁸² Nakai, *Reminded by the Instruments*, 86–89.

⁸³ Nakai, 89.

⁸⁴ John Cage to Pierre Boulez, December 18, 1950, in Nattiez, *Boulez-Cage Correspondence*, 77–78.

⁸⁵ Clarkson, “Composing the Performer,” 31 (my emphasis).

describe the “whole organism as a remarkable musical instrument.”⁸⁶ A soon-to-be anthroposophist of serious dedication, Tudor would encounter these writings at least by the mid Fifties; but there is no hard evidence he knew of them in 1950.⁸⁷ On the other hand, Tudor’s reading of Artaud may well have been contoured by two other figures with whom he *was* then familiar: Émile Jaques-Dalcroze, and Artaud and Boulez’s mutual friend, Jean-Louis Barrault. Tudor had known of Dalcroze since working with Irma and possibly before, and his exposure to Barrault came via the director’s *Réflexions sur le Théâtre* (1949). Tudor’s onetime partner Mary Caroline (M.C.) Richards (1916–1999) recalls him lending her *Réflexions* in 1951, and as the book’s dedicated chapter on Artaud is disproportionately concerned with respiratory training (to be sure, an unusual point of focus), it would make sense for Tudor to have read it while practicing the Second Sonata.⁸⁸ This may all seem like so much arcana, but a significant common concern surfaces when Artaud, Barrault, and Dalcroze are considered together: the regulation of “automatic,” unconscious, or subconscious activity.

When it comes to the honing of one’s bodily rhythm, a “force analogous to electricity” (“an energy, an agent—radio-active”), Dalcroze regards as a necessary exercise the “acquisition of numerous automatisms”: “Muscular actions, after constant repetition, *pass outside the control of the brain*. New reflexes can be created, and the time lost between the conception and realization of the movement reduced to a strict minimum.”⁸⁹ Such automatisms can and must be united with “actions of spontaneous volition,” but “automatisation” of the body’s natural rhythms—the efficient

⁸⁶ Nakai, *Reminded by the Instruments*, 87.

⁸⁷ No hard evidence, at least, of which I am aware. We can reconstruct the following timeline as regards Tudor’s early engagement with Steiner and anthroposophy: M.C. Richards recalls that “a few years” after 1949, Tudor gave her Steiner’s books on education. Richards, *Opening Our Moral Eye*, 180–181. Matt Rogalsky has meanwhile confirmed that Tudor became a member of the Anthroposophical Society of America in 1957, and “on at least two occasions” in 1963, gave piano concerts produced by the Anthroposophical Society. Matthew R. Rogalsky, “Idea and Community: The Growth of David Tudor’s Rainforest, 1965–2006.” (PhD diss., City University of London, 2006), 54–57.

⁸⁸ Richards, *Opening Our Moral Eye*, 20–22.

⁸⁹ Émile Jaques-Dalcroze, *Rhythm, Music and Education*, trans. Harold F. Rubinstein (London: Chatto & Windus, 1921), 91, 96 (my emphasis).

distribution and compartmentalization of reflexes—is critical to the performer’s executive functioning. One otherwise risks a “breakdown of the system.”⁹⁰ For Barrault (as for Artaud), what is at issue is not rhythm as such, but the breathing that supports it, and the stated ambition of Barrault’s “respiratory solfeggio” is a passage beneath the threshold of conscious thought into grey matter: through breathing, one can “attain to the unconscious, and thence plumb the soul and its states and try to modify them.”⁹¹ Artaud, finally, speaks of a “balance between two kinds of breathing: the *automatic*. . . .under the direct control of the sympathetic nervous system, and [that] which is subject to those reflexes of the brain which have once again become conscious.”⁹²

Out of this tangle of ideas, Tudor, already a skilled sight-reader, would have been particularly struck by Dalcroze’s correlation of automatisms to what he termed “rhythmic images.” Briefly, Dalcroze outlines a physical training regimen whereby performers can construct mental representations—“images”—of coordinated physical movements and maneuvers through repeat conditioning. Rhythmic images, which sharpen in clarity as movements harden into reflex, can then be conjured in performance to trigger muscular activity with maximal efficiency.⁹³ Far from entailing an un-coordination of the physical and the psychological, the rhythmic image relies upon a machine-like tightening of the mind-body feedback loop.

Avoiding, even, discussion of “muscle memory” (no doubt an analogous concept), Dalcroze’s theorizations would have appealed especially to an organist and pianist who spent his career rejecting the value of memorization, insisting instead upon the importance of simply *seeing* scores, in the moment of performance, and “trying to realize what’s there” via the logic of raw optical stimulus response. Indeed, later in life, Tudor suggested that his practice methods entailed

⁹⁰ Jaques-Dalcroze, *Rhythm, Music and Education*, 96, 201–202.

⁹¹ Jean-Louis Barrault, *Reflections on the Theatre*, trans. Barbara Wall (London: Rockliff, 1951), 53–54.

⁹² Artaud, “Theatre and Its Double,” 12 (my emphasis).

⁹³ Jaques-Dalcroze, *Rhythm, Music and Education*, 201–202; Émile Jaques-Dalcroze, *The Eurhythmics of Jaques-Dalcroze* (Boston: Small, Maynard & Company, 1918), 16–17, 31, 44–49.

the memorization of “difficult physical maneuver[s]” associated with scores (e.g., fingerings), but never the music itself.⁹⁴ And while, as we will see, Tudor’s preparations for performance often entailed the production of dozens—or hundreds—of worksheets lined with the workings-out of musical or mathematical problems, he preferred to leave his performance scores “clean as a whistle”—free of needless annotations.⁹⁵ As Eric Smigel has creatively analogized, “a martial artist must train diligently to master the physical movements necessary to deflect an incoming strike, but he must not anticipate the strike in the actual confrontation.”⁹⁶

It is probable that Tudor’s idiosyncratic practice methods began with the Second Sonata, a work whose structural incoherence would have hobbled any musician’s attempt to memorize it as an unbroken continuity. We can reasonably reconstruct his training: foregoing any effort to understand Boulez’s work as a *unity*, Tudor decomposed its score into a series of learned “rhythmic images” coordinated with discrete physical movements and breath; he conjured these images in the amnesic heat of performance, looking neither backwards nor forwards (“not remembering what had passed”), but simply trusting his muscles and fingers to launch him over each hurdle placed in his line of vision.⁹⁷ More athleticism *as such* than the affective variety Artaud preached, Tudor’s workout would nonetheless have hung on a smooth circulation of breath and the reign of a state “somewhere between gesture and thought” (in other words, *automatism*).⁹⁸

⁹⁴ David Tudor, “Reminiscences of a Twentieth-Century Pianist: An Interview with David Tudor,” by John Holzaepfel, *The Musical Quarterly* 78, no. 3 (Autumn 1994): 633–634, <https://doi.org/10.1093/mq/78.3.626>. In this conversation with Holzaepfel, Tudor also indicates that his preparation for the Second Sonata premiere involved the recopying of the score onto a different sheet of paper for purposes of analysis. Tudor explains: “With the Boulez, it was only an analysis, two or three pages. I put it on three staves instead of two, so I could see the relationship of the voices. When I played it, I only had to be reminded. So I saw my realization in the back of my mind. But I wasn’t encumbered by having to look at it. Fingerings are for study.”

⁹⁵ Tudor, interview by Holzaepfel.

⁹⁶ Smigel, “Alchemy of the Avant-Garde,” 188–189.

⁹⁷ Clarkson, “Composing the Performer,” 31.

⁹⁸ Artaud, “Theatre and Its Double,” 68.

The most precise contours of Tudor’s passage through Boulez and Artaud must necessarily remain obscure. But that this talk of automatisms affected the pianist is evident both in his several cryptic statements regarding Artaud (in 1995, he would recollect that his writings helped to teach him “robotics”) and in the interpretive work he would carry out next—the subject of the following two sections.⁹⁹ It is thus crucial that we understand, as a corollary to You Nakai’s instrumentalized body, a performing mind placed in partial suspension and conveyed via the electrical firings of the unconscious. At this early stage, Tudor may have recognized that he was learning to transform his body into a mechanical medium for the sounding of music’s Busonian essence; but he could not yet have known that this transformation would carry him into the realm of high technology. Perhaps this was already written behind his eyes: following the premiere of the Second Sonata, which, as Cage reported to Boulez, was met with a “divided” audience, a review described the proceedings as “a series of uninteresting ideas worked out with the help of an IBM computing device.”¹⁰⁰ A slightly older Tudor would have recognized in this remark a great and prophetic wisdom.

3. Scanning (1951)

Combing chronologically through David Tudor’s many extant notes and notebooks, eclectic but reliable barometers of his changing interests, one registers a curious shift upon moving from the Forties to the Fifties: while literary snippets (Rainer Maria Rilke, 1875–1926, and Paul Valéry, 1871–1945) remain, tucked alongside evidence of an expanding spiritual cosmos, they increasingly cede space to pages upon pages of mathematical equations, and literature of a very different sort.¹⁰¹ One

⁹⁹ Tudor, interview by Vees and Adams, 29. Tudor recalls that “part of [his] technique was robotics” while discussing Artaud, and the application of his ideas to a particular series of works: composer Sylvano Bussotti’s (1931–2021) *Five Piano Pieces for David Tudor* (1959).

¹⁰⁰ Richard F. Goldman, “Current Chronicle,” *The Musical Quarterly* 37, no. 2 (April 1951): 253–254, <https://www.jstor.org/stable/739899>.

¹⁰¹ The pertinent notes can be found in Folders 1–4 of Box 107 of the Tudor Papers. One of several boxes collecting Tudor’s more “generalized” notes (i.e., materials not strictly bound to particular compositions or activities), Box 107 is contained within Series VII of the Tudor Papers, which is dedicated to “Personal” material.

folder of notes datable roughly to the early Fifties contains, for example, the following: two 1951 articles from *Radio Electronics* detailing “How an Electronic Brain Works,” a 1952 *Radio Electronics* piece on “Algebra in Electronic Design,” passages on binary mathematics transcribed, in French, from cybernetician Louis Coffignal’s *Les Machines à penser* (1952), and a 1947 article from *New Republic* (“Custom-Built Genius”) weighing an emergent breed of “electronic calculators” against flesh-and-blood mathematicians.¹⁰² What was on Tudor’s mind such that he was now losing himself in long division and familiarizing himself with the (techno-)logic of new electronic devices? As before, with *Battle Piece* and the Second Sonata, what oriented these new intellectual voyages was a particular work: John Cage’s *Music of Changes*, composed over the course of 1951.

With good reason, *Music of Changes* is regarded as a watershed in Cage’s compositional development, and the first truly radical statement of his post-percussion period. To listen to it performed is to experience a jarring but beautiful renovation of musical time. One could not call it “disintegrating and dispersive,” as Boulez’s Second Sonata, but nor does it hang together according to a linear continuity: chords, trills, and individual notes flare irregularly in empty space, sometimes colliding like wayward particles, but more often missing each other across breathy expanses of silence. Attacks are alternately delicate and violent—no two sounds seem to follow from the same hands.

Music of Changes was a watershed in Tudor’s development as well: realized largely through his close and continued collaboration with Cage in the year following the Second Sonata premiere, it occasioned a further growth of his automatisms, and his evolution into a properly *techno-logical*

¹⁰² These references all appear in Box 107, Folder 3, Tudor Papers. The citations can be reconstructed as follows: Edmund C. Berkeley and Robert A. Jensen, “How an Electronic Brain Works, Part IX,” *Radio Electronics*, June 1951, 38–40; Edmund C. Berkeley and Robert A. Jensen, “How an Electronic Brain Works, Part X,” *Radio Electronics*, July 1951, 56–65; Edmund C. Berkeley, “Algebra in Electronic Design,” *Radio Electronics*, February 1952, 55–57; Louis Couffignal, *Les machines à penser*, (Paris: Éditions de Minuit, 1952); and James R. Newman, “Custom-Built Genius,” *New Republic*, June 23, 1947, 14–18.

performer. The work also bound Tudor inextricably to Cage for the next decade. Those who have written of this close collaboration are fond of pointing to Cage's 1970 remark to Daniel Charles that "At that time [of its development], [Tudor] was the *Music of Changes*."¹⁰³ Martin Iddon, pointing out that Tudor's interpretive work for *Music of Changes* yielded "over 100 sheets of notes. . .[containing] a huge number of complex calculations," has even seen fit to "reverse the construction, [suggesting] that. . .*Music of Changes* was Tudor, or at least a pretty fair portrait."¹⁰⁴ Striking formulations, these; but colliding in tautology, they offer little insight. Any worthy investigation of this chain of relations must work to determine both what Cage saw in Tudor so worthy of a "portrait," and what Tudor, in ways perhaps unexpected, made thinkable—*possible*—in Cage's practice, such that *Music of Changes* could come to exist. Much of this investigative work has been done; but in what immediately follows, I hope to texture this work anew by looking at its little-understood relationship to Cage's emerging explorations of electronic media.

Not all aspects of *Music of Changes* were unprecedented. For one thing, the work's broader structural logic—its division into parts, and the relation of those parts—was conceived according to a technique dating back to Cage's percussion work: namely, the device of "rhythmic structure," by which Cage would divide works into durational phrases or time-lengths existing in proportional relation.¹⁰⁵ In terms of its *sounds*, however, *Music of Changes* was not "composed" in the usual, purposive sense of the term, although "composition," understood as a kind of aggregative *construction*, does capture some of what went on behind the scenes.¹⁰⁶ The sounds contained in the work were derived from three charts, each referring to one aspect of a possible "sound event"; these

¹⁰³ John Cage and Daniel Charles, *For the Birds* (Boston: Marion Boyars, 1981), 178–179.

¹⁰⁴ Iddon, *Cage and Tudor: Correspondence*, 40. It is musician Christian Wolff, Cage and Tudor's close colleague, who has provided the most direct and grounded take: "I don't think John Cage would have written *Music of Changes* if it hadn't been for David Tudor." Nakai, *Reminded by the Instruments*, 39.

¹⁰⁵ Pritchett, *Music of John Cage*, 13–14, 83–84.

¹⁰⁶ My description of *Music of Changes* leans significantly on James Pritchett's canonical analysis of the work. See Pritchett, *Music of John Cage*, 78–88.

aspects were sonority, duration, and dynamics. Each chart, in turn, contained sixty-four cells, each cell containing different contents: for example, while the “sonority” chart contained, as its various possibilities, single notes, “intervals” (two-note sounds), chords, complex clusters, string-plucks, and silences (these constituting half the cells), the “durations” chart comprised durational or rhythmic units described as aggregations of metrical values like whole notes, eight notes, and thirty-second notes. For each and every “sound event” comprised by *Music of Changes*, Cage referred to his three charts and selected one cell from each.

But Cage did not choose his component cells deliberately; the cells of Cage’s charts were sixty-four in number to correspond to the sixty-four hexagrams of the *I Ching*, an ancient Chinese divinatory text.¹⁰⁷ Customarily, one “consults” the *I Ching* either by throwing stalks of the yarrow plant, or flipping coins—from these actions derive values corresponding to an *I Ching* hexagram and its associated text or commentary. First introduced to the *I Ching* by a young musician and pupil named Christian Wolff, Cage immediately recognized its potential as a means of “chance” composition—and so he set out to divine a musical work.¹⁰⁸ Cage’s bold move towards “chance,” a word with which he is indelibly associated, was neither impulsive nor unanticipated; the developments in his life and work of which *Music of Changes* represents a culmination had been underway for some time.

From the mid Forties on, Cage had begun cultivating a new artistic disposition strongly informed by various strands of South and East Asian philosophy. Historian and philosopher Ananda K. Coomaraswamy’s suggestion (borrowed from St. Thomas Aquinas) that art should work to “[imitate] Nature in her manner of operation” formed one major arm of Cage’s aesthetic doctrine at

¹⁰⁷ Pritchett, *Music of Changes*, 70–71, 78–79. See also musician Alvin Lucier’s lucid explanation of the *I Ching* in Alvin Lucier, *Music 109: Notes on Experimental Music* (Middletown, CT: Wesleyan University Press, 2012), 14–15.

¹⁰⁸ Lucier, *Music 109*, 14. As Lucier explains, Christian Wolff’s father, Kurt Wolff, was the Publisher of Princeton University Press’s Bollingen Series, which issued an English version of the *I Ching* (translated from Richard Wilhelm’s German version) in 1950.

this time.¹⁰⁹ The notion, impressed upon him by an Indian musician named Geeta Sarabhai, that music might serve to mute the activity of the conscious mind and leave one more “susceptible to divine influences” came to function as Cage’s other major philosophical plank.¹¹⁰ In 1950–51, in a pair of lectures delivered at the New York painters’ haunt The Artists’ Club, Cage distilled these influences into a polemically *detached* and disinterested vision of musical creation, proposing that sounds be rescued from the violent imposition of thoughts, intentions, and *a priori* structures, and permitted to exist, of their own accord, in relations of “no-continuity.”¹¹¹

As musicologists David W. Bernstein and Jean-Jacques Nattiez have shown, Cage’s changing musical language also drew influence from the compositional philosophy of Boulez, with whom Cage had been in close correspondence since his 1949 travels in Paris. While the composers’ relationship would sour in just a few years owing to Boulez’s changing sympathies, in 1950–51, their directions were still sufficiently parallel that Boulez could remark to Cage, “we are at the same stage of research.”¹¹² On the cusp of *Music of Changes*, in works such as *Concerto for Prepared Piano and Chamber Orchestra* (1950–51), Cage was just beginning to employ cellular charts as compositional tools: in a May 22, 1951 letter, Cage explained to Boulez how he had decided to start arranging sound events “not in a gamut (linearly), but rather in a chart formation,” and how, navigating his cells like chess squares in the process of composition, he “made moves on this chart of a ‘thematic nature’ . . . e.g. down 2, over 3, up 4, etc.”¹¹³ Boulez was meanwhile adopting chart arrangements in his move towards “total serialism,” which sought to apply the logic of the series to musical qualities other than pitch: e.g., dynamics, attacks, and duration. Boulez found in the twelve-by-twelve chart,

¹⁰⁹ You Nakai, “How to Imitate Nature in Her Manner of Operation: Between What John Cage Did and What He Said He Did,” *Perspectives of New Music* 52, no. 3 (Autumn 2014): 144–145, <https://doi.org/10.7757/persnewmusi.52.3.0141>.

¹¹⁰ Pritchett, *Music of John Cage*, 36–38.

¹¹¹ Pritchett, 55–56, 66–69.

¹¹² Pierre Boulez to John Cage, between May 22 and July 17, 1951, in Nattiez, *Boulez-Cage Correspondence*, 97.

¹¹³ John Cage to Pierre Boulez, May 22, 1951, in Nattiez, 92–94.

populated like a completed sudoku puzzle, an expedient way to permute and multiply the dodecaphonic series.¹¹⁴

Neither composer had achieved, in their respective charts, what could be called a truly “non-linear” (dis-)organization of sound events: while Boulez’s serial derivations were still *serial*, or numerically ordered, no matter the series’ degree of “generalization” or “globalization,” Cage was still relying upon a logic of spatial or geometrical contiguity whereby he could make “moves” (left-right, up-down) along a chart-turned-chess-board. Cage was acutely aware of the residual linearity, which is why, in his May 22 letter, he compared the *Concerto*’s parts to “still-picture[s] rather than. . . movie[s]”—and announced to Boulez his radical new use of the *I Ching* in a work left unidentified.¹¹⁵

The work was *Music of Changes*, and it was by this time well underway—Cage had completed its first movement on May 16.¹¹⁶ Turning from Cage’s running dialogue with Boulez to his correspondence with Tudor, we can see glints of how crucial the latter musician must have been to Cage’s thinking at this time, and to his plunge from the chess-board to the *I Ching*. Owing to both Tudor and Cage’s close proximity for much of the year (both lived in New York City), and to, one suspects, Tudor’s taciturn nature, the correspondence is laden with weighty silences and absences, of information and emotion. But two early, successive letters, both written by Cage while Tudor was out of town giving recitals, are still highly revealing: in late January, Cage, still at work on his *Concerto*, writes, “I think only of you playing it and hope ^your circumstances will permit that. I miss you very deeply. . .”; and in early June, with one *Music of Changes* movement complete, “[I wonder]

¹¹⁴ Pierre Boulez to John Cage, August 1951, in Nattiez, 101–103.

¹¹⁵ “Statements by Morton Feldman, John Cage, and Christian Wolff collected by John Cage” (1951–52), in Nattiez, 94.

¹¹⁶ Iddon, *Cage and Tudor: Correspondence*, 12n17.

[w]hether you played or will play the *Changes*, + how you feel about them. And whether you miss me . . .”¹¹⁷

Beginning with the *Concerto* and continuing through the writing of *Music of Changes*, Tudor’s body was ever on Cage’s mind; doubtless, part of this fixation was romantic and sexual.¹¹⁸ But Cage also conceived of Tudor’s body as the ideal physical medium for his music’s realization, and as a point of technical reference according to which he could compose to specification: in multiple interviews, Tudor has recalled that Cage, having to “make some compositional decisions” regarding *Music of Changes*, asked, “How many arms should I assume that you have?”¹¹⁹ (Tudor recalls answering ‘eight,’ and to this may owe the fact that *Music of Changes* uses no more than eight possible “voices” or superimposed layers in any given section.)

The success of *Music of Changes*’ ongoing development required that Cage maintain an open and up-to-date line of communication with Tudor—an unbroken feedback circuit—and this is evident in a July exchange between the two: early in the month, Cage reports to Tudor a number of structural ambiguities, mistakes, and “irrationalities” discovered in the first movement of *Music of Changes*. Tudor replies, later in July, “Thank you for [your] communication regarding the Changes; I knew all that already!”; he then proceeds to pose yet another set of questions as to points of confusion and alternative sonic possibilities, remarking on his recently discovered “innovations”

¹¹⁷ John Cage to David Tudor, between January 21 and 27, 1951, and John Cage to David Tudor, ca. early June 1951, in Iddon, 9, 13.

¹¹⁸ Cage’s feelings in this regard are especially acute circa Winter-Spring 1951. Cage’s most explicit declaration can be found in a letter sent to Tudor in early June of that year. “I do not tell you about loving you,” Cage writes, “because you said you were afraid it would kill you. I do love you but it will always be so that you need not be afraid.” Writing to Tudor and his then-partner M.C. Richards in late September 1951, Cage strikes a tone of placid resignation, seeming to indicate that he has come to terms with Tudor’s lack of romantic interest (and indeed, Tudor’s relationship with M.C.): “I am glad to hear you are in the land of the happy night. Enjoy yourselves. My own feelings towards you were always those of wishing to flow in where it looked like water was absent (mixed with an inherited missionary attitude, itself not practicing what it preached).” Iddon, 11, 29.

¹¹⁹ David Tudor, “I smile when the sound is singing through the space’: An interview by Teddy Hultberg in Düsseldorf, May 17, 18, 1988,” last modified November 29, 2001, <https://daviddudor.org/Articles/hultberg.html#Untitled/Toneburst>.

regarding attacks and pedaling.¹²⁰ In a moving final passage, Tudor conjures for Cage a sort of aural “sneak preview” of *Music of Changes*, reflecting on a profound transformation of musical “space”: “The impressions I have from this piece are incredible. . . . [I]n [it] space is around one, that is, present in a new dimension. . . . It appears of the utmost importance to me now to be able to explain this phenomenon.”¹²¹

That *Music of Changes* was composed “to spec”—molded to the highly specific (but ever evolving) capacities of Tudor’s mind and body—is of course highly significant. But this fact alone is not terribly revelatory, and neither is the *general* observation that Tudor’s virtuosity as a performer enabled a work as structurally non-linear as *Music of Changes* to blaze into existence. One particularly significant dimension of *Music of Changes* has gone all but unacknowledged in Cage scholarship, and I would argue that this hidden layer, which quite possibly took greatest advantage of Tudor’s unique affordances, says something new about what Cage saw in his interpreter-collaborator, and about the transformations that *Music of Changes* encouraged in Tudor. This story, which concerns the work’s conceptual roots in magnetic recording tape, begins properly after 1950—once Cage realized he had privileged access to an IBM-in-training. However, a substantial detour through prehistory is in order.

As I mentioned above, work in percussion (including use of the prepared piano) represented a key center of gravity in Cage’s pre-1950 work; it is not for nothing that *LIFE* magazine, in their coverage of a 1943 concert given by Cage’s percussion ensemble at New York’s Museum of Modern Art, called Cage “the most active percussion musician in the U.S.”¹²² Percussion served a specific early function for Cage: its unusual, unpredictable, and materially *specific* (ideophonic) sonorities, uniquely irreducible to musical notation, offered him a crude glimpse of sonic agency—of the will of

¹²⁰ John Cage to David Tudor, ca. early July 1951, and David Tudor to John Cage, late July 1951, in Iddon, *Cage and Tudor: Correspondence*, 15, 18.

¹²¹ David Tudor to John Cage, late July 1951, in Iddon, 19.

¹²² David Nicholls, “Cage and America,” in *The Cambridge Companion to John Cage*, ed. David Nicholls, Cambridge Companions to Music (Cambridge: Cambridge University Press, 2002), 3.

sounds to be and act without regard for the musician's best laid plans. The culminating prepared piano of 1940, which Boulez loved for its violent disarticulation of Western tonality, should be regarded less as a polemic than as what Caroline A. Jones has termed a "mechanistic antidote to ego."¹²³ But percussion wasn't enough, and as is suggested by Jones's modifier "mechanistic," the Cage of the prepared piano was already seeking out new, more expedient antidotes to ego in the realm of electronic media.

At Seattle's Cornish School, the same environment whose troupes of dancers and nearby junkyards of metal scrap had encouraged Cage's embrace of percussion, the composer found the antidotes he was looking for. The institution's radio station and its arsenal of equipment allowed him to experiment with "live" broadcasting (the station could transmit sounds to an adjacent theatre in the school) and electronic amplification, and it is thus that in 1939, Cage could commence an enduring series of works "using electric or electronic technology": *Imaginary Landscape No. 1* featured piano and a large Chinese cymbal, but also radio sound-testing records played on variable-speed phonographs (their speeds and styluses manipulated in live performance).¹²⁴ In his second *Imaginary Landscape* work, produced in 1942, he amplified the "small sounds" of a wire coil by sticking it in a phonograph cartridge.¹²⁵ These early explorations and encounters were revelatory for Cage; what is striking, however, is that while he would continue to work with radio and phonography in subsequent years, and return to amplified "small sounds" decades later, no single technology or medium from this period induced changes in his *thinking* that had not already been anticipated by percussion. Magnetic tape, the medium that would comprehensively transform Cage's vision of

¹²³ Caroline A. Jones, "Finishing School: John Cage and the Abstract Expressionist Ego," *Critical Inquiry* 19, no. 4 (Summer 1993): 633, <https://doi.org/10.1086/448691>.

¹²⁴ Gordon Mumma, *Cybersonic Arts: Adventures in American New Music*, ed. Michelle Fillion, Music in American Life (Urbana: University of Illinois Press, 2015), 168–169; Brown, *Through the Looking Glass*, 30–37.

¹²⁵ Mumma, *Cybersonic Arts*, 168–169.

“sound-space,” had not yet reached American shores; and it is no coincidence that its arrival paralleled the composer’s drift into the non-linear cosmos of chance.

The tape technology that came to the American mass-market in the early Fifties was the cross-Atlantic progeny of the “Magnetophone,” a recording device which, introduced on the German commercial market in the mid-Thirties, stored audio signals on paper or celluloid tape lined with iron oxide powder. The Magnetophone was discovered by the Allies upon Germany’s “unconditional surrender,” and the United States quickly monopolized its associated patents, rushing clones into production.¹²⁶ As late as 1951, magnetic tape was still the more-or-less exclusive province of broadcasting studios and mainframe computing, but Cage was fortunate, in the early Fifties, to make the acquaintance of fledgling electronic composers Louis and Bebe Barron (1920–1989; 1925–2008).¹²⁷ The Barrons moved to New York City’s Greenwich Village c. 1950, establishing what has been called the “first electronic music studio in America.”¹²⁸ Via a connection to the inventor of the early Stancil-Hoffman tape recorder, and a family tie to the Minnesota Mining and Manufacturing Company (3M), among the first mass-producers of tape, they secured a custom-made recorder and a batch of reels before much of the public knew what the stuff was. While initiating their own tape-music practice with an eye to film scoring, they also opened their doors, and equipment, to eager composers.¹²⁹

Cage would not take comprehensive advantage of the Barrons’ *matériel* until Spring 1952, when \$5000 secured from architect Paul R. Williams (1898–1980), a sympathetic friend, funded the composition of the enormously ambitious tape piece *Williams Mix* (1952), which used *Music of*

¹²⁶ Thom Holmes, *Electronic and Experimental Music: Technology, Music, and Culture*, 3rd ed. (New York: Routledge, 2008), 33–35.

¹²⁷ David Morton, *Sound Recording: The Life Story of a Technology* (Baltimore: Johns Hopkins University Press, 2006), 122–127; Holmes, *Electronic and Experimental Music*, 81–82.

¹²⁸ Holmes, *Electronic and Experimental Music*, 80.

¹²⁹ Holmes, 80–81.

Changes-style charts and the *I Ching* to dictate the meticulous cutting and splicing of 500–600 field recordings (taken in the city and rural surround by the Barrons).¹³⁰ [Figure 1] But earlier, in January 1952, Cage had enlisted the Barrons (and Tudor) in the creation of *Imaginary Landscape no. 5*, a tape work which, also using the *I Ching*, stitched together a collage of re-recorded phonograph LPs; and prior to *that*, in 1949–1950, Cage had composed a score for *Works of Calder* (1950), filmmaker Herbert Matter’s (1907–1984) portrait of artist Alexander Calder (1898–1976), featuring a collage of “noises” that Cage had cut and scotch-taped together from two hours of source material recorded in Calder’s studio.¹³¹ [Figure 2] Cage’s earliest ventures into magnetic recording were thus before and then completely parallel to his work on *Music of Changes*, begun early in 1951 and premiered in full, by Tudor, on New Year’s Day 1952.¹³²

In a well-noted 1957 text titled “Experimental Music,” Cage extolls the virtues of magnetic tape at length, going so far as to directly link its presence on earth, beyond the bounds of Germany, to the “experimental” music of “openness,” transparency, and egoless-ness of which he had become the premiere American proponent. “[I]t is a striking coincidence that just now the technical means to produce such a free-ranging music are available,” Cage declares, going on to recount the Allies’ rescue of the Magnetophone.¹³³ Cage’s praise for magnetic tape is specific, and revealing: on the one hand, he highlights tape’s ability to reimagine tonal “space” by circumventing the necessity of the chromatic scale and pitch relations, and on the other, he notes its potential for sonic superimposition. Regarding the former capacity, he remarks, “[C]autious stepping [between pitches] is not characteristic of . . . magnetic tape, which is revealing to us that musical action or existence can occur at any point or along any line or curve or what have you in total sound-space”; regarding the

¹³⁰ Holmes, 82–86.

¹³¹ Holmes, 83; Brown, *Through the Looking Glass*, 108–111.

¹³² Iddon, *Cage and Tudor: Correspondence*, 31n84.

¹³³ Cage, “Experimental Music” (1957), in *Silence*, 8.

latter, “electronic mixing permits the presentation of any number of sounds in combination, [and] ordinary splicing permits the juxtaposition of any sounds, [as well as] unconventional cuts.”¹³⁴

The qualities of tape that Cage regards as most consequential for modern musical thought are precisely those which distinguish the medium as a “technical medium” in Friedrich Kittler’s sense of the term: circumventing the *symbolic* language of musical notation and the chromatic scale, which, per Alexander Rehding, “act as a filter that prevents noise, wrong notes, [and] extraneous sounds. . . from entering into circulation,” the tape, like the gramophone, records and reproduces continuous physical *data streams*, “warts and all.”¹³⁵ With “record grooves and magnetic tape,” states Kittler (echoing Cage, with his “sound-space”), “it becomes possible to store. . . colorations of musical instruments [*Instrumentalfarben*], sonic spaces [*Klangräume*], and indeed, even abyssal stochastic noise.”¹³⁶ Further, while “discrete” symbolic languages such as musical notation and the alphabet offer limited possibilities for what Kittler terms “time-axis manipulation,” or the (re-)configuration of time-serial data within spatial coordinates, with tape comes the possibility of “time reversals” and “stop tricks, cuts, and montages.”¹³⁷

It is far from a “striking coincidence” that these capacities of tape resonate powerfully with Cage’s ambitions for *Music of Changes*, as well as its unique sound—described briefly at the start of this section. In 1950, calling upon a term marshaled in “Experimental Music” (1957), Cage reported to Boulez his discovery in piano music of an “‘espace sonore,’ in which [each sound] may exist and change.”¹³⁸ While Cage came to most closely associate this sound-space with magnetic tape (whose

¹³⁴ Cage, “Experimental Music,” 9.

¹³⁵ Alexander Rehding, “Discrete/Continuous: Music and Media Theory after Kittler,” *Journal of the American Musicological Society* 70., no. 1 (2017): 223, <https://doi.org/10.1525/jams.2017.70.1.221>.

¹³⁶ Friedrich A. Kittler, *The Truth of the Technological World: Essays on the Genealogy of Presence*, trans. Erik Butler (Stanford, CA: Stanford University Press, 2013), 55.

¹³⁷ Kittler, *Optical Media*, 190. See also Friedrich Kittler, “Real Time Analysis, Time Axis Manipulation,” trans. Geoffrey Winthrop-Young, *Cultural Politics* 13, no. 1 (March 2017): 5–7, <https://doi.org/10.1215/17432197-3755144>; and Sybille Krämer, “The Cultural Techniques of Time Axis Manipulation: On Friedrich Kittler’s Conception of Media,” *Theory, Culture & Society* 23, nos. 7–8 (2006): 93–109, <https://doi.org/10.1177/0263276406069885>.

¹³⁸ John Cage to Pierre Boulez, December 18, 1950, in Nattiez, *Boulez-Cage Correspondence*, 78.

“limits. . .are ear-determined only”), he also set out to achieve it in *Music of Changes*, and Tudor, who had remarked unprompted on the work’s encompassing, and “mirage”-like “new dimension,” appears to have registered this spatialized sonic quality.¹³⁹

One finds clear evidence that Cage’s early tape experiments consciously structured his approach to *Music of Changes* in two of the work’s compositional innovations. First, there is the fact of the work’s vertical polyphony: as James Pritchett has remarked, while all of Cage’s earlier works had been “essentially monophonic in texture,” featuring a “single series of sounds that followed one after the other,” in, *Music of Changes*, the composer deployed the *I Ching* and a chart for “density,” using these devices to build up compositional phrases layer-by-layer. Layers were composed individually, using the sonority, duration, and dynamics charts described above, and then superimposed according to *I Ching* readings, with the densest phrases containing as many as eight layers (one for each of Tudor’s arms).¹⁴⁰ The logic of superimposition, of course, is precisely what Cage would later highlight in speaking of “electronic mixing” and tape’s amenability to collage and superimposition (“permit[ting] the presentation of any number of sounds in combination”).¹⁴¹ And we can visually see this vertical polyphony in the stacked superimpositions in *Williams Mix*.

Secondly, and more significantly, there is the new articulation of duration and spacetime at play in *Music of Changes*—the aspect of the work whose realization, we will see, owes most directly to Tudor. The quality that Cage may have regarded as tape’s greatest gift—its unconditional access to “total sound-space”—was more properly a matter of *time*, or *spacetime*, pried loose from the regimented scaffolding of equal temperament and allowed to unfold as a “continuum.” In the 1959 text “History of Experimental Music in the United States,” Cage lays out the considerable stakes:

Counting is no longer necessary for magnetic tape music (where so many inches or centimeters equal so many seconds): magnetic tape music makes it clear that *we are in time*

¹³⁹ Cage, “Experimental Music,” 9.

¹⁴⁰ Pritchett, *Music of John Cage*, 83–88.

¹⁴¹ Cage, “Experimental Music,” 9.

itself, not in measures of two, three, or four or any other number. . . All this can be summed up by saying each aspect of sound. . . is to be seen as a continuum, not as a series of discrete steps favored by conventions.¹⁴²

While this fascinating statement first finds Cage talking explicitly about “magnetic tape music,” he quickly seems to lapse into discussion of a more generalized condition or realization *instigated* by tape, but applicable to music writ large (i.e., electronic *and* acoustic instrumentation). Cage had good reason to make such a generalization, for in *Music of Changes*, he had successfully extrapolated tape’s revelation of a spatiotemporal continuum to piano music. Indeed, *Music of Changes* represented an early flirtation (perhaps *the* earliest) with what would come to be called “time-space notation” (or “proportional notation”): musical notation in which temporal events are represented as spatially extended graphic forms whose lengths correlate to time, usually measured in seconds.

In *Music of Changes*, the innovation was in part an expedient: the work’s chance-derived durational phrases, often oddly fractional and irregular in their interrelation, effectively refused assimilation into a larger metrical structure. Left, then, without an easy way to articulate relationships between individual notes, Cage placed them in a framework equating page-space to rhythmic or metrical values: two-and-a-half centimeters of space were made equal to one quarter note (and five centimeters equal to a half-note, and so on).¹⁴³ In *Music of Changes*’ compositional notes, Cage made explicit the influence of tape: “The notation expresses a relation between time and space such as exists in the case of sound recorded on magnetic tape.”¹⁴⁴

Of course, this notational solution was something of a patchwork—an attempt to graft metrical values onto a time-space ground—and thus a significant but incomplete move towards true

¹⁴² Cage, “History of Experimental Music in the United States” (1959), in *Silence*, 70–71 (my emphasis).

¹⁴³ Pritchett, *Music of John Cage*, 79–81; Iddon, *Cage and Tudor: Correspondence*, 36–38.

¹⁴⁴ John Cage, “Notes on Compositions II (1950–1963),” in *John Cage, Writer: Selected Texts*, ed. Richard Kostelanetz (New York: Cooper Square, 2000), 51–52.

time-space notation. This hybridity finds bizarre expression in Cage's treatment of note attacks: while the notes of *Music of Changes* are *symbolically* representative of metrical values, Cage also treats them as *iconic* forms or spatial extensions, indicating in his performance directions that "a sound begins at the point in time corresponding to the point in space of the stem of the note (not the note-head)." ¹⁴⁵

And the solution was an imperfect, and hugely problematic one: as Martin Iddon notes, if Cage's centimeter-to-meter, or space-to-time, relation had remained static throughout *Music of Changes*, the score would have been a "straightforward representation of events in time-space notation." However, Cage had made the decision to lend flexibility to the work's "rhythmic structure"—its most rigid compositional element—by varying the tempo among rhythmic units, or, the work's proportional sections and subsections.¹⁴⁶ As can be seen in Martin Iddon's schematic outline of *Music of Changes'* first rhythmic cycle [Figure 3], the presence of tempo changes (*accelerandos* and *ritardandos*) in certain units means that two-and-a-half centimeters are equivalent to different temporal values at different points in the work.

Crucially, Cage notes in his performance instructions that these tempo changes "are to be associated with the rhythmic structure, rather than with the sounds that happen in it."¹⁴⁷ In other words, per Eric Smigel, "the musical elements. . .do not articulate the form of the work; *structural velocity exists independently* of pitch, duration, timbre, and dynamics."¹⁴⁸ Negotiated in relation to an expanding and contracting time-space "continuum," these tempo fluctuations thus demanded a performer capable of abandoning conventional, "rhythmic" changes in speed for a conception of speed as velocity.¹⁴⁹ "Formerly," writes Cage of *Music of Changes* in a 1952 article, "[compositional

¹⁴⁵ Iddon, *Cage and Tudor: Correspondence*, 36–38.

¹⁴⁶ Iddon, 37.

¹⁴⁷ Smigel, "Alchemy of the Avant-Garde," 111–112.

¹⁴⁸ Smigel, 169 (my emphasis).

¹⁴⁹ Iddon, *Cage and Tudor: Correspondence*, 38.

phrases] were time-lengths, whereas in [my] recent work the lengths exist only in space, the speed of travel through this space being unpredictable.”¹⁵⁰

Cage was fortunate indeed that he had Tudor to rocket through the total sound-space of *Music of Changes*, for a lesser performer could scarcely have left the launch-pad. Up until now, my argument regarding Cage’s 1951 work has hovered close to what might be called technological determinism, as I have held that *Music of Changes*’ fundamental character was in part determined, or at the very least colored, by the composer’s encounter with magnetic tape. Here I want to complicate this script, proposing that such a determination only became possible—thinkable—once Tudor arrived in Cage’s life to *humanly* mediate it. Indeed, I believe that Cage, having witnessed up-close Tudor’s performance of Boulez’s Second Sonata, and having well understood the implications of its violent and complex discontinuity, knew instinctively that the pianist would be able to navigate the alien temporal fabric of *Music of Changes*.

Tudor was certainly the performer for the job; but *Music of Changes* was a different beast than Boulez’s Second Sonata, and demanded from him a substantial evolution of his performative abilities. As I argued in the previous section, the sharpening of his reflexes and “automatisms” had allowed Tudor to reduce the complexities of Boulez’s score to a series of rhythmic “images” or Artaudian “gestures.” For the highly non-linear *Music of Changes*, which Tudor would look back on as an “even further break” from conventional musical continuity, the pianist had to refine his automaticity still further, such that he could move fluidly between notes and clusters scattered and superimposed in space according to the vagaries of the *I Ching*.¹⁵¹ He has recalled, with remarkable turns of phrase, the need to bring about a complete evacuation of his normal (human) awareness: “When I came to [*Music of Changes*]. . . . [I needed to be] ready for anything at each instant. . . . I had

¹⁵⁰ “Statements by Morton Feldman, John Cage and Christian Wolff collected by John Cage” (1951–52), in Nattiez, *Boulez-Cage Correspondence*, 105.

¹⁵¹ Tudor, “Piano to Electronics,” 24.

to learn how to be able to *cancel my consciousness of any previous moment*, in order to be able to produce the next one.”¹⁵²

However, returning to the complexities of Cage’s not-quite-time-space-notation and its shifting tempi, Cage’s “no-continuity” represented only one of the challenges Tudor faced in preparing for *Music of Changes*. Tudor found himself dealing not only with notes that failed to hang together logically, but also with a spatial manifold that he needed to move through at variable speeds. Eric Smigel and Martin Iddon have recounted, at length, the incredible convergence of circumstances that carried Tudor towards a solution: Irma Wolpe, Tudor’s former teacher, had divorced Stefan Wolpe in 1949 and married the German-American mathematician Hans Rademacher; through his old connection, Tudor was able to secure from Rademacher a pair of mathematical formulae by which he could calculate the time, in seconds, that any given section of *Music of Changes* would take to elapse (under conditions of static or changing tempi, depending).¹⁵³

As Smigel notes, while the formulae Rademacher provided must have struck Tudor as exotic, they are in fact the stuff of “elementary physics”—specifically, they appear to be kinematics equations of the sort used to calculate an average rate of acceleration or deceleration from two velocities.¹⁵⁴ Using Rademacher’s equations, Tudor converted the length in *space* of each unit in *Music of Changes*’ rhythmic structure into *time* (factoring in the relevant changes in tempo, or velocity), and “constructed [his own] chart that presents the cumulative elapsed time of each unit,” rounding values in seconds to two decimal places.¹⁵⁵ Next to every tempo change in his performance score (or, at junctures between rhythmic units), Tudor then penciled in the overall time elapsed in seconds, and the time of the next tempo change; each of the chronometric “boundaries” or sign-posts in

¹⁵² Tudor, 24 (my emphasis).

¹⁵³ Iddon, *Cage and Tudor: Correspondence*, 38–40; Smigel, “Alchemy of the Avant-Garde,” 167–179.

¹⁵⁴ Smigel, “Alchemy of the Avant-Garde,” 195.

¹⁵⁵ Smigel, 178.

Tudor's score also bore a plus or minus sign, these symbols functioning as prompts meaning, in essence, "prepare to accelerate" and "prepare to decelerate," respectively.¹⁵⁶ In performance, Tudor found he could check himself against these chronometric sign-posts using a stopwatch (much like an athlete continually checking themselves during laps around a track).

"Elementary" or not, Rademacher's equations demanded from Tudor a dizzying amount of number-crunching. Within a vast trove of "general" Fifties-era worksheets and notebooks contained in Tudor's papers (but not filed alongside his *Music of Changes* material, so labeled), one finds hundreds of velocity calculations, tables of logarithms and decimal-to-fraction conversions, and basic tenets of algebra transcribed from vintage mathematics handbooks like mechanical and civil engineer Oliver Byrne's *The Practical Model Calculator* (1852).¹⁵⁷ Most interesting is a small, six-ring notepad containing dozens of exercises copied from John Jesse Clark's 1921 reference manual *The Slide Rule and Logarithmic Tables* along with associated diagrams.¹⁵⁸ [Figure 4] As the notepad in question also lists Rademacher's formulas, it is reasonable to infer that Tudor used a slide rule (specifically, a "Mannheim" slide rule with four scales, all logarithmically graduated) to carry out his work for *Music of Changes*.¹⁵⁹ [Figure 5]

To be sure, circa 1951, the slide rule would have been the most expedient instrument available to Tudor for his mathematical purposes—its presence in his notes is thus not entirely

¹⁵⁶ Smigel, 169–179; Iddon, *Cage and Tudor Correspondence*, 39–40. Interestingly, Iddon seems to interpret the plus and minus signs differently than Smigel: "In Tudor's copy of the score, [temporal] indications are given to the nearest second, with a superscript plus or minus symbol, should the tempo change occur just after or just before the indicated time point." Smigel's interpretation of the symbols would seem more plausible.

¹⁵⁷ Miscellaneous "mathematical" notes, ca. 1950s, Box 107, Folders 3–4, Tudor Papers.

¹⁵⁸ Notepad with slide-rule exercises, mathematical equations, and other miscellaneous notes, ca. 1950s, Box 107, Folder 2, Tudor Papers. The diagram pictured in [Figure 4] alongside Tudor's pen-and-ink rendering appears in Chapter IV of Clark's manual—the section concerned with "slide rule settings" and "diagrams of settings." John Jesse Clark, *The Slide Rule and Logarithmic Tables, Including a Ten-place Table of Logarithms: A Concise and Accurate Reference Work on the Application of the Slide Rule and Logarithmic Tables to Practical Problems* (Chicago: F.J. Drake & Co., 1921), 61.

¹⁵⁹ The Mannheim slide rule is described in Clark's manual thus: "The Mannheim slide rule consists of a body, called the *rule*, a movable part of the same material with tongues on each side to fit in grooves in the rule, called the *slide*, and a rectangular frame carrying a piece of glass or other transparent material on which is engraved a hairline, called the *runner* or *cursor*. The term *Mannheim* when applied to a slide rule, always implies a certain combination of four logarithmic scales, marked *A*, *B*, *C*, *D* . . . and always requires the use of a runner." Clark, *The Slide Rule*, 24.

significant in and of itself. However, as *Music of Changes*' novel time-space notation demanded that Tudor learn to process its score *proportionally*, with reference to both ticking seconds and the spatial boundaries of the page, it is not surprising that Tudor found special value in the logarithmic slide rule, which allows the skilled operator to carry out calculations at a *glance* through the relative alignment or positioning of its four scales. Following Sybille Krämer, we should thus understand Tudor's slide rule, which made mathematics visible, as a *medium* of "operative iconicity" facilitating "problem-solving through spatialized ordering."¹⁶⁰ That the visual language of logarithmic scales resurfaces in Tudor's earliest musical diagrams (see the brief discussion of Tudor's "nomographs" in Chapter 3) testifies to the slide-rule's importance for the cracking of *Music of Changes*' greatest notational puzzle.

For Cage and Tudor both, the consequences of the latter's mathematical legwork, and the implications of his particular "solution" to *Music of Changes*, were vast. By converting the entirety of *Music of Changes* into chronometric time, Tudor had at last rendered considerations of rhythm and meter moot; Tudor's concomitant choice to perform *Music of Changes* with the external reference of a stopwatch—a necessary new technical prosthetic—solidified Cage's resolve to plunge headlong into chronometric measurement and time-space notation proper. As Cage reflected to interviewer Richard Kostelanetz in 1986, "Due to David Tudor's studying a form of mathematics. . . I dropped all notion of meter and went directly into plain space equals time, which enormously facilitated the writing of new music."¹⁶¹ Meanwhile, Tudor kept his stopwatch for much of his performance work throughout the following decade.¹⁶²

¹⁶⁰ Sybille Krämer, "Trace, Writing, Diagram: Reflections on Spatiality, Intuition, Graphical Practices and Thinking," in *The Power of the Image: Emotion, Expression, Explanation*, ed. András Benedek and Kristóf Nyíri (Bern, Switzerland: Peter Lang Edition, 2014), 5.

¹⁶¹ John Cage, "John Cage and Richard Kostelanetz: A Conversation About Radio," by Richard Kostelanetz, *The Musical Quarterly* 72, no. 2 (1986): 219–220, <https://doi.org/10.1093/mq/LXXII.2.216>.

¹⁶² Iddon, *Cage and Tudor: Correspondence*, 40.

As ever, the *inward* changes that these preparations brought about in Tudor were perhaps the most substantial. While the description of Tudor's cumulative clocking of time elapsed in *Music of Changes* makes it sound as if he used chronometric markings to anticipate and smoothly automate *his* accelerations and decelerations through the composition's musical continuum (kinematics equations, after all, are concerned with the motions of objects and bodies), Tudor's reflections on his performance of the work tell a very different story: "I was *watching* time rather than *experiencing* it. That difference is basic. Even playing pieces which last an indefinite amount of time your relationship to time is different, because you are now able to telescope some periods and microscope others at will."¹⁶³ If Tudor refers not to his own "motion," here, but rather to an almost synoptic stretching and compressing of time-space, it is because *Music of Changes* had transformed him into something like an optical scanner.

For Boulez's Second Sonata, Tudor had needed to master the construction of "rhythmic images" executable through trained automatisms alone. For *Music of Changes*, Tudor departed from rhythm entirely, finding a way to approach music as nothing *but* image—fodder for pure visual data-processing. As You Nakai has managed to reconstruct, between 1978 and 1994, Tudor was tutoring a piano student named Joseph Kubera, whom he was teaching *Music of Changes*, and to whom he was attempting to explain the nature of this departure from rhythm. The eye, Tudor instructed Kubera, must "read space at the correct speed": "Read," he continued, "measuring by eye (notation in space). Measure your accuracy against a stopwatch, *computing amount of time* between MM [metronome] markings + converting to minutes + seconds."¹⁶⁴ How can we make sense of this new manner of performance, in which "reading" is elided with "computation" and flattened into an act of spatial measurement?

¹⁶³ Tudor, "Piano to Electronics," 24.

¹⁶⁴ Nakai, *Reminded by the Instruments*, 42 (my emphasis).

While an unlikely source, British avant-garde musician Cornelius Cardew (1936–1981) offers us an enormously valuable seed of an answer never before invoked in connection with Tudor. Writing in the mid Seventies, Cardew, once a close associate of Tudor, and a former follower of Cage who by this time had turned on the elder composer with a vengeance, reflected critically on the vogue of “graphic notation” that had arguably begun with the “time-space” innovations of works like *Music of Changes*:

In reading music one normally ‘reads’ the symbols for how long and short the individual notes or chords are supposed to be, but when time is notated proportionally (say 1cm = 1 second [. . .]) you are supposed to ‘scan’ the page with your eye. You let your eye travel from left to right, and when it picks out an obstacle you play the appropriate note. It is a slightly dehumanizing method, because it aims to replace thought (reading) with an automatic physical reflex (scanning).¹⁶⁵

In his highly specific invocation of “scanning” in the sense of an “automatic physical reflex,” the widely read Cardew is quite possibly referring to the portion of Norbert Wiener’s *Cybernetics: Or Communication and Control in the Animal and the Machine* (1948) dealing with neurophysiology, and specifically, the functional analogy between the nervous system and an “ultra-rapid computing machine.”¹⁶⁶ This thread of Wiener’s text finds him drawing on the work of fellow cyberneticians Warren S. McCulloch and Walter Pitts, who, having argued that a nervous “net” furnished in part “with a tape [and] scanners connected to afferent[t] [neurons],” could perform numerical computations, proposed to invent a pattern-recognition machine that could “read” the visual input of a printed page and convert it into sound.¹⁶⁷ “Such a selective reading,” states Wiener, “can be performed automatically as a scanning process.”¹⁶⁸

¹⁶⁵ Cornelius Cardew, “Wiggly Lines and Wobbly Music,” *Studio International*, November–December 1976, 252. Cardew’s article is both a polemic and a *mea culpa*; while Cardew was, at the time of his writing, producing deeply political music informed by his activities as a member of the Communist Party of England, in the Sixties, he had devoted years of work to the production of an extensive graphic score titled *Treatise* (1963–67).

¹⁶⁶ Norbert Wiener, *Cybernetics: Or Control and Communication in the Animal and the Machine*, 2nd ed. (Cambridge, MA: MIT Press, [1948] 2000), 12, 121–123, 137–140.

¹⁶⁷ Warren S. McCulloch, *Embodiments of Mind* (Cambridge, MA: MIT Press, 1988); see also Pesi Rustom Masani, *Norbert Wiener: 1891–1964*, Vita Mathematica 5 (Basel: Birkhäuser, 1990), 223–227.

¹⁶⁸ Wiener, *Cybernetics*, 22–23.

While Cardew wielded his “scanning” formulation as a Marcusean accusation of music turned cold and operational, it is as good a description as we have of Tudor’s culminating evolution: note its resonances with the pianist’s instructions to Kubera, and with the lessons of Artaud, Dalcroze, and Barrault reviewed earlier. For Tudor, the reflexive pattern-recognition and clock-mensuration of scanning would have seemed a logical conclusion to his steady acquisition of automatisms, and his longtime refinement of sight-reading—now given an entirely new meaning. Indeed, scanning, which for Norbert Wiener turned on the “exchangeability of time and space” in the realm of data-processing, can be understood as a sophisticated but necessary corollary to the new form of “time-axis manipulation” implicit in time-space notation.¹⁶⁹

Tudor was working with one of the oldest time-storage mediums in human history—musical notation—and yet, as his own words suggest, he had learned to take “measurement” of notation so efficiently and automatically that he could reconstruct its serial data in one synchronic optical sweep, avoiding linear travel along its axis. (“I was *watching* time rather than *experiencing* it.”) As the pianist had finally exorcised rhythm from his body, delegating all timekeeping to a stopwatch, this activity could take place, as it were, outside of time, in a pure state of proportional analysis (“telescop[ing]. . .and microscop[ing]. . .at will”). “Place by eye,” Tudor instructed Kubera, “rather than rhythmic pulse,” dictating a break from precisely that quality of music—the pulse, or beat—revealed through the temporal capture (entrainment) of the body’s psychobiological clock.¹⁷⁰

Entrained no more, perhaps Tudor had merely come to inhabit a *different* time. Writing of the strange temporality inherent to electronics, media theorist Wolfgang Ernst draws on the Ancient

¹⁶⁹ Masani, *Norbert Wiener*, 226.

¹⁷⁰ Nakai, *Reminded by the Instruments*, 43; Manfred Clynes, a scientist and theorist of music who, incidentally, coined the term “cyborg” in 1960, explains entrainment thus: “[M]usic engages and programs a psychobiologic clock, or clocks, which function subconsciously but give conscious readouts, and what in computer function are called ‘interrupts.’” James R. Evans and Manfred Clynes, eds., *Rhythm in Psychological, Linguistic, and Musical Processes* (Springfield, IL: C.C. Thomas, 1986), 195–196.

Greek opposition between the “diachronic arrow” of *chronos* (workaday human time, conceived of as a linear series of present moments), and the “mythic or synchronic” *kairos*—the time of the “right thing at the right moment,” originally defined in Greek thought as “right position” or “proportion.”¹⁷¹ Given *Music of Changes*’ roots in Cage’s slicing and splicing of magnetic tape, still another etymon of *kairos* warrants mention: “cut.”¹⁷² Whatever time Tudor had passed into, it changed him irrevocably, such that musical “feeling” now meant something entirely new to him. Recalling, in 1972, Stefan Wolpe’s difficulty understanding *Music of Changes*, Tudor reasoned that he was “trying to *feel* it in his physical organism, as musicians were taught to do up to that time. What he meant to say was that he couldn’t feel it. But I could, because by that time I was in a different musical atmosphere.”¹⁷³ For his part, Tudor, contra Cardew, did not find his passage through *Music of Changes*, and his decisive penetration into techno-logic, dehumanizing. “What [*Music of Changes*] did for me,” he would reflect, “was to bring about freedom, the freedom to do anything, and that’s how I learned how to be free for a whole hour at a time.”¹⁷⁴

Of Tudor’s commentators, Eric Smigel has come closest to grasping the stakes at play here: “The most obvious and germane analogy,” he writes of Tudor’s final transformation, “is the manner in which a tape machine, without a sense of anticipation or memory, reads the data on a strip of magnetic tape as it passes by the sensor. . . . It is reasonable that Tudor, surrounded by composers who were greatly inspired by the possibilities of magnetic tape, looked to his electronic counterpart for guidance.”¹⁷⁵ This is a magnificent analogy, but it can be textured slightly: first, I have claimed that in Cage’s case, the “possibilities” of tape, at least as regards instrumental composition, were not

¹⁷¹ Wolfgang Ernst, *Chronopoetics: The Temporal Being and Operativity of Technological Media*, Media Philosophy (London: Rowman & Littlefield International, 2016), 7–8.

¹⁷² Ernst, *Chronopoetics*, 143.

¹⁷³ Tudor, “Piano to Electronics,” 24.

¹⁷⁴ Tudor, 24.

¹⁷⁵ Smigel, “Alchemy of the Avant-Garde,” 180.

accessible to inspiration until Tudor made them so. Second, while working with Cage on *Music of Changes*, and in successfully premiering the work on January 1, 1952, Tudor clearly demonstrated a power and possibility that *transcended* the magnetic medium as such; this would explain why, after making *Williams Mix* later that year, Cage curiously halted his work with tape until 1958; in the intervening years, he had nearly unmitigated access to Tudor and his scanning abilities.¹⁷⁶

In Tudor, Cage found a musician who could brilliantly translate the technological into the abstractly *techno-logical*, and, as a crucial bonus, a performer whose qualified humanity and liquidated ego (cancelled consciousness) made him no risk as far as contamination through ego or intention was concerned. As we will see below, In the years following 1951, intersecting circles of avant-garde musicians demonstrating a fluency in or curiosity towards electronics would follow Cage's lead, calling on Tudor's performance abilities, and locating in him a techno-logical value beyond the strictly technical. Regarding this stage of Tudor's development, we can tentatively quote the conclusion of the musician's carefully filed *New Republic* article ("Custom-Built Genius"), mentioned upfront: "Fears of mechanical calculators are, of course, nonsense. . . . As for the problem 'man v. machine,' Pascal once delivered himself of an eloquent judgment worth recalling: 'Man is but a reed—the weakest thing in nature—but he is a reed that thinks.'"¹⁷⁷

4. A techno-logical repertory (after 1951)

Tudor's decade-long performance career following *Music of Changes* (1951) spans continents, and it is sufficiently meaty to have occupied no fewer than two dissertations.¹⁷⁸ I cannot hope, in this final section, to do justice to the vast expansion of Tudor's concert repertory over these years; I do, however, want to offer a synoptic panorama of Tudor's two loci of performance activity (America

¹⁷⁶ Holmes, *Electronic and Experimental Music*, 88.

¹⁷⁷ Newman, "Custom-Built Genius," 18.

¹⁷⁸ I refer to the theses of John Holzaepfel and Eric Smigel, cited throughout.

and Europe), and look more closely at several of Tudor's collaborative relationships in the Fifties. I have suggested above that *Music of Changes* represented Tudor's proper self-realization as a technological performer, and in what follows, the unifying analytic of techno-logic will serve to structure my discussion (and reframing) of Tudor's repertory. I will emphasize, here, the rather compelling fact—noted by others before me—that the composers represented in Tudor's repertory, while most associated with conventionally instrumental work, are united by either a conscious interest in electronics, or experience working with electronics. However, far from suggesting that these composers saw in Tudor a means to apply *preconceived* techno-logic, I want to review instances in which Tudor awakened the very possibility of techno-logical translations and transpositions in those around him, and in any case, continued to use engagements with the work of others as opportunities for further self-transformation and invention. Chapter 3 will begin with a closer look at Tudor's post-*Music of Changes* work with Cage—thus I privilege composers other than Cage in the analyses that follow.

Artist Irwin Kremen (1925–2020), the dedicatee of Cage's infamous “silent piece” 4'33” (1952), has remarked, with reference to Cage and Tudor, that *Music of Changes* initiated a “working partnership of exquisite accomplishment.”¹⁷⁹ *Music of Changes* likewise triggered, for Tudor, an over ten-year period of tireless work with composers other than Cage—all of whom were happy to make use of his virtuosic abilities. Holzaepfel has done a brilliant job of detailing one major locus of Tudor's activity: the so-called “New York School” of composers (John Cage, Morton Feldman, Christian Wolff, and Earle Brown) who converged upon a common interest in musical “freedom,” and a changed relationship between composer and performer. It has been customary to regard Cage, indissolubly wed to “chance” in the historical imaginary, as the gravitational center and effective representative of this circle; but his New York School colleagues had ideas entirely their own, and in

¹⁷⁹ John Holzaepfel, “Cage and Tudor,” in *The Cambridge Companion to John Cage*, ed. Nicholls, 173.

some instances helped show Cage the way forward in the “new musical atmosphere” that Tudor inhabited.

As David Nicholls notes, it was as early as December 1950 (before, he points out, Cage had begun *Music of Changes*) that Morton Feldman took a sheet of graph paper and sketched out a spare, graphical composition for solo cello (*Projection 1*) that specified duration and timbre, but left it to the performer to decide upon pitch. With this work, Feldman more or less “invented” what Cage would later term, in his own late-Fifties practice, “indeterminate” composition—that is, composition leaving interpretive decisions to the performer.¹⁸⁰ And more pertinent to this account, Holzaepfel has made the compelling case that it is Tudor, not Cage, who functioned as the New York School’s driving motor in the early-to-mid Fifties. At this time, Tudor dedicated himself wholly to the increasingly abstract and “open” works of Feldman, Brown, Wolff, and Cage, at first performing directly from composers’ scores, but later deriving from their indeterminate or otherwise unconventional graphics his own pitch selections, disposed according to time-space notation. These were “interpretations”—scores for performance—that were nearly distinct “works” in their own right.¹⁸¹ (Ferruccio Busoni would be inclined to agree.)

As mentioned early on, Tudor simultaneously earned a place of prominence in a more distant musical circle: the community of European avant-gardes that clustered around Darmstadt, Germany’s Internationale Ferienkurse für Neue Musik (International Summer Course for New Music, hereafter Darmstadt). A contemporary concert series featuring lectures, panels, and courses, Darmstadt functioned as a clearing-house for major trends within the European avant-garde (notably, serialism and electronic music), and, thanks in part to Tudor, as an occasional platform for

¹⁸⁰ David Nicholls, “Towards Infinity: Cage in the 1950s and 1960s,” in *The Cambridge Companion to John Cage*, ed. Nicholls, 101–102.

¹⁸¹ Holzaepfel, “Performance of American Experimental Music,” vii–x.

the showcasing of American experimentalism.¹⁸² In 1958, Tudor famously visited Darmstadt with Cage, providing musical accompaniment to the composer's lecture on "Indeterminacy" that caused a seismic "shock" of revulsion, disbelief, and curiosity to rumble through Germany's avant-garde network.¹⁸³ But he had been to Darmstadt previously, having accompanied his old teacher Stefan Wolpe there in July 1956. Wolpe had signed on to deliver a lecture "On New (and Not-So-New) Music in America," and tasked Tudor with providing live musical "examples" of composers discussed.¹⁸⁴

Even earlier, in 1954, Tudor and Cage had traveled to Donaueschingen, where they performed at the small southwest German town's annual music festival; and to Cologne, where they had arranged to perform for live broadcast at Nordwestdeutscher Rundfunk (Northwestern German Broadcasting, or NWDR).¹⁸⁵ It was during the latter visit that Tudor met Stockhausen, who was at the time working extensively in the NWDR's newly minted electronic studio—an operation founded by Herbert Eimert (1897–1972), a musicologist and evangelical serialist, in association with physicist and information theorist Dr. Werner Meyer-Eppler (1913–1960).¹⁸⁶ In Cologne, Tudor had occasion to hear two of Stockhausen's electronic studies, which were played, along with other new German electronic music, before he and Cage went on stage; Stockhausen likewise had opportunity to hear Tudor perform *Music of Changes*—which astonished him. After returning to the United States, Tudor

¹⁸² Amy C. Beal, "Negotiating Cultural Allies: American Music in Darmstadt, 1946–1956," *Journal of the American Musicological Society* 53, no. 1 (Spring 2000): 112–113, <https://doi.org/10.1525/jams.2000.53.1.03a00040>. Amy C. Beal has quite rightfully criticized the tendency, in English-language scholarship, to reductively portray Darmstadt as "a summer camp dedicated to the exploration of electronic music and European serialism," and thus ignore the real diversity among its ranks. But as the Darmstadt composer that most regularly worked with Tudor, Karlheinz Stockhausen, sits more or less at the center of the tendencies Beal invokes, this is not the worst description for our purposes. Beal, "Cultural Allies," 106–107.

¹⁸³ Martin Iddon, *New Music at Darmstadt: Nono, Stockhausen, Cage, and Boulez*, Music since 1900 (Cambridge: Cambridge University Press, 2013), 196–228.

¹⁸⁴ Iddon, *New Music at Darmstadt*, 171–177.

¹⁸⁵ Iddon, 156–164.

¹⁸⁶ Holmes, *Electronic and Experimental Music*, 56–61.

wrote to Stockhausen, “please know that it was a great joy to meet and be with you, and that I like your music ‘the best’, and that I will devote myself to it and play it wherever possible.”¹⁸⁷

Surprisingly few have examined why Tudor’s repertory—highly selective, and restricted exclusively to new music—should have placed these two groups of musicians, “avant-garde” (European) and “experimental” (American) side by side. To those accustomed to placing “chance” and “serialism” at diametrical poles, the musical arsenal might indeed seem a conflicted one. Seeking a common thread in Tudor’s repertory, Eric Smigel nods to the familiar argument that serialism and chance-based (or indeterminate) works take different routes towards the same destination: mitigation of authorial control. And he offers a much more original perspective in arguing that a more revealing unifying feature of Tudor’s repertory is “rhythmic innovation”—a new handling of time.¹⁸⁸ But his most compelling observation, one of great relevance to this dissertation, is that “most of the composers. . .[in] Tudor’s repertory spent a good deal of time in electronic music studios.”¹⁸⁹ “Developments in instrumental composition,” he explains, “went hand-in-hand with those in the recording media.”¹⁹⁰ As Smigel indicates, and as was seen in the lengthy discussion of tape’s influence on the time-space of *Music of Changes*, rhythmic innovation and electronic experimentation, time and technics, are clearly deeply connected; yet there are implications at play here that extend beyond the realm of rhythm alone.

Smigel has very valuably centered Tudor in the postwar convergence of the electronic and the instrumental, but he is not the first to have remarked more generally on these confluences. As early as 1957, writing from the frontlines of New York School composition, Christian Wolff published a brief but suggestive text titled “New and Electronic Music” that not only addresses the

¹⁸⁷ Iddon, *New Music at Darmstadt*, 164; Robin Maconie, *Other Planets: The Complete Works of Karlheinz Stockhausen*, updated ed. (Lanham: Rowman & Littlefield, 2016), 125–126.

¹⁸⁸ Smigel, “Alchemy of the Avant-Garde,” 76–83

¹⁸⁹ Smigel, 89.

¹⁹⁰ Smigel, 89.

exact composers whose music Tudor played most regularly, but also, as per its title, elides electronic music with the otherwise “new” music of the Cage circle and the Darmstadt school. “[S]ince 1950,” writes Wolff, “one finds a concern for a kind of objectivity, almost anonymity—sound come into its own. The music is a resultant existing simply in the sounds we hear, given no impulse by expressions of self or personality.”¹⁹¹ He continues, a bit later:

As for the electronic music generally, it has brought about, or was coincident with, a self-consciousness about the nature of sound, its production and perception, that has rarely been equaled. . . . Yet it is not a question of no longer writing instrumental music. There are simply more possibilities available. Boulez speaks primarily of combining electronic and instrumental activity. Varèse has written a work, *Déserts*, which uses both. . . . Stockhausen transfers many ideas realized in working with electronic means to his instrumental works.¹⁹²

The agency Wolff ascribes to electronics in the construction of a new sonic “self-consciousness” is striking; but most valuable is his rejection of the notion that a neat opposition between the “electronic” and the “instrumental” structured this historical moment. In what remains of this section, I want to build on the observations of Smigel and Wolff, pursuing further the suggestion that composers of new postwar music—particularly those Tudor placed in his repertory after *Music of Changes*—played with techno-logical exchanges between the concert hall and the production studio, seeing, simply, “more possibilities available.” I also want to propose that Tudor, by virtue of his honed automatisms, scanning abilities, and “robotics” challenged and *allowed* composers to explore the possibilities on offer to them, rendering a new musical techno-logic practical and thinkable.

As is indicated by Wolff’s somewhat selective examples above, the connections between electronics and the instrumental practices of European avant-gardes (exemplified by Stockhausen) have long been well known; these composers mused upon such connections *themselves* in lengthy, verbose articles for *Die Reihe*, the theoretical journal edited by Stockhausen and Herbert Eimert

¹⁹¹ Christian Wolff, “New and Electronic Music” (1958), in *Occasional Pieces: Writings and Interviews, 1952–2013* (New York: Oxford University Press, 2017), 11.

¹⁹² Wolff, “New and Electronic Music,” 16.

between 1955 and 1962. While Cage's techné has been actively investigated by music and media historians, Feldman, Brown, and Wolff's respective flirtations with the electronic have gone all but untheorized.¹⁹³ Below, I will examine three of Tudor's cross-Atlantic collaborations as brief case studies, discussing Stockhausen before turning attention to the New York School, represented by Brown and Wolff.

Stockhausen — densities

By his 1954 encounter with Tudor, Stockhausen had already experienced a number of compositional revelations in the electronic studio, and further, he had already begun to integrate his findings into music for conventional instruments. Like Cage, Stockhausen had been shaped powerfully by his acquaintance with tape, which he had first handled in the studios of French composer Pierre Schaeffer. Tape had shown Stockhausen the possibility of a “unified time domain” (or an absolute temporal continuum) in much the same way as it had pressed Cage toward the use of time-space notation.¹⁹⁴ In Eimert’s Cologne studio, however, Stockhausen found himself using a battery of devices—sine- and sawtooth-wave generators, frequency filters, and a white-noise generator—whose capacity to finely shape and synthesize sound on a near-molecular level inspired additional concerns.¹⁹⁵ It is no coincidence that the technology of the NWDR (or, from 1956 onward, the WDR, or Westdeutscher Rundfunk) lent itself beautifully to serialist exercises in rigorous tonal construction, and Stockhausen’s *Studie I* (1953) is one such exercise. Composed entirely of sine tones derived mathematically from a fundamental frequency of 1,920 Hz, the work is stunningly austere—an x-ray of a composition.¹⁹⁶

¹⁹³ For a fine account of the many technical supports propping up Cage’s thought, see Nakai, “How to Imitate Nature.” On this subject, see also Brown, *Through the Looking Glass*, and Frances Dyson, *Sounding New Media: Immersion and Embodiment in the Arts and Culture* (Berkeley: University of California Press, 2009), esp. 54–82.

¹⁹⁴ Holmes, *Electronic and Experimental Music*, 62.

¹⁹⁵ Holmes, 59, 62–65.

¹⁹⁶ Holmes, 63.

However, as musicologist Jennifer Iverson has recounted, the Cologne studio's "primitive and unwieldy" equipment, and the mediating presence of multiple technicians (extra hands to twist knobs and cut tape) introduced a "degree of imprecision" into electronic works that humbled those composers pursuing total organization of a composition's every constituent tone.¹⁹⁷ Stockhausen and his peers thus learned to adapt: finding that, for example, they could neither predetermine nor fully control the fast flurries of sound produced by their pulse generators, they stopped thinking in terms of isolated sound events (as per the "pointillist" aesthetic of so much Webern-indebted serialist music), and shifted their focus to larger statistical structures: clouds of macro-level sonic activity, and big, tectonic shifts in density. Already thinking techno-logically, Stockhausen seamlessly transposed statistical composition methods to instrumental works. Sketches for his *Gruppen* (1955–57) for three orchestras quite literally *graph* incidences of marimba and woodblock attacks as cresting curves rising and falling in cartesian coordinates.¹⁹⁸ [Figure 6]

It is one thing to negotiate sweeping, probabilistic densities when operating on an orchestral scale—but how could one reasonably bend this logic to the piano? By the mid Fifties, Stockhausen had already been trying: in 1952–53, he composed the first four in an ongoing series of conventionally notated piano pieces (*Klavierstücke*) intended to explore a shift in concern from "points" to "groups." True to this ambition, in *Klavierstück I*, notes tumble towards one another in successions of clusters, their movement governed not by rhythm (or so it would seem), but rather something like gravity or magnetism.¹⁹⁹ When he first made Tudor's acquaintance in 1954, Stockhausen was still at work on the next set of *Klavierstücke* (*V–VIII*, 1954–55); after their meeting, he made revisions to all but *Klavierstück VIII*, and dedicated the set to Tudor.²⁰⁰

¹⁹⁷ Jennifer Iverson, "Statistical Form Amongst the Darmstadt School," *Music Analysis* 33, no. 3 (October 2014), 344–347, <https://doi.org/10.1111/musa.12037>.

¹⁹⁸ Iverson, "Statistical Form," 347–348.

¹⁹⁹ Maconie, *Other Planets*, 108–109.

²⁰⁰ Kyle Gann, liner notes, *Karlheinz Stockhausen – David Tudor – Klavier Stuecke*, hat ART CD 6142, 1994, compact disc.

It is not so readily obvious why these pieces, which, commentators have noted, even more pointedly reflect Stockhausen's experiences with oscillators and pulse flurries, should have been entrusted and molded to Tudor's hands. Indeed, Stockhausen heard Tudor perform *Music of Changes*, which, despite its use of superimpositions, favors the discontinuous, the isolated, and the unevenly juxtaposed: a creature of collage and the cut, it speaks more to tape than electronic point clouds. However, whether implicitly or through his conversations with Tudor, Stockhausen seems to have grasped one of the finer implications of the pianist's scanning: his ability to take rapid proportional measure of musical events—an essentially visual skill well-matched to Stockhausen's demand that the pianist read trends and graphs, or distributions of density, into notes disposed conventionally on five-line staffs.

The recordings documenting Tudor's performances of the *Klavierstücke* in 1958–59 prove the soundness of Stockhausen's judgment, testifying to a mutually understood techno-logic; per Kyle Gann, the piano "gives its answer to the synthesizer."²⁰¹ Paying a more oblique compliment to Tudor's early presentations of these works, musician Alvin Lucier (1931–2021) has pointed out that one original set of reel-to-reel recordings was rendered unreadable by signal bleed—caused, he claims, by the extremity and abruptness of Tudor's playing.²⁰² As Eric Smigel notes, in the published version of the *Klavierstück VI*, issued in 1965, Stockhausen dispensed with the conventionally notated (and wildly dizzying) tempo markings included in the work's original score and instead expressed tempo changes via a simple graphical aid placed above the staff—a rising, falling, and zig-zagging line making explicit the trends at play. Perhaps he anticipated, shrewdly, future performers ill-equipped to scan with the proficiency of his original dedicatee.²⁰³ [Figure 7]

²⁰¹ Gann, liner notes, *Stockhausen – Tudor*.

²⁰² Lucier, *Music 109*, 76–77.

²⁰³ Smigel, "Alchemy of the Avant-Garde," 99–101.

Brown — multichannel

In Stockhausen, we have a figure who was consciously exploring exchanges between the electronic and the instrumental prior to and during his encounter with Tudor. While significant to Tudor's story, the collaboration with Stockhausen marked a convergence of mutually reinforcing concerns already more or less manifest. By contrast, the partnership of Earle Brown and Tudor is more revealing, given Brown's silence on the subject of technical media. The silence is not unique to Brown within the context of the "New York School" group, which, setting aside Cage, has never been very forthcoming about the techno-logical. Nonetheless immersed in the realm of media, Brown, Wolff, and Feldman are indeed all bound by their common participation in a lengthy investigation into the compositional affordances of tape. In 1952, the trio participated with Tudor in the cutting and splicing of recorded sounds for Cage's *Williams Mix* (1952), and this mammoth work was merely the main outgrowth of a larger 1952–53 venture (known both as "Project: Sound," and "Project for Magnetic Tape") in which each artist had the opportunity to produce a tape work in the studio of Louis and Bebe Barron.²⁰⁴

Brown devised two tape works under the auspices of the "Project for Magnetic Tape"—*Octet I* (1952–53), and *Octet II* (1954). Successfully realized and presented live at the University of Illinois in March 1953, *Octet I* is a work which, when performed in concert, assigns eight channels of recorded sound to eight different loudspeakers, ideally placed "equidistantly (360 degrees) around the audience."²⁰⁵ Brown sourced sounds for *Octet I* from the library of recordings amassed by the Barrons for *Williams Mix*, and by stitching "very brief fragments" of these recordings into dense and intricate patterns, attempted to render them an incoherent cacophony of "sheer sound."²⁰⁶ An

²⁰⁴ David Cline, *The Graph Music of Morton Feldman*, Music since 1900 (Cambridge: Cambridge University Press, 2016), 334–337.

²⁰⁵ "Octet I," Earle Brown Music Foundation, accessed September 6, 2021, <https://earle-brown.org/work/octet-i/>.

²⁰⁶ "Octet I."

excerpt of Brown's score for the work [Figure 8], executed on graph paper, positions faint pencil outlines of tape fragments with reference to two axes: one for time, and another specifying sound channels.

Plenty compelling on its own—Brown was early to experiment with multichannel sound, let alone of a surround-sound variety—*Odet I* begs more questions when considered in relation to the composer's instrumental compositions of the early Fifties, well noted for their striking graphic scores. When Brown was first assimilated into Cage's wider circle following his move from Denver, Colorado to New York with partner Carolyn Brown (1927–, a dancer who would achieve great renown in the Merce Cunningham Dance Company), he was transitioning out of a dryly serial musical style shaped by the teachings of Joseph Schillinger (1895–1943), a music theorist and composer who had developed a comprehensive new compositional program rooted in mathematics.²⁰⁷ The first of several works he wrote for David Tudor, whom he had first met in Denver in the fall of 1951, was *Perspectives* (1952)—a structurally thorny work derived through the subdivision, multiplication, and aggregation of rhythmic cells.²⁰⁸

Perspectives turned out to be a threshold work for Brown. Conscious of the composition's highly irregular meter and rhythmic discontinuity—he would remark that “it fell into phrases and groups of durations and rests which were extremely difficult to read in the sense of *counting*”—Brown asked Tudor if he wanted him to re-notate it according to a uniform pulse. Tudor responded incredulously: he had no need for “counting,” because he simply measured the work’s durations proportionally in the act of performance, telescoping and micro-scoping sections at will.²⁰⁹ The

²⁰⁷ Earle Brown, “On December 1952,” *American Music* 26, no. 1 (Spring 2008), 1–3; Earle Brown, “The Notation and Performance of New Music,” *The Musical Quarterly* LXXII, no. 2 (1986): 191–192, <https://doi.org/10.1093/mq/LXXII.2.180>.

²⁰⁸ Carolyn Brown, *Chance and Circumstance: Twenty Years with Cage and Cunningham* (Chicago: Northwestern University Press, 2009), 8–10.

²⁰⁹ Brown, “Notation and Performance of New Music,” 191–192; Smigel, “Alchemy of the Avant-Garde,” 149–151.

response astonished Brown, who felt a weight lifted from his shoulders; just as Tudor's use of a stopwatch in *Music of Changes* cemented Cage's move to time-space notation, the pianist's disbelieving remark regarding "counting" gave Brown the necessary push to embrace a highly abstract form of proportional notation in collaboration with Tudor's techno-logical body. The composer would most programmatically explain what Tudor had revealed to him in the performance notes for his *Music for Cello and Piano* (1954–55), which outline a specific vision of "time notation" rooted in a sophisticated appreciation of Tudor's scanning:

Music for Cello and Piano is divided into 3 sections of 3 minutes each. There are 3 systems on each page; each system is to be performed in a total time of 15 seconds. The durations are extended visibly through their complete space-time of sounding and are precise relative to the space-time of the score. . . . As the score is practiced, the performer will quickly discover the relative time of each duration as it relates to each of the other durations and to the total time of each system. The end of each system (15 seconds) is a point of orientation and the "time-sense" of this duration soon becomes accurate within one or two seconds. The performer may slightly increase or decrease his speed through each system to compensate for these differences. David Tudor, who will perform the piano part in the Darmstadt performance, is very familiar with the notation and the time aspect of the work.²¹⁰

Here, Brown evidences a developed understanding of both the proportional or spatial nature of Tudor's reading ("measurement") technique, and the nearly immediate or *synchronic* temporality in which it is executed: he notably anticipates a performer capable of orienting their "time-sense" within just "one or two seconds." However, even before *Music for Cello Piano*, in a dossier of earlier graphic scores titled *Folio* (1952–53), Brown had reacted immediately and brilliantly to his contact with Tudor in an array of experiments toying with the musical time-axis. *December 1952* (1952), possibly the most celebrated work of the *Folio*, transmutes Tudor's abandonment of the count into a vision of stunning simplicity: stripped of staff lines and notational symbology, vertical and horizontal rectangular forms hover in space, appearing to glide past one another in their passage through and beyond the two-dimensional frame of the score. [Figure 9] According to Brown's consciously

²¹⁰ "Music for Cello and Piano," Earle Brown Music Foundation, accessed September 6, 2021, <https://earle-brown.org/work/music-for-cello-and-piano/>.

ambiguous instructions, the performer, using any instrument, is to read the score from any conceivable direction, simply correlating “relative intensity” to the forms’ thickness, and negotiating sequence and duration with reference to horizontal and vertical axes of the page.²¹¹

While Brown seems to credit Tudor as the instigating spark behind his move to graphic notation in *December 1952* and similar works, he also implies that Tudor served to catalyze influences already dormant within him—specifically, the kinetic grace of Alexander Calder’s mobiles, and the “immediacy of contact” between Jackson Pollock (1912–1956) and his paint-strewn canvases.²¹² Calder’s impress on *December 1952*’s constellation of loosely articulated parts can be discussed, and Brown’s debt to the Pollock of art critic Harold Rosenberg’s “action painting” theorizations is equally evident.²¹³ But I would offer that Tudor catalyzed another of Brown’s influences as well—one which, if not consciously operative in the *Folio* works, casts a long shadow over them. Consider Brown’s instructions for his slightly earlier *November 1952* (1952), which features conventionally notated pitches, but suspends them in a large field or continuum of closely hatched horizontal lines: “Attacks may be interpreted as completely separated by infinite space, collectively in blocks of any shape, or defined exactly within that space. Lines and spaces may be thought of as *tracks moving in either direction (horizontally at different and variable speeds)*.²¹⁴ [Figure 10]

Naturally, Brown’s invocation of variable-speed tracks calls to mind nothing so much as magnetic tape, and the reel-to-reel equipment used to record and edit Cage’s *Williams Mix* in the fall of 1952. Brown, we should not forget, was closely involved in this effort, spending much of his

²¹¹ “Folio and 4 Systems Prefatory Note,” Earle Brown Music Foundation, accessed September 6, 2021, <https://earle-brown.org/wp-content/uploads/Folio-and-Four-Systems-Prefatory-Note.pdf>.

²¹² Brown, “Notation and Performance of New Music,” 191–192.

²¹³ Brown has referred to Pollock’s “immediate, ‘action’ technique of painting (forming).” Earle Brown, “Form in New Music” (1967), in Larry Austin and Douglas Kahn, eds., *Source: Music of the Avant-Garde, 1966–1973* (Berkeley: University of California Press, 2011), 28. The relevant Harold Rosenberg text is “The American Action Painters,” *Art News*, January 1952, 22–23, 48–50.

²¹⁴ “Folio and 4 Systems Prefatory Note” (my emphasis).

autumn, as recalls Carolyn Brown, splicing tape “for about twelve hours a day.”²¹⁵ It is thus striking to consider that the sonic mobility and modularity Brown encountered in that setting helped to motivate the structural simplicity of works like *December 1952*, whose black strips, smooth blocks of duration, can be interpreted quite easily as abstracted segments of tape. This rather superficial evocation of the medium, however, serves to distract from a more idiosyncratic manifestation of techno-logic: one identifiable in *December 1952*’s explicit invitation to *spatialized* interpretation.

In the work’s performance instructions, Brown asks that the interpreter “realize that [the music] is in motion and step into it. . .either sit and let it move or move through it at all speeds.”²¹⁶ Coupled with the composer’s indication that the work can be played from any of the scores “four rotational positions,” this request seems to imagine an ideal situation in which music *surrounds* the performer (and, perhaps, their audience), flowing from all directions. Recall Brown’s slightly later *Octet I* and its multi-tracked, surround-sound treatment: does not *December 1952*, when read as a *floor-plan*, not a score (Pollock would be pleased), anticipate multichannel sound within the confines of conventional instrumentation, conjuring the crisscrossing of transverse loudspeaker streams?

We cannot verify, as with Stockhausen, these plays of techno-logical exchange, retracing the transposition of possibilities and affordances from tape, to *Folio*, and back; Brown has never suggested that such links and correspondences exist, and has preferred instead to foreground his admiration for Pollock and Calder. But a back-channel of techno-logic inspiration cannot be ruled out in light of what has been discussed above. And if such covert influences *are* at play here, then the chronology would indicate that they lay dormant and inert—functionally dead—until Brown met a human being, David Tudor, who *didn’t need to count*. As in the case of Cage, it would have been Tudor the scanner who actuated these techno-logical relations as practical possibilities.

²¹⁵ Brown, *Chance and Circumstance*, 34.

²¹⁶ “Folio and 4 Systems Prefatory Note.”

Wolff — real-time

Certainly, the work of Stockhausen and Brown presented Tudor with valuable new challenges, or at the very least, further opportunities for the training and sharpening of his scanning abilities: while Stockhausen's *Klavierstücke* would have forced the pianist to translate his proportional thinking into the language of statistical densities, Brown's graphic scores would have required him to weigh and counterbalance durations with sufficient precision to compensate for their ambiguities. Neither composer's works, however, would have posed challenges comparable to those conjured by Christian Wolff, who in the late Fifties, confronted Tudor with some of the last great hurdles of his performance career—and pressed him onto a plane of techno-logic still more rarefied.

The junior composer of the New York School, Wolff had first entered Cage's orbit in 1950, when the elder composer took him on as a composition student.²¹⁷ (Wolff was only sixteen at the time.) Cage warmed quickly to Wolff, both because he admired his compositional work—he penned a number of pieces for prepared piano in the early Fifties—and, perhaps, because he had introduced Cage to the *I Ching*. While Feldman and Brown, as has been discussed, distinguished themselves from Cage through their early flirtations with graphic notation and indeterminacy, Wolff eventually carved out a path for himself marked by an abiding interest in contingency, and the elimination or subversion of the musician's *decision time* in the live-performance context. Wolff's *Duo for Pianists II* (1957) represented his first real extension into this territory: an invitation to improvisation in everything but name, *Duo for Pianists II* evenly apportions sound events between a pair of performers, and then assigns each a set of corresponding sonic “cues,” or triggers, to listen for while performing. Cues are received as performance instructions, and thus the work takes shape via a feedback loop as performers trigger each other's cues and prompt associated sound events. The

²¹⁷ Holzaepfel, “Performance of American Experimental Music,” 133–136.

signal innovation of the work, at least in Cage's eyes, was its substitution of moment-to-moment contingency for predetermined duration, or its exchange of *object* for *process*.²¹⁸ Referring to the time of decisions, Wolff has remarked that *Duo* reduces tempo to "zero"—Cage evocatively called this "Zero Time."²¹⁹

Duo for Pianists II is arguably one of Wolff's first engagements with a music of "social relations."²²⁰ Wolff would grow increasingly interested in political practice and the interpersonal dynamics of musical performance in the Sixties and Seventies, and thus *Duo for Pianists II* can reasonably be regarded as a kind of social experiment. But Wolff also composed this work with the knowledge that Tudor would perform it (he premiered the work, alongside, Cage, at Darmstadt in 1958); thus we should entertain the possibility that Wolff, who wrote so eloquently of electronic affordances at around the time he composed *Duo for Pianists II*, also conceived of the work technologically. The possibility intrigues in part because the term "zero time," or "time zero," carried a very specific meaning in the Fifties: this was the time of atomic detonation arriving just after countdown.²²¹ As Tung-Hui Hu has written, the corollary of postwar "zero time" was the "real-time" technology then implemented to stave it off at all costs. In 1958, the American Air Force first took command of the Semi-Automatic Ground Environment (SAGE) system, a vast air-defense apparatus meant to track Soviet bombers, and significantly, the first computer system allowing for real-time screen interaction.²²² But Hu also notes that the notion of "real time" had been in

²¹⁸ Michael Hicks and Christian Asplund, *Christian Wolff*, American Composers (Urbana: University of Illinois Press, 2012), 26–27.

²¹⁹ Pritchett, *Music of John Cage*, 146–148.

²²⁰ The phrase "social relations" was used by composer Walter Zimmerman in a 1976 interview with Wolff. See Wolff, *Occasional Pieces*, 53.

²²¹ See, for a representative reference to "zero time" in this sense, J.C.G., "Review: The Effect of Atomic Weapons," *Current Science* 20, no. 3 (March 1951): 76, <https://www.jstor.org/stable/24214070>. "The amount of energy produced in the fission of 1 kg. of uranium 235 or plutonium is equivalent to 2×10^{13} calories or 20,000 tons of T.N.T. This corresponds to the energy of the atomic bombs dropped over Japan. At the instant of explosion, the core temperature may be of the order of 1 million degrees, which starts an expanding ball of fire which at -1 millisecond after zero time may have a radius of 45 ft. and a temperature of 300,000°."

²²² Tung-Hui Hu, "Real Time/Zero Time," *Discourse* 34, no. 2–3 (Spring/Fall 2012): 164, <https://doi.org/10.13110/discourse.34.2-3.0163>.

circulation earlier: in 1946, engineer J. Presper Eckert described as “real-time” those computers that carry out experiments “in intervals of time shorter than that required by human judgment.”²²³

Duo for Pianists II can in this light be seen as an attempt to collapse Tudor’s reaction time into precisely such real-time intervals, robbing him of his usual opportunity to *prepare* for his optical contact with a score, and of course, eliminating any preexisting time-axis or event sequence that he might take easy measure of via his scanning. Wolff’s next work, *For Pianist* (1959), which the composer has described explicitly as a “reaction to Tudor” and his tendency to “work out a piece fully beforehand,” succeeded in adapting *Duo for Pianist*’s built-in contingency to the situation of the soloist, effectively constructing a choose-your-own adventure narrative for the performer, who must attempt various actions at the piano (“go from a note near the bottom piano register to a note near the top as quickly as possible”), and based on their success or failure, proceed along one of multiple forward paths.²²⁴ **[Figure 11a]** If in effect, *For Pianist* brought to the concert hall the kind of branching, if-then command logic used by FORTRAN, the programming language minted by IBM in 1957, then Tudor was prepared to evolve his methods accordingly.²²⁵ **[Figure 11b]** As You Nakai has observed, Tudor’s realization score **[Figure 12]** goes so far as to include manipulable and movable components capable of responding actively to contingencies, and furnishing instructions in nothing less than *real time*.²²⁶

By 1958–59, Tudor had been honing and reinventing his abilities for many years—but now, with a little help from Wolff, he had finally made of himself the IBM he was destined to be from the cultivation of his first-ever automatism. Whether or not Wolff had arrived at real-time (or “zero-

²²³ J.P. Eckert, Jr., “Continuous Variable Input and Output Devices,” in *The Moore School Lectures: Theory and Techniques for Design of Electronic Digital Computers*, ed. Martin Campbell-Kelly and Michael R. Williams (Cambridge, MA: MIT Press, 1985), 394.

²²⁴ Wolff, *Occasional Pieces*, 41.

²²⁵ Paul E. Ceruzzi, *A History of Modern Computing*, 2nd ed. (Cambridge, MA: MIT Press, 2003), 91–93.

²²⁶ Nakai, *Reminded by the Instruments*, 67–70.

time”) composition via Tudor and his techno-logism, he would not linger long in this conceptual space, so colored by games of performer frustration and “labyrinthian complications.” In subsequent years, he would take a turn towards poetic and inviting prose scores designed for human beings—not computers.²²⁷ Meanwhile, having achieved “real time,” Tudor would, in the early Sixties, make a break for the real, remaining close to technology, but exorcising his own techno-logism for good.

Conclusion: Electroshocks

Only ten years separated Tudor’s tenure as an organist at Swarthmore, PA’s Trinity Church from his early-Fifties ascension as the premiere pianist of the postwar avant-garde. As I have shown, however, this decade was patterned with a series of substantial transformations that left Tudor’s musical perception (and the work of those fortunate to know him) substantially altered. The story of Tudor’s rise as a performer has already been told by several worthy commentators; but here, I have tried to reframe the usual narrative, focusing not on virtuosity as such, but rather on the *techno-logism* of Tudor’s metamorphosis. This techno-logism found a reflection in the compositional practices of postwar experimentalists, who were busy bending the lessons and effects of technical media to conventional instrumentation. As I will argue in Chapter 3, turning to Tudor’s uptake of electronics in the early Sixties, the techno-logical element in the pianist’s earlier performance practice crucially contoured the nature of his change in direction. The reframing accomplished here will thus help us identify a crucial continuity linking Tudor’s early performance practice to his turn to composition.

A frustrating chicken-or-egg question has haunted the history discussed here: which came first, a techno-logical Tudor, or a techno-logical postwar music? One could argue that the technical demands of Boulez’s Second Sonata and Cage’s *Music of Changes* were what pushed Tudor to invent a

²²⁷ Holzaepfel, “Performance of American Experimental Music,” 162.

new performative disposition for himself, with Artaud, Dalcroze, and Barrault also helping to clarify the power and virtue of automatism. But even earlier, of course, Irma Wolpe's Dalcrozean command of the performing body (what Tudor termed her "apparatus") had encouraged her young student to first embrace the piano and fold the machinic weight and splendor of the organ into himself. This initial chain of causality is less decisive than what happened after: Tudor converged with composers who, with his collaboration, invented new sound-worlds suspended between vastly different means of music-making. Conversely, Tudor found, in their music, opportunities to further invent *himself*—valuable spurs towards the continued development of his own apparatus.

Why did Tudor do it? That is, why did he make himself an embodied machine? We have heard reasons why he so aggressively dedicated himself to the realization of (highly difficult) music by Cage, Stockhausen, and others: Tudor enjoyed puzzles; he relished challenges; and, as Martin Iddon has beautifully said in connection to Cage's work, Tudor was unwilling to take the *chance* that without his virtuosity, such music would simply "not turn up."²²⁸ But why did Tudor, again and again, willingly "cancel his consciousness," evacuating his humanity for the sake of such work? In one sense, as I have discussed, this was precisely what the work demanded—a supra-human performer unbothered by structural *illogic* and capable of bending the time-space continuum. But I suspect that Tudor, who found "freedom" in this transformation, also derived from Artaud, mingled with Busoni, the belief that a becoming-technological might allow him to outpace the symbolic logic of the musical work and its attendant score, and to penetrate into a deeper sonic essence.

Despite his hatred of all *textual* mediation, Artaud was not opposed to the theatrical application of multimedia; he in fact felt that tools like the loudspeaker, wielded as a deafening agent of terror and surprise, could serve to recapture some of the carnal energy that had been robbed from

²²⁸ Iddon, *Cage and Tudor: Correspondence*, 7. Cage famously remarked of Tudor, "his interest in puzzles invited the whole thing of indeterminacy." Holzaepfel, "Cage and Tudor," 175.

the stage by authors and scripts.²²⁹ Marshaling a striking metaphor in her description of Artaud's imagined theater, in which words are ground into shavings, thoughts are rendered equivalent with objects, and “expression” is achieved only through pyrotechnic plays of light and sound, media theorist Frances Dyson has stated that “[on Artaud’s stage], a primal law operates with the precision of a metaphysical, ethical, and aesthetic machine.”²³⁰

While he spoke in a voice colored by a Romantic love of Nature, not a fevered rage against Western art and metaphysics, Busoni, another of Tudor's key early influences, was curiously aligned with Artaud in his belief that technology might serve to rend open the space of the symbolic for the benefit of art. One is shocked to find that Busoni's *Sketch of a New Esthetic of Music* (1907), which compares musical motifs to “different families of plants,” and waxes poetic about “breaking sunbeams” and the “flush of dawn,” makes breathless mention, while nearing its conclusion, of American inventor Thaddeus Cahill's (1867–1934) then-new “Telharmonium,” an organ-like tone-generator powered by fleet of electrical generators or “dynamos.” Busoni expresses hope that the Telharmonium, among the first-ever electrical (not yet electronic) instruments, might at last reveal the “infinite gradation of the octave” with its live current and “mathematically exact” vibrations.²³¹ Suggestively, patent numbers associated with the Telharmonium, jotted down beside Cahill's name, can be found among Tudor's unsorted notes.²³²

Tudor, I would suggest, took these proto-media theories to heart as early as his path-breaking Second Sonata premiere. Why, then, didn't he take up tape composition or sound synthesis? Why, for so long, did he stick with the piano? In the first place, marked by Busoni's writings on the power of the interpreter, and impacted by his close collaborative work with Stefan

²²⁹ See, for an introduction to Artaud's technological interests, Denis Hollier, “The Death of Paper, Part Two: Artaud's Sound System,” *October* 80 (Spring 1997): 27–37, <https://doi.org/10.2307/778806>.

²³⁰ Dyson, *Sounding New Media*, 38–39.

²³¹ Busoni, *New Esthetic*, 33.

²³² Undated note with Telharmonium patent numbers, Box 36, Folder 2, Tudor Papers.

Wolpe and John Cage, the younger Tudor believed firmly in the power and necessity of the performer, and was not yet ready to speak in his own compositional voice. In the second place, it is possible that Tudor regarded his techno-logized body as more capable than any of the media at his disposal of bringing new life and possibility to the music around him.

Tudor might have been encouraged in this belief by Artaud, who (recall) taught him “robotics.” While Artaud was able to flirt with radio at the very end of his life, he was generally wanting for the “machines of instant utility” crowding his imagination, and accordingly, he often seems to have imagined *himself* as a machine, communicating electrically via his nerves, and, perhaps, circumventing the written word via the power of direct current.²³³ But Tudor’s composer collaborators would also have functioned to corroborate his first instinct: the techno-logical reliance on the body (his body). Recall that Cage took a seeming hiatus from experimentation with tape after finding that Tudor could more than model its effects and possibilities.

Tudor’s trust in his own techno-logism would not last forever. In one of his last interviews, he would look back upon the late Fifties and early Sixties, with some bitterness, as a period during which he was “playing the piano like an automaton.”²³⁴ This mid-Nineties interview also recalls a difficult transitional moment, which we will turn to in Chapter 3, when the freedom that Tudor had found in his automatisms—his cancellation of consciousness—had evaporated, and his role as postwar music’s resident scanner had turned oppressive. Artaud, painted by his friend, painter Jean de Bosschère (1878–1953) as *L’Automate* (1926, “The Automaton”) [Figure 13], had felt his mechanized body turn against him as well: enduring brutal electroshock therapy in his final years,

²³³ Ros Murray, *Antonin Artaud: The Scum of the Soul* (New York: Palgrave Macmillan, 2014), 15–20, 140–143. The phrase “machines of instant utility,” originally Artaud’s, appears in Stephen Barber, *Artaud: Blows and Bombs* (London: Creation Books, 2003), 151.

²³⁴ David Tudor, interview by Jack Vees and Pauline Oliveros, December 6, 1995, OHV 241 k-l, transcribed tape recording, Major Figures in American Music, Oral History of American Music (OHAM), Irving S. Gilmore Music Library, Yale University, New Haven, CT, 93, https://archives.yale.edu/repositories/7/archival_objects/3185379.

he left behind a portfolio of late drawings in which organic forms lay mutilated beside “machines of torture” and “broken circuits.”²³⁵

Tudor, fortunately, did not meet such an end. Beginning in the Sixties, while working with contact microphones, transistors, and electroacoustic transducers, he would effect a reversal of the techno-logic that had structured his performance practice in the Fifties. Having before learned to locate the machine within himself, he would now find an animate life in external machines, learning to construct electronic assemblages and feedback systems possessed of their own character and agency. An automaton no more, Tudor would find in technologies outside of himself a means by which to remediate and reimagine music and forge his own compositional path. A spiritually aligned musician named Pauline Oliveros, herself entangled in electronic media, would prove a crucial spur to his metamorphosis.

²³⁵ Murray, *Scum of the Soul*, 140–143.

Chapter 2: Pauline Oliveros and Tape, 1958–1963

“[T]he tape recorder is the most important tool of the twentieth century.”

—Pauline Oliveros, “Cues,” 1993¹

Introduction: “Negative operant phenomena”

Pauline Oliveros spoke often of the sounds that surrounded her during her childhood in Houston, Texas. A “wonderland” of natural sound,” in her pleasant recollection, the sprawling farmlands and humidity-choked pine woods and pecan orchards of the area harbored a dense and intricate symphony of biological rhythms: the chirping of crickets, the buzzing of cicadas, and croaking of tree frogs.² The sticky complexity of this wetland soundscape impressed itself powerfully upon Oliveros’s auditory perception while it was still concretizing, cohering, and pulling itself from the “undifferentiated masses of sound” that swaddle infant ears.³ If one listens closely, they can still hear echoes of Houston in the oscillator chirps and accordion drones that populate Oliveros’s work in the Sixties and Seventies. “Natural sound,” however, was but one class of sounds that intrigued Oliveros from an early age; for every mention of humming berry orchards in the composer’s writings, there is a reference to the crackling static of her grandfather’s crystal radio, and the “whistles and white noise” suspended between the stations of her father’s shortwave receiver.⁴ Oliveros speaks also of her family’s old wind-up Victrola, recalling it not for the music it properly conveyed, but for the strange, time-stretched sounds of records played when its “mechanism was running down.” “I loved all the negative operant phenomena of systems,” Oliveros has stated.⁵

¹ Pauline Oliveros, “Cues,” *The Music Quarterly* 77, no. 3 (Autumn 1993): 377, <https://doi.org/10.1093/mq/77.3.373>.

² Oliveros, Pauline. “My ‘American Music’: Soundscape, Politics, Technology, Community.” *American Music* 25, no. 4 (Winter 2007): 390–391, <https://doi.org/10.2307/40071676>.

³ Pauline Oliveros, “Three Themes” (1972), in *Software for People: Collected Writings: 1963–1980*, 2nd ed. (Baltimore, MD: Smith Publications, [1984] 2015), 69.

⁴ Elliott Schwartz, *Electronic Music: A Listener’s Guide* (London: Secker & Warburg, 1973), 247.

⁵ Schwartz, *Electronic Music*, 247.

As these small but significant recollections indicate, technology loomed always in the background of Oliveros's sonic imaginary. A fascination with the electronic accompanied her from her earliest years onward to her last decades of practice (the Nineties and early Aughts), during which she collaborated with computer programmers, performed via videoconference (long before the age of Zoom), and mused on the future existence of “bionic ears” and a “post-human consciousness.”⁶ As stated in this dissertation’s Introduction, the enduring importance of the technological within Oliveros’s larger body of work has not exactly been self-evident to the musician’s scholars, who have tended to treat the “electronic” as a single phase in her longer development—one that begins with her early-Sixties tape experiments and ends with her move to meditational practice in the Seventies.

Detailing Oliveros’s childhood and adolescence but focusing primarily on her rapid development between 1958–1963, this chapter foregrounds the foundational importance of magnetic tape in the composer’s early imaginary; in so doing, it lays the foundation for the media-focused inquiries of subsequent chapters. Just as this dissertation claims, more broadly, that none of Oliveros’s major compositional innovations (for example, her theater pieces of the mid-Sixties, addressed in Chapter 3, and her *Sonic Meditations* of the early Seventies, addressed in Chapter 4) can be disentangled from her ongoing experiments with electronic media, this chapter argues that magnetic recording functioned as a key motor driving her first steps towards mature composition, and as an elastic technological model for her changing conceptions of listening and sounding. Naturally, Oliveros’s first tape work, *Time Perspectives* (1961), is addressed at length here; meanwhile, her later (1963–) engagements with tape are discussed briefly. However, seeking to counter a bracketed understanding of the role played by electronics in this stage of Oliveros’s artistic

⁶ Pauline Oliveros, “From Outside the Window: Electronic Sound Performance,” in Roger T. Dean, ed., *The Oxford Handbook of Computer Music* (Oxford: Oxford University Press, 2011), 470–471; Pauline Oliveros, *Sounding the Margins: Collected Writings 1992–2009* (New York: Deep Listening Publications, 2010), 175, 249.

evolution, this chapter addresses numerous works and projects that are not themselves electronic—at least in any straightforward sense. I want to insist that tape’s significance for the young Oliveros extends well beyond her use of it as a compositional tool, encompassing her thinking around the selectivity of listening, the idiosyncrasies of her queer subjectivity, and the affordances of the human body.

To preempt the inevitable question: this is not an argument of technological determinism. In the previous chapter, which dealt with David Tudor’s first decade of activity as a virtuoso piano performer, I argued that new technologies of tape and sound-synthesis powerfully shaped the conventionally instrumental work of postwar composers like John Cage and Karlheinz Stockhausen, but only via Tudor’s *human* mediation of such electronic influence. What I have described as Tudor’s “techno-logism” (an important antecedent of his electronic, or properly technological work) thus promises to complicate more crudely determinist understandings of electronic influence on postwar composition. In the case of Oliveros, whose artistic development resembles a negative image of Tudor’s own, we are dealing not with a techno-logical performer, but rather a composer engaged, from her very first productions, with actual technologies—chief among them tape. The question of electronic “influence,” however, is still very much at issue here—for how else are we to understand tape’s magnetic pull on Oliveros’s wider thinking and practice?

Writing recently (and appropriately) of magnetic tape, its technical affordances, and its diverse uptake among composers and popular musicians in the Fifties, musicologist Brian Kane has rightly put pressure on accounts that ascribe a crude influence or agency to the *materiality* of tape without taking into account the meaning-laden cultural practices (“listening, composing, recording, splicing, pirating, trading,” and so on) that necessarily intersect or collide with this materiality, either

responding with “sheer indifference” and “resilience,” or with “extinction or obsolescence.”⁷ Kane’s point is that the complexity of cultural practices ensures that one can never predict, with certainty, what sort of effect a new medium (like tape) might have on a given mode of music-making, or, indeed, on any conceivable facet of life; nor should the historian casting a retrospective glance on such encounters impose upon them a determinism or teleology. Given the moments of “unexpected or unforeseen change” that often accompany intersections of media and ways of living and making, one is best off, Kane argues, considering mediatic “influence” in terms of the “relay and transformation of a practice as it encounters a shift in media,” and the “inflections and deflections” of “potentialities of use” that occur during these relays.⁸

Kane’s notion of the “relays” whereby practices and media encounter one another, experiencing inflection or deflection, is a useful one. Such a model resonates with musicologist Georgina Born’s discussion of “ relayed creativity,” or the transformative journeys traveled by musical works as they volley between “creative agents” (human makers and technological devices), undergoing “decomposition, composition, and re-composition” in each individual encounter.⁹ One is similarly reminded of media theorist Sybille Krämer’s theorization of a “mediality” that is not a material property of media artifacts, but rather an “elementary dimension of human life and culture”: an *emergent* or “distributive” property born of human engagement with technical and symbolic systems.¹⁰ In what follows, keeping all these theorizations in play and holding them close in

⁷ Brian Kane, “Relays: Audiotape, Material Affordances, and Cultural Practice,” *Twentieth-Century Music* 14, no. 1 (2017): 66, <https://doi.org/10.1017/S1478572217000068>.

⁸ Kane, “Relays,” 66.

⁹ Georgina Born, “On Musical Mediation: Ontology, Technology and Creativity,” *Twentieth-Century Music* 2, no. 1 (2005): 26.

¹⁰ Sybille Krämer, *Medium, Messenger, Transmission: An Approach to Media Philosophy*, trans. Anthony Enns, Recursions: Theories of Media, Materiality, and Cultural Techniques (Amsterdam: Amsterdam University Press, 2015), 75. Krämer and Horst Bredekamp speak of the “distributive, and hence collective” nature of human intelligence in a 2013 article regarding the media-theoretical framework of “cultural techniques.” While Krämer’s “mediality” *as such* is not precisely at issue in this context, she and Bredekamp are engaged with essentially the same quality of human-media interaction. Sybille Krämer and Horst Bredekamp, “Culture, Technology, Cultural Techniques — Moving Beyond Text,” *Theory, Culture & Society* 30, no. 6 (2013): 26–27, <https://doi.org/10.1177/0263276413496287>.

mind, I will speak of “relays” of influence between Oliveros and tape, insisting that her continued work with the medium must be regarded as a kind of “dance of agency,” to borrow Andrew Pickering’s phrase.¹¹ At certain key moments, Oliveros will willingly receive and absorb tape’s effects, deriving from the technology valuable lessons regarding her own musical practice; at other points, she will assume the role of teacher, impressing herself upon tape, rubbing it against the grain, and extracting from it an increasingly diverse array of “negative operant phenomena.” These relays will trace out a winding, circuitous pattern of transformation, and will reveal how just much of Oliveros’s early thinking was forged in the crucible of magnetic mediality.

In the first section of this chapter, I survey Oliveros’s early upbringing in Houston in the Forties and begin to set the scene for her move to San Francisco in 1952; I speculate as to what may have drawn Oliveros to the West Coast, her home for nearly three decades, and discuss less obvious respects in which the Bay Area proved a propitious environment for her artistic maturation. In the second section, I discuss Oliveros’s first several years in San Francisco, lingering on her initial intersection with composer and mentor Robert Erickson (1917–1977) before turning to her involvement in a now-famous string of group improvisations staged in the studios of Bay Area radio station KPFA-FM. In the third section, I discuss Oliveros’s inaugural tape work *Time Perspectives* (1961) and sketch out the context of its live debut: the electronic concert series “Sonics.” Organized by Oliveros and her peer Ramon Sender (1934–) at the San Francisco Conservatory of Music, “Sonics” served as a precursor to the San Francisco Tape Music Center (referred to hereafter by the colloquial name “Tape Center”)—Oliveros’s institutional home from 1963 until her late-Sixties departure from San Francisco. Finally, in the fourth section, I tell the brief story of the Tape Center’s founding at the first of two physical locations—a story from which Oliveros, for reasons

¹¹ Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science* (Chicago: University of Chicago Press, 1995), 21.

discussed, is absent; in parallel, I discuss the making of *Sound Patterns for Mixed Chorus*, or simply *Sound Patterns*, the landmark 1961–62 choral work that Oliveros premiered while “in absentia.”

Threaded between the lines of Oliveros’s rich biography are other micro-histories demanding mention—histories that constitute a backdrop for subsequent chapters. The postwar origins of electronic music, the shading of Bay Area Beat culture into psychedelia, and the arcane history of magnetic recording’s filtration into the United States are all addressed in turn, these narratives cut up, spliced, and multi-tracked like so many reels of tape.

1. Magnetic West

Pauline Oliveros came of age in a household dominated by female musicians. In 1941, following Pearl Harbor, Oliveros’s father John B. Oliveros left home to join the Coast Guard “rather than be drafted into the Army,” and this leave of absence, which well outlasted World War II, marked his effective disappearance from the Oliveros household.¹² In Oliveros’s writing, he is appropriately a specter—mentioned only in response to direct prompting. In marked contrast, Oliveros has only ever been too eager to discuss the foundational role played by her mother, Edith Gutierrez, and her maternal grandmother, Pauline V. Gribbin, in her adolescent cosmos.¹³ Following John’s departure, Gutierrez and Gribbin, who both taught piano, supported Oliveros and her younger brother via music lessons, and Gutierrez supplemented this income by accompanying dance classes at the YWCA, and maintaining a chicken farm populated with “two-hundred white leghorns.”¹⁴ This was a distinctly working-class upbringing; although Gutierrez and Gribbin appear to have sustained a reasonable level of household comfort, it should not be forgotten that Oliveros

¹² Martha Mockus, *Sounding Out: Pauline Oliveros and Lesbian Musicality* (New York: Routledge, 2008), 123.

¹³ Mockus, *Sounding Out*, 12.

¹⁴ Oliveros, “Cues,” 374.

was born into the very heart of the Great Depression, whose aftereffects rippled powerfully through the female job sector, and bore on music teachers early on, reducing streams of private students to a trickle.¹⁵

What mattered, however, and what proved to be incalculably important for Oliveros's trajectory, was that Gutierrez and Gribbin piloted Oliveros through this precarity and did so via their music. Oliveros has reflected that her mother and grandmother's professional activities seemed, to her, a "cue" beckoning her to the world of composition, and she found further "cues" in the faces of female composers lining much of the pedagogical sheet music that drifted in and out of her house.¹⁶ Much as these sights and sounds traced out a world of concrete possibility for Oliveros, who saw before her the choice to support herself through music, her entry into this world was neither linear nor seamless. Oliveros has highlighted the difficulty she endured while first learning the violin at age nine, recalling that her teacher made her cry at each lesson because she "couldn't put [her] fingers down exactly where he wanted them."¹⁷ Quickly abandoning the violin, Oliveros next turned to the piano, and was naturally able to draw on the expertise of her mother and grandmother as she familiarized herself with its language.¹⁸ The instrument that most strongly "cued" the young Oliveros, however, drawing her into its folds, was the accordion.

Fairly late in life, Oliveros could still write with noted clarity of the day, sometime during World War II, on which her mother brought home a Hohner 120 bass accordion, with its "ornate grillwork, buttons and keys."¹⁹ In one interview, Oliveros has suggested that the Hohner was intended for her brother; elsewhere, she has written that her mother, taking note of the accordion's

¹⁵ Melissa J. De Graaf, "'Never Call Us Lady Composers': Gendered Receptions in the New York Composers' Forum, 1935–1940," *American Music* 26, no. 3 (Fall 2008): 278–282, <https://doi-org.libproxy.mit.edu/10.2307/40071709>.

¹⁶ Oliveros, "Cues," 373–374.

¹⁷ Oliveros, 374.

¹⁸ Oliveros, 376.

¹⁹ Pauline Oliveros, "Reverberations: Eight Decades," *Jefferson Journal of Science and Culture*, no. 2 (July 2012): 42, <https://journals.sfu.ca/jjsc/index.php/journal/article/view/12>.

unusual popularity in Houston, purchased the instrument with the intention of learning it herself.²⁰ It is in any case that Oliveros swiftly and stridently announced her desire to learn it, and after much pleading, was placed in lessons with accordion teacher Willard Palmer (1917–1996).²¹ A member of the Army Air Corps in World War II, Palmer was stationed in San Antonio, where he was able to perform as a soloist with numerous local ensembles. After the war, Palmer went on to publish a bestselling accordion method book and did much to raise the profile of the accordion as an instrument worthy of college-level study.²² Teaching Oliveros through high-school, Palmer afforded her the first glimpse of the sonic witchery that would creep into her later work with electronics, showing her how to conjure combination tones: the faint low-pitched tones often heard when two high-pitched tones of varying frequency are sounded at the same time.²³

Oliveros would hold the accordion close until the very end of her life, and it seems almost compulsory to remark, as many have, on the respects in which the instrument reflects and embodies pieces of her identity and biography. Indeed, a prototypical “outsider” instrument with a uniquely polarizing charge, the accordion began its life, in the 1850s, as a bespoke and intricately constructed staple of the upper-class German drawing room, before entering mass production, and filtering outward into new, distinctly urban venues (taverns, beer halls, and dancehalls), and new geographical contexts (the shores of Argentina).²⁴ In these new locales, the “mechanically sophisticated,” but practically “simple” accordion, whose earliest models produced only a modest range of pitches, became at once a “democratic” instrument bound to “immigrant, ethnic, and working-class

²⁰ William Duckworth, “Pauline Oliveros,” in *Talking Music: Conversations with John Cage, Philip Glass, Laurie Anderson, and Five Generations of American Experimental Composers*, 1st Da Capo Press ed. (New York: Da Capo Press, 1999), 161; Oliveros, “Cues,” 374.

²¹ Oliveros, “Cues,” 374–375.

²² Faithe Deffner, “Willard ‘Bill’ Palmer’s Legacy to the Accordion Community,” Accordions Worldwide, accessed October 21, 2021, <http://www.accordions.com/articles/willard.aspx>.

²³ Oliveros, “Some Sound Observations” (1968), in *Software for People*, 26.

²⁴ Helena Simonett, “From Old World to New Shores,” in *The Accordion in the Americas: Klezmer, Polka, Tango, Zydeco, and More!*, ed. Helena Simonett, Music in American Life (Urbana: University of Illinois Press, 2012), 19–31, 34–35.

expression,” and a potent symbol of folk music’s corruption at the hands of industrial modernity.²⁵

Oliveros surely appreciated the accordion’s subversive connotations just as she took readily to its acutely physical demands on the performer, who draws its bellows in and out in a vigorous pantomime of breath.

Here, though, anticipating the broader thrust of this chapter, we should make mention of another instrument that served as a key technical support during Oliveros’s accordion training: the wire recorder. A short-lived precursor to the tape recorder that induced magnetic patterns in a thin steel wire, the wire recorder functioned as the world’s rather anti-climactic introduction to magnetic recording, whose history we will rehearse later in this section.²⁶ The Sears “Christmas Wish Book” of 1947 holds up its Silvertone model wire recorder as a supreme tool of preservation and self-improvement, wreathing it in exactly the rhetoric that would cling to tape in the early Fifties.

[Figure 1] “Help yourself immeasurably in your study of public speaking,” the Wish Book spread enjoins, similarly encouraging buyers to “record vocal or instrumental recitals” and make their own records of “playlets” and “radio music.”²⁷ Some of the first wire recorders on the market appeared under names such as the “Mirraphone” and the “Sound Mirror,” and Oliveros surely found in the 1947–48 model purchased by her mother a ready means of (self-)reflection; using a term that surfaces frequently in her writings on recording, she has recalled that “[she] learned [accordion] faster from the *feedback* of recordings of [her] own playing.”²⁸

Simultaneous with her training on the accordion, which, Oliveros quickly discovered, was not welcomed into her grade-school band classes, the musician learned the French horn, another

²⁵ Simonett, “Old World to New Shores,” 7–8.

²⁶ David Morton, *Sound Recording: The Life Story of a Technology* (Baltimore: Johns Hopkins University Press, 2006), 120–121. See also David Morton, “Armour Research Foundation and the Wire Recorder: How Academic Entrepreneurs Fail,” *Technology and Culture* 39, no. 2 (April 1998): 213–244, <https://www.jstor.org/stable/3107045>.

²⁷ Sears, Roebuck and Co., *Sears 1947 Christmas Book* (Minneapolis, MN: Sears, Roebuck and Co., 1947), 247.

²⁸ Oliveros, “Software for People” (1978), in *Software for People*, 181 (my emphasis).

instrument she would continue to play for some time.²⁹ Outside of her lessons, Oliveros attended her high school's subscription symphony concerts, listened to weekly broadcasts of the Metropolitan Opera, the NBC Orchestra, and the New York Philharmonic on the radio, and took in the rich welter of regional music that Texas had on offer—Dixieland, Cajun music, Tex-Mex, polka, and New Orleans jazz.³⁰ Increasingly, Oliveros also heard “imaginary music” in her head—music that she would later describe as partly “symphonic,” very “abstract,” and, sometimes, evocative of the electronic music she came to make later in her twenties.³¹ These vivid “sound images,” which presented themselves to Oliveros in a sort of “hypnagogic state,” were a powerful factor in her decision, around age sixteen, to become a composer—and thus attain the tools to *actualize* her sonic “visions.”³²

As Oliveros’s “sound imagination” developed through adolescence, so too did her feelings of sexual difference. Fantasies about female friends and classmates came to Oliveros early on, and she did find places—at camp, with her Harris County Girl Scout troop, and in the company of her John H. Reagan High School softball teammates—where she could explore her desire, and work to better understand this fundamental piece of herself.³³ In sociologist Erving Goffman’s terminology, which would seem appropriate considering Oliveros’s later theatrical explorations, these contexts offered a much-needed “backstage” where she could loosen the rigorous protocols of self-presentation and self-policing that the conservatism of the time (and Texas) always required of her.³⁴ As her softball team’s stalwart catcher, she jettisoned the name “Pauline” and anointed herself “Buster,” after *Flash Gordon* actor Buster Crabbe.³⁵

²⁹ Oliveros, “Cues,” 374.

³⁰ Duckworth, “Pauline Oliveros,” 161–162.

³¹ Duckworth, 163.

³² Duckworth, 163.

³³ Mockus, *Sounding Out*, 3–5.

³⁴ Erving Goffman, *The Presentation of Self in Everyday Life* (Edinburgh: University of Edinburgh Social Sciences Research Centre, 1956), 69–73.

³⁵ Mockus, *Sounding Out*, 4.

When, in 1949, Oliveros enrolled in the University of Houston as an accordion major, entering an environment which promised her, if not *sexual* freedom, at least the opportunity to enrich and manifest her “sound images,” she encountered frustration and disappointment. Perhaps predictably, her identity as an accordion player did attract a certain amount of confusion and dismissiveness from those around her, but more than anything else, it was the necessity of working from traditional models that Oliveros bristled at. She recalls being asked, in her junior-year composition class, to write a piece emulating Felix Mendelssohn’s (1809–1847) *Songs Without Words* (1829–1845). Recognizing that Mendelssohn’s work “had no relationship to what [she] was hearing internally,” she resisted the exercise, and instead sought after her own musical language on the piano.³⁶ Already, anticipating a key thread of her later work, she began conceiving of compositions characterized by their “qualities of colors (timbre)” and their mixing of different instrumental textures.³⁷

Oliveros saw several successes while at University of Houston: she recalls with ecstasy hearing an early piece of hers performed in a composition recital by her mother, and a violinist from the Houston Symphony Orchestra; she meanwhile honed her French horn abilities in a school “laboratory” for jazz-band arrangement led by noted local saxophonist and arranger Ed Gerlach.³⁸ Oliveros appeared in several newspaper articles covering Gerlach’s class, although such pieces invariably remarked on her status as the class’s lone female musician: “on the left, the class’s only girl, Pauline Oliveros, tries out a French horn part,” reads one picture caption; reads another, “the 18-year-old French born [*sic*] player is the sole feminine touch to the Gerlach experimental jazz band.”³⁹ **[Figure 2]** Ultimately, however Oliveros’s unwillingness to bend to the staid historical

³⁶ Oliveros, “Cues,” 376.

³⁷ Heidi Von Gunden, *The Music of Pauline Oliveros* (Metuchen, NJ: Scarecrow Press, 1983), 4–6.

³⁸ Von Gunden, *Music of Pauline Oliveros*, 4–6.

³⁹ Kathleen Bland, “Song Arrangement Classroom Jumps,” *The Houston Post*, February 25, 1953, 8; “Pauline Oliveros Uses Athletics for Diversion, Music for Career,” *The Cougar*, May 18, 1951, n.p.

models of the classroom, and the tensions and terror she encountered as a closeted lesbian in so conservative a city as Houston, encouraged her to leave the university and the area prior to graduating. In 1952, having received word of San Francisco from an older female friend there, and indeed, having traveled there for a short spell, she decided to make it her new home.⁴⁰ Oliveros biographer Heidi Von Gunden has described the move in spare but cinematic terms: “Oliveros decided to go to San Francisco in search of a composition teacher who would understand how she was hearing sounds. She left home with \$300 and an accordion.”⁴¹

The narrative of westward travel—and specifically, travel to California—weaves complexly and evocatively through American history. For Frederick Jackson Turner, he of the “frontier thesis,” arrival in California represented both comprehensive conquest (of the vast swaths of supposedly “empty” land stretching across the country), and the “closure” or *foreclosure* of the movement that drove this conquest.⁴² While Turner believed settlement of the Pacific coast, and the eventual rumblings of urbanization, would dim the golden glow of the far west that had so stoked American imaginations, it continued to exert a very particular magnetic pull. Between 1940 and 1970, its population grew from 13 million to over 33 million, and during this time, per John M. Findlay, the Mountain and Pacific States became a “mosaic of ‘voluntary regions’” that collected “self-selecting” individuals.⁴³ The west was colored, in other words, not by circumstance, but rather, choice. Oliveros’s choice to travel to San Francisco marks the beginning of her artistic development proper, and thus we should ask, in what remains of this section, just what it was that exerted a magnetic pull on her, drawing her out of her family network in Houston—not without substantial pain and strain—and into an environment where she had no immediate prospects of work or education.

⁴⁰ Mockus, *Sounding Out*, 4–6.

⁴¹ Von Gunden, *Music of Pauline Oliveros*, 6.

⁴² John M. Findlay, “Far Western Cityscapes and American Culture Since 1940,” *Western Historical Quarterly* 22, no. 1 (February 1991): 21–22, <https://doi.org/10.2307/968726>.

⁴³ Findlay, “Far Western Cityscapes,” 19–20.

Some of Oliveros's stated reasons have been clarified above: facing frustration, intolerance, and limits upon her imagination in Houston, she sought, in more ways than one, a more "open" space, and opportunity for freer self-expression. And from her older friend who beat her to San Francisco, acting as an advance party gathering reconnaissance, she might have heard of the environment of sexual permissiveness and possibility left behind following the war, which pulled scores of men and women into San Francisco's ports and shipyards. As James Agee notes, many gay men and women in the military—some of them purged from the ranks—chose to remain in the city after armistice, opting against returning to their families or to less-accepting environments.⁴⁴ She might have heard of the proliferating lesbian bars (the Beaded Bag, Blanco's, the Chi-Chi Club, the Tin Angel, and Tommy's Place) which, following the opening of the pioneering Mona's in 1936, had begun to fill the city's North Beach district—not yet the Beat Culture hot-spot it would soon become.⁴⁵ She might have heard of the city's uniquely independent cultural tenor, which, since the existence of the author's circle known as the Bohemian Club in the 1870s, had boasted a "democratic and anarchic" streak.⁴⁶ This sensibility had only sharpened in the Twenties and Thirties, which witnessed the formation of a lively circle of literati centrally anchored by poet Kenneth Rexroth (1905–1982), and the continued infusion of progressive politics via crowds of conscientious objectors and groups like the Libertarian Circle, which counted among its membership "anarchists, longshoremen, doctors, cabbies, [and] professors."⁴⁷

It is also possible that Oliveros knew something of San Francisco's musical landscape, which, after a period of suspension and recovery in the wake of the 1906 earthquake, had

⁴⁴ Christopher Agee, "Gayola: Police Professionalization and the Politics of San Francisco's Gay Bars, 1950–1968," *Journal of the History of Sexuality* 15, no. 3 (September 2006): 466–467, <https://doi.org/10.1353/sex.2007.0024>.

⁴⁵ Nan Alamilla Boyd, *Wide-Open Town: A History of Queer San Francisco to 1965* (Berkeley: University of California Press, 2003), 68–70.

⁴⁶ Nancy J. Peters, "The Beat Generation and San Francisco's Culture of Dissent," in *Reclaiming San Francisco: History, Politics, Culture: A City Lights Anthology*, ed. James Brook, Chris Carlsson, and Nance J. Peters (San Francisco: City Lights Books, 1998), 200.

⁴⁷ Peters, "Culture of Dissent," 201–203.

consolidated itself around several impressive institutions, including the San Francisco Symphony, the San Francisco Opera Company, a formidable orchestra at University of California Berkeley, and the San Francisco Conservatory of Music.⁴⁸ (This last institution would play a noted role in Oliveros's musical future.) Between 1926 and 1936, San Francisco's music culture had meanwhile been briefly but powerfully marked by the radically avant-garde concert series hosted by the New Music Society, an organization formed by musician Henry Cowell.⁴⁹ A forum for the presentation of modern and "ultramodern" work unequalled at the time, the New Music Society introduced San Francisco to such composers as Arnold Schoenberg, Igor Stravinsky, Edgard Varèse, and Charles Ives (1874–1954).

There is one stratigraphic layer in San Francisco's modern history which, while never mentioned in relation to Oliveros, is of great importance to the present account. I refer to the Bay Area's developing technological infrastructure, which, beginning in the Sixties, would provide Oliveros and her peers with much of the technological capital needed to realize their vision of electronic music. It is unlikely that Oliveros knew of these sites of growth and their magnetic pull, but as they constitute a central backdrop to the narrative that follows, they warrant brief excavation.

⁴⁸ Mina Yang, *California Polyphony: Ethnic Voices, Musical Crossroads, Music in American Life* (Urbana: University of Illinois Press, 2008), 21–25.

⁴⁹ Yang, *California Polyphony*, 39–41; Rita H. Mead, "Henry Cowell's New Music Society," *The Journal of Musicology* 1, no. 4 (October 1982): 453, <https://doi.org/10.2307/763678>. Henry Cowell, at the home of whose stepmother (Olive Cowell) Oliveros will meet David Tudor in 1963 (see Chapter 3), boasts an unusual biography that echoes Oliveros's own in certain compelling (and painful) respects. Born nearby to San Francisco in Menlo Park, Cowell was a childhood violin prodigy whose training and schooling was cut short at an early age by a bout of sickness; between the ages of eight and fourteen, lacking ready access to any instruments, he was "compelled to make his mind into a musical instrument," and nurtured a rich but purely virtual "sound-mind" begging actualization. In his later adolescence, following a period of real formal training, he began to rapidly contribute formal innovations to modern American music, writing compositions incorporating "tone-clusters" (large groups of adjacent piano keys sounded with the fist or forearm), and exploring, in boldly theatrical performances, means of manipulating the piano's strings, either with one's fingers, or various sundry tools (knives, hammers, rubber bands). These methods would exert a profound influence on John Cage (inspiring the prepared piano). Set apart not only by his brazen ultramodernism, but also by his identity as a gay man, Cowell was imprisoned in San Quentin in 1936 on charges of improper relations with younger men (the nature of these relations having been exaggerated in court testimony). It is Cowell's arrest that brought an end to the New Music Society concerts. Henry Cowell, "The Process of Musical Creation," *The American Journal of Psychology* 37, no. 2 (April 1926): 235, <https://doi.org/10.2307/1413690>; Kyle Gann, *American Music in the Twentieth Century* (New York: Schirmer Books, 1997), 28–36.

Historians of Silicon Valley typically locate the seeds of the region in the years leading up to World War II, when a network of Stanford University graduates surrounding Frederick E. Terman, head of Stanford's electrical engineer department from 1937 onward, laid the foundations of future Valley juggernauts such as Varian Associates and Litton Industries.⁵⁰

An investor in Varian and Litton and an eventual director of the former company, Terman also encouraged two former students, William Hewlett and David Packard, to form a company (Hewlett-Packard) via which they could commercialize and further develop a precision audio oscillator they had designed.⁵¹ Another key regional node took root when William Shockley moved to the Bay Area in 1956 to form Shockley Transistor Corporation after a decade of work at New Jersey's Bell Laboratories. At Bell, Shockley was instrumental to the development of the transistor, which would supersede the finicky vacuum-tube as the premiere amplifying device, and start shrinking commercial electronics (first, the hearing-aid and the radio) beginning in the early Fifties.⁵² As will be seen in this and subsequent chapters, the transistor and the oscillator were indeed critical for the postwar development of electronic music in the United States, and the piercing sine tones of the Hewlett-Packard oscillator grounded some of Oliveros's earliest electronic experiments.

These connections are of general historical interest, but the role played by these companies in our narrative is at best an indirect one. We can say such more of the early Silicon Valley fixture Ampex, which will assume a significant place in what follows via its dealings in magnetic tape. While by the mid Fifties, Ampex had come to sit beside Hewlett-Packard, Varian, and Lockheed Corporation in the sprawling Stanford Research Park, its history begins unglamorously in a San Francisco machine shop, where in the Twenties and Thirties, shop owner Tim Moseley enlisted a

⁵⁰ Carroll W. Pursell, *Technology in Postwar America: A History* (New York: Columbia University Press, 2007), 178–179.

⁵¹ Pursell, *Technology in Postwar America*, 179–180.

⁵² Pursell, 180–181.

Russian research engineer named Alexander Poniatoff to assist him with design and development.⁵³

In 1944, Moseley and Poniatoff won a contract to develop an airborne radar antenna for the Navy,

and these antennae relied crucially on two small electric motors and a miniaturized generator.

Moseley encouraged Poniatoff to form his own company to produce these components, then

unavailable on the market; the latter obliged, dubbing his new company “Ampex,” and outfitted

antennae until the war’s end, at which time, facing canceled military contracts, he was compelled to

break new ground in motor technology or face obsolescence. Poniatoff enlisted a young electrical

engineer named Myron Stolaroff to help shepherd him through this moment of transition.⁵⁴

Just as Poniatoff and Stolaroff were taking stock of their options, wondering whether to move Ampex in an entirely new direction, British and American intelligence operatives abroad were combing through the ruins of a defeated Germany searching for military and nonmilitary technology they could port back to their home countries. Of great interest to investigators was the magnetic recording device—the Magnetophon—which, via its durable and lightweight recording material (iron oxide-coated *tape*, rather than steel wire), and its simplified mechanics, had been supplying German radio stations with crystal-clear broadcasts for a decade.⁵⁵ Recalls U.S. Army Signal Corps investigator Jack Mullin, who had been dumbstruck by these broadcasts, “It was the answer to my question about where all of that beautiful night-music had come from.”⁵⁶ Mullin was among a handful of individuals who aggressively worked to evangelize tape recording once back in the United States, and on May 16, 1946, he staged a live demonstration of the Magnetophon for the San Francisco chapter of the Institute of Radio Engineers.⁵⁷ [Figure 3] Engineers Harold Lindsay and

⁵³ Timothy J. Sturgeon, “How Silicon Valley Came to Be,” in *Understanding Silicon Valley: The Anatomy of an Entrepreneurial Region*, ed. Martin Kenney (Stanford, CA: Stanford University Press, 2000), 42–44.

⁵⁴ Sturgeon, “Silicon Valley,” 42–44; John Leslie and Ross Snyder, “History of the Early Days of Ampex Corporation,” *Journal of the Audio Engineering Society* (December 17, 2010): 1–2, https://www.aes.org/aeshc/docs/company.histories/ampex/leslie_snyder_early-days-of-ampex.pdf.

⁵⁵ Morton, *Sound Recording*, 117–121.

⁵⁶ John T. Mullin, “Creating the Craft of Tape Recording,” *High Fidelity*, April 1976, 63.

⁵⁷ Leslie and Snyder, “History of the Early Days of Ampex Corporation,” 1–2.

Walter Selsted, recently brought into the Ampex orbit, were present at this demonstration (by all accounts an impressive one), and Poniatoff and Stolaroff were subsequently treated to a private Magnetophon demonstration at Palmer Films. Very quickly, the cohort decided to enter the tape business, and by Spring 1948, the inaugural Ampex machine, Model 200A, had been developed and sent into production.⁵⁸

Priced at around \$4,000, pioneering devices like the 200A were prohibitively expense for private consumers, and while the 200A's accompanying brochure assures users of its friendliness and ease of operation, its manual offers interior glimpses of a hulking cabinet that resembles a kitchen stove much more than the reel-to-reel recorders ubiquitous in the postwar years.⁵⁹ [Figure 4] Companies like Ampex encountered further initial barriers to commercial growth in the form of wire recorders already crowding the market—recall that Edith Gutierrez brought a wire recorder back to the Oliveros household as early as 1947–48.⁶⁰ Developed earlier in the Forties without the benefit of intel regarding the Magnetophon's game-changing plastic tape, wire recorders had already secured numerous commercial commitments and corporate sponsors by the time tape reached the market, and it would still be several years before the deficiencies of steel wire—its poorer signal, and tendency to snarl, tangle, and break—would be made clear.⁶¹

Where tape recording gained greater early traction, and where it would come to have the most enduring impact, was in broadcasting and recording studios. In the late Forties, major news networks such as ABC and CBS discovered tape's suitability for both capturing recordings on location, and, more importantly, bridging time-zone differences in broadcasting.⁶² No longer did

⁵⁸ Leslie and Synder, 2–3.

⁵⁹ David Morton, “‘The Rusty Ribbon’: John Herbert Orr and the Making of the Magnetic Recording Industry, 1945–1960,” *The Business History Review* 67, no. 4 (Winter 1993): 601–604, <https://doi.org/10.2307/3116805>.

⁶⁰ Morton, “The Rusty Ribbon,” 605–607.

⁶¹ Morton, 605–607; Earl Walker, Philip L. Miller, and Morton Lee, “Recording Symposium,” *Notes*, 2nd series, 7, no. 3 (June 1950): 364, <https://doi.org/10.2307/891321>.

⁶² Morton, *Sound Recording*, 122–123.

networks have to assemble casts and crews *twice* in order to prep programming for the East and West Coasts: ABC could now “time-delay” broadcasts by transmitting them over a land line to Western affiliates at the necessary time.⁶³ It is tape’s ability to annihilate or circumvent the irreversibility of time that laid the foundation for Ampex’s growth—and, we will see, for tape’s use as a creative musical medium.

The story is well known, at least within the industry: in 1947, crooner Bing Crosby (1903–1977) teamed with ABC for his popular radio program, having broken with NBC because of their unwillingness to let him record his shows. ABC was sympathetic to Crosby’s desires, recognizing the strain of needing to be present for live recordings delivered twice for different time zones, but found the disc recording then in use to be insufficient in quality.⁶⁴ ABC invited Jack Mullin to their studios to tape a show for the 1947–48 season using the Magnetophon, and were stunned by both the recording quality, and the ease with which Mullin was able to “edit down” taped material into a final, seamless take by literally snipping out routine performance errors, and splicing tape ribbons back together.⁶⁵ It is thus that Ampex’s 200A units stamped with serial numbers 1 and 2 ended up in the hands of the Bing Crosby Show; meanwhile much of the initial production run of twenty units went directly to ABC. [Figure 5] Ampex’s next models, the 300/351, soon took their place among the equipment essentials of broadcasting stations and studios around the country.⁶⁶

Oliveros would encounter tape only *after* arriving in San Francisco in 1952, and thus we cannot count reels of iron-oxide particles among the magnets that drew her westward. With the benefit of hindsight, however, and recognizing the role Ampex’s machines eventually came to play in her artistic development, one cannot but remark on this synchronicity. As we will see in the

⁶³ Morton, 122–123.

⁶⁴ Morton, 123.

⁶⁵ Morton, 123.

⁶⁶ Leslie and Snyder, “Early Days of Ampex,” 4–5.

following section, Oliveros would, upon first using tape, latch onto the promise of “true-to-life fidelity” that Ampex and successor companies used to market magnetic recording, discovering in it a precise and exacting ear capable of hearing *more* and more *indiscriminately* than she was able to. Of course, there is a sharp irony to Ampex trumpeting “true-to-life reproduction” in discussion of their Crosby coup, which replaced a living, breathing Crosby and his once “live” presentations with phantom performances confined to liberally edited reels. And indeed, Oliveros and her peers would ultimately come to underscore this irony in their taped creations, directing tape’s newfound “fidelity” and ease of manipulation towards expressions of *unreality* and private subjectivities.

2. Tape lesson one: “a blood brother to the camera lens”

Two years elapsed between Oliveros’s arrival in San Francisco and her 1954 enrollment at San Francisco State College, where she would work towards a bachelor’s degree in music. Much as it is evident that Oliveros’s first years on the West Coast were marked by a new freedom and elasticity of self-expression (precisely what she lacked in Houston), it is also clear that Oliveros encountered considerable hardship. In the late Sixties or early Seventies, writing in an unpublished book documenting her “theater pieces” of the mid-Sixties, Oliveros remarked that San Francisco was her “battleground,” and made particular note of her problems with money.⁶⁷ In July 1952, at which time she secured work as a mail clerk for the Pacific Public Service Company, Oliveros commenced a string of often short-term jobs and “casual engagements” (“dance work,” “solo accordion playing”) that carried her through to the mid Sixties only with the slightest measure of stability.⁶⁸ By the late Sixties, Oliveros had worked as a “milk tester” and lab assistant for the city of Berkeley, as a file

⁶⁷ “Theater Piece Book,” ca. 1968–1972, Box 10, Folder 8, Pauline Oliveros Papers (hereafter Oliveros Papers), MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

⁶⁸ Employment records, 1955–1980, Box 30, Folder 3, Oliveros Papers.

clerk at the Bank of America, as a receptionist at Orange County Medical Center, as a dishwasher in an animal lab, and finally, following the lead of her mother and grandmother, as a private music teacher.⁶⁹

Amidst this financial strife, however, Oliveros did find the social mobility she was seeking. At the time of Oliveros's move, San Francisco boasted a considerable infrastructure for queer communities in the form of both gay and lesbian bars, and homophile organizations like the Mattachine Society (primarily oriented towards the rights of gay men), and the lesbian-centric Daughters of Bilitis.⁷⁰ Homophile activists, working in "antagonistic cooperation" with the bar scene, were mainly invested in mainstream visibility for queer communities, and worked, per Nan Boyd, to "articulate an explicitly public discourse about homosexuality" and "addres[s] themselves to professional journals and the mainstream press."⁷¹ The often-regressive means by which they worked to secure wider acceptance (for example, the gatekeeping of styles, aesthetics, and modes of self-fashioning) often placed them in tension with activists on the ground. To the professional veneer of homophile activism, Oliveros seems to have preferred the smokier, more freewheeling sociality of bars, but she was not, ultimately, comfortable with either "scene"; her romantic explorations took place in the comfort of apartments shared with lovers, and within small circles of friends.⁷²

At this mid-Fifties moment, the tenor of the broader United States was still one of cool conformity, anxiety, and strained expression. In years previous, fearing censure from the government, writers had opted for the safe and the commercial, and the artist was eyed as a dangerous and disruptive figure. By 1954–55, however, certain bonds were loosening as civil-rights

⁶⁹ Employment records, 1955–1980, Oliveros Papers.

⁷⁰ Boyd, *Wide-Open Town*, 159–165.

⁷¹ Boyd, 165.

⁷² Mockus, *Sounding Out*, 6–8.

activism was gaining ground, and Joseph McCarthy, following a run of televised hearings, and his own censure by the Senate, was taking his first substantial blows in the public eye.⁷³ In San Francisco, where the “Bohemian era” was shading into the reign of the “Beat,” the early germination of the counterculture was accelerated. Writer Allen Ginsberg’s (1926–1997) storied 1955 reading of a draft of *Howl* (1956) at Six Gallery announced the West Coast arrival of several key Beat-literature architects (Jack Kerouac, 1922–1969, Neal Cassady, 1926–1968, and Gary Snyder, 1930–) who had originally linked up in New York, and the cheap, isolated, and ethnically diverse neighborhood of North Beach, which Oliveros began exploring not long after her cross-country move, provided ideal conditions for the growth of a new artistic ecosystem.⁷⁴ Institutions like the Co-Existence Bagel Shop and the City Lights Bookstore (founded by Lawrence Ferlinghetti, 1919–2021, and Peter Martin, 1923–1988, in 1953) anchored a scene in which the first iteration of the San Francisco Tape Music Center, to be founded in nearby Russian Hill, would take root.⁷⁵

One of Oliveros’s earliest conduits into this growing welter of artistic and political activity was the local Bay Area radio station KPFA, which she would later reflect was a “major force in the development of [her] career.”⁷⁶ The brainchild of Lewis Hill (1919–1957), KPFA was launched in 1949 on the sixth floor of Berkeley office building, its control room and studios quite literally cobbled together by local friends and families who assisted with hammering, painting, and soundproofing. Hill regarded KPFA, the country’s first “listener-sponsored” radio station, as a “utopian” endeavor—a demonstration that radio could indeed be made “subject to the same aesthetic and ethical principles as we apply to any communicative act.”⁷⁷ During its first twenty years

⁷³ Jonah Raskin, *American Scream: Allen Ginsberg’s Howl and the Making of the Beat Generation* (Berkeley: University of California Press, 2004), 3–6.

⁷⁴ Peters, “Culture of Dissent,” 204–206.

⁷⁵ Peters, 204–206; Christopher Lowen Agee, *The Streets of San Francisco: Policing and the Creation of a Cosmopolitan Liberal Politics, 1950–1972* (Chicago: University of Chicago Press, 2016), 43–45.

⁷⁶ Mockus, *Sounding Out*, 131.

⁷⁷ Eleanor McKinney, ed., *The Exacting Ear: The Story of Listener-Sponsored Radio, and an Anthology of Programs from KPFA, KPFK & WBAI* (New York, NY: Pantheon Books, 1966), 9–14, 19–20.

of existence, KPFA continually pressed at, and indeed, brazenly dismantled the limits placed on broadcasting by standards of “decency” and decorum: in 1956, only two years after it had aired a program discussing marijuana decriminalization (and allegedly allowed pot smoke to waft through its studios), the station welcomed in Allen Ginsberg to read three selections from *Howl*. Later in the Sixties, KPFA provided essential on-the-ground coverage of the free speech movement (FSM) at University of California, Berkeley, even running a shuttle between the school’s campus and its studios during the December 1964 takeover of the administration building.⁷⁸

It is on KPFA that Oliveros first heard the McCarthy hearings upon reaching California, and in the Sixties, she would listen regularly to its broadcasts of campus uprisings.⁷⁹ It is probable that KPFA brokered her first exposure to FSM leader Mario Savio’s famous “Operation of the Machine” speech of December 1964, which called for students to “put [their] bodies upon the gears and upon the wheels” of the administrative “apparatus.” As we will see in the following chapter, Oliveros directly sampled this speech in one of her major theater pieces of the mid Sixties.⁸⁰ More pertinent to the present discussion, KPFA introduced Oliveros to a new musical cosmos not available to her on Houston’s airwaves: she has remarked that she first heard tape music—“both electronic and *concrète*”—via broadcast in the early Fifties.⁸¹

It is fitting that the technical medium of radio provided Oliveros with her first exposure to experimental and electronic music, and a wider world of progressive politics, for the expansion of her consciousness would soon unfold along *technological* as well as social lines. However, a different medium—tape—would function as the chief catalyst of this transformation. In 1953, Oliveros received a reel-to-reel tape recorder from her mother, who had introduced her to the virtues of

⁷⁸ Jeff Land, *Active Radio: Pacifica’s Brash Experiment* (Minneapolis: University of Minnesota Press, 1999), 99–103.

⁷⁹ Mockus, *Sounding Out*, 131–132.

⁸⁰ Land, *Active Radio*, 102–103.

⁸¹ Oliveros, “On the Need for Research Facilities for New Music and the Related Arts” (1979), in *Software for People*, 195.

magnetic recording five years earlier.⁸² By 1953, critical changes had rippled through the consumer electronics market, urged on by the phenomenon known as “high-fidelity” (or “hi-fi”). The term “high-fidelity” had been in use for decades, but it was not until the postwar years, which saw the improved phonograph disc formats of the “LP” and the “45,” the first experiments with stereophonic sound, and a booming new commercial market for the suburban home, that hobbyist magazines such as *High Fidelity* (introduced Summer 1951) could convincingly craft the discourse of hi-fi, and take up the cause of “better reproduction of music.”⁸³

Hi-fi commentators, who highlighted the comparative inadequacy of wire recording in print, helped smooth the entry of more modestly priced (approximately \$200) tape recorders into commercial channels, where, while putting scarcely a dent in the market for discs, they promised endless avenues of home use.⁸⁴ (“Proficient dictation” and recorded “idea sessions”! Audio memos or notes-to-self! Mementos of “reunions, marriages, and happy events”! “Eavesdropping”?!)⁸⁵ The reel-to-reel recorder that Oliveros received from her mother was either an Eico or a Sears Silvertone model; available commercial chronologies suggest it was a Sears.

Whatever the make of the recorder, on some fateful day between 1953 and 1958 (accounts differ), Oliveros wired it to a microphone, set it near the window in one of her San Francisco apartments, and placed a “supply reel” of blank tape on one of the machine’s two spindles.⁸⁶ Threading several inches of tape past the machine’s two heads (“erase” and “record/playback”) and through a slot in an empty “take-up reel” on the opposite spindle, she wound the empty reel several times to eliminate slack. She then turned the machine on, and after waiting for its tubes to warm up

⁸² Oliveros, “Cues,” 376.

⁸³ Morton, *Sound Recording*, 129–140; Charles Fowler, “As the Editor Sees It,” *High Fidelity*, Summer 1951, 8–9.

⁸⁴ Morton, “Rusty Ribbon,” 606–607.

⁸⁵ These potential uses are all discussed in H. Jay Bullen and Dick Hodgson, *How to Use a Tape Recorder: In Your Business, in Your Home* (New York: Hastings House, 1957).

⁸⁶ The year 1953 is cited in Oliveros, “Cues,” 376; 1958 is cited in Oliveros, “Software for People,” 182.

(“transistorized” it was not!), adjusted the volume control, and recorded the world outside until the tape ran off the supply reel. When she played her tape back, she was startled:

About 1953, my mother gave me a tape recorder. In 1953 they had just arrived on the market. (Incidentally, I think the tape recorder is the most important tool in the twentieth century for musicians.) I began to record everything from my window, just record and listen back. I realized that the microphone was picking up sounds that I missed. This taught me to listen in a new way. As I went on, I began to get involved in making tape music, and eventually I found that a lot of the sounds that I was hearing in [my] imagination were available to me through electronic means.⁸⁷

This story, which Oliveros cites throughout her writings as a watershed moment in her development, is a remarkably unusual one, and not just because the figure of the “window” inserts a stubborn visual supplement into an “origin story” regarding sonic perception; most curious is that Oliveros nominates the tape recorder as a teacher, crediting to it a lesson that reverberates throughout her entire body of work. “From that moment,” she has written elsewhere, “I determined that I must expand my awareness of the entire sound field. I gave myself the seemingly impossible task of listening to everything all the time.”⁸⁸ That Oliveros was, at this moment, able to learn from her tape recorder, and derive from it an important lesson regarding the possibility of comprehensive listening, indicates that she regarded tape as possessing certain unique powers. Specifically, it suggests that the young composer heard, in the clarity and fine grain of its recorded sounds, the murmurs of an *objective*, unvarnished hearing unconstrained by past experience, prejudice, or the clumsy flesh and fallibility of human biology.

At this early postwar moment, when the novelty and allure of tape had not yet diminished, Oliveros was not alone in ascribing to tape the promise of objective, exacting, or universal hearing. This discourse flowed abundantly, and well outside of conversations around music alone: journals of anthropology recommended the adoption of tape recorders in ethnographic fieldwork, heralding

⁸⁷ Oliveros, “Cues,” 376.

⁸⁸ Oliveros, “Software for People,” 182.

their efficacy “in producing permanent and recallable traces of some real situations and events”; public libraries, adopting “tape libraries,” looked upon their shelves of reels as one unfailing prosthetic memory—a “stockpile of culture”; “instrumentation” divisions of companies like Ampex, which promised data recorders of “scientific” precision, supplied tape for the purposes of black-box recording on airplanes, the transcription of telemetry information, and, at the White Sands Missile Range, the recording of atomic-bomb blasts (so wide was tape’s frequency range, and so low its distortion).⁸⁹ More popularly, the tape recorder was recommended to consumers as an instrument of indexical capture and recall on par with the camera in its power to permanently fix the transient phenomena of everyday life, including all that which spills beyond human registers of attention. “The human ear,” states a 1957 how-to book on tape recording, “is the same as the eye. It usually hears only what it wants to hear. The tape recorder is a blood brother to the camera lens: it reproduces everything the microphone will pick up—with no discrimination except that of an electronic nature.”⁹⁰

As remarked in relation to Jack Mullin’s taping (and editing) of Bing Crosby’s ABC broadcasts, it is distinctly ironic that tape would come to fulfill, for Oliveros and others, the role of

⁸⁹ Ivan Polunin, “Visual and Sound Recording Apparatus in Ethnographic Fieldwork,” *Current Anthropology* 11, no. 1 (February 1970): 3–7, <https://doi.org/10.1086/201220>; Charles Elliott, “The Magnetic Tape Revolution in Library Service,” *ALA Bulletin* 49, no. 7 (August 1955): 324, <https://www.jstor.org/stable/25694563>; Paul J. Weber, *The Tape Recorder as an Instrumentation Device*, 3rd ed. (Redwood, CA: Ampex Corporation, 1963), 4–7; Leslie and Snyder, “Early Days of Ampex,” 6.

⁹⁰ Bullen and Hodgson, *How to Use a Tape Recorder*, 17. Andrea Bohlman and Peter McMurray have recently argued for the existence of a “phonographic regime” in musical discourse—one which, since its first iteration in the time of Thomas Edison and Emile Berliner, has upheld the phonograph as an “infallible scribe” combining the “ultimate promise of presence, coupled with a perfect, infinite inscription of that presence.” For Bohlman and McMurray, the later phonographic regime—“regime 2.0”—is represented by theorists of media like Theodor Adorno and Friedrich Kittler, who have again selected the phonograph record as the exacting and faithful index *par excellence*: “the last remaining universal language since the construction of the tower” (Adorno), and a conduit to “noise. . . prior to any semiotic order and linguistic meaning” (Kittler). Bohlman and McMurray are correct in suggesting that these phonographic regimes have consistently consigned tape to subordinate or occluded role in the discourse of sound studies, and broader discussions around twentieth-century media. And while they posit tape, with its associated “non-linear” recording practices (“splicing, looping, dubbing”), and its straddling of the digital-analogue divide, as a productive counterpoint to the prototypically “inscriptive” or indexical phonograph disc, the examples discussed demonstrate that tape both inherited the phonograph’s promise of objective inscription and *inflated* it. Andrea F. Bohlman and Peter McMurray, “Tape: Or, Rewinding the Phonographic Regime,” *Twentieth-Century Music* 14, no. 1 (2017): 3–24, <https://doi.org/10.1017/S147857221700032>.

an “objective” ear; for in Friedrich Kittler’s estimation, once firmly lodged in the postwar recording studio, it “inaugurated the musical-acoustic present” by “creat[ing] empires of simulation.”⁹¹ Take, for instance, the phenomenon of multitracking: beginning, some would argue, with the experiments of guitarist Les Paul (1915–2009) in the mid-to-late Forties, tape was adopted as a means of *layering* different recordings, or piling sounds one on top of the other: practicing a technique known as “sound-on-sound,” Paul could record himself playing one guitar instrumental, rewind the reel, and hit record once more, performing another instrumental in step with the existing recording.⁹² True “sound-on-sound” was unreliable, as the piling on of signals resulted in increasing degradation of quality, but the introduction of stereo recording and multi-track tape soon allowed for multiple “channels” of sound to be recorded discretely on a single reel of tape.⁹³ In the Fifties and Sixties, innovations like multitracking, and the readiness with which tape could be cut up with scissors and reassembled, utterly transformed the recording studio, freeing bands from the obligation of needing to achieve a “perfect” performance in one sitting.⁹⁴ That recordings could be cobbled together from multiple takes recorded on multiple days meant that popular songs were more technologically hybrid than ever before. For all its fidelity and precision, tape created Frankenstein monsters.

Oliveros would, in time, learn to take advantage of this hybridity. For now, however, she was dutifully taking in the pristine reflections cast off by her “sound mirror,” as she would at one time term the tape recorder.⁹⁵ In the fall of 1954, just as she was receiving regular lessons from her reel-to-reel machine, Oliveros enrolled in San Francisco State College to continue her formal education in music. While San Francisco State did not provide Oliveros with the sensitivity of guidance she

⁹¹ Friedrich A. Kittler, *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael Wutz, Writing Science (Stanford, CA: Stanford University Press, [1986] 1999), 107–109.

⁹² Ken Cormier, “Sounding the Multitrack Imagination,” *Symploke* 24, nos. 1–2 (2016): 371–376, <https://doi.org/10.5250/symploke.24.1-2.0371>.

⁹³ Gilbert Trythall, *Principles and Practices of Electronic Music* (New York: Grosset & Dunlap, 1973), 113–116.

⁹⁴ Morton, *Sound Recording*, 141–148.

⁹⁵ Oliveros, *Sounding the Margins*, 47.

sought, it did lead her indirectly to a musician who would serve as her private teacher and close mentor for the next six years: the Michigan-born composer Robert Erickson. At San Francisco State, Oliveros heard several of her earliest pieces performed in a weekly Composers' Workshop led by Professor Wendell Otey, and on one occasion—quite possibly the workshop of May 18, 1954—she and Erickson both had pieces on the program.⁹⁶ [Figure 6] Oliveros and Erickson met following the workshop, finding that they liked each other's pieces very much, and thus commenced a meaningful and long-lasting relationship of mutual influence.⁹⁷

In 1954, Erickson was just leaving San Francisco State, where he was teaching beginning harmony courses, to join the payroll of KPFA, which had offered him the job of music director. He was newer to the Bay Area than Oliveros, having arrived in October 1953 via Minnesota (where he had studied under composer Ernst Krenek, 1900–1991) and then New York City.⁹⁸ In some respects, the Robert Erickson of the mid Fifties would seem an unusual candidate for a mentor to Oliveros; while in New York, he had finished a book titled *The Structure of Music* (1954), a “comprehensive ‘listener’s guide’ to the contrapuntal tradition,” and in his own music, was just transitioning out of a style shaped by the tradition of serialism (but not properly serialist) into a more exploratory space marked by experiments in texture and rhythm.⁹⁹ But Erickson was above all a pragmatist who desired for his students an organic and immediate relationship with sound and rejected the abstruse and esoteric.

If Erickson carried his emphasis on transparency and immediacy into his private lessons with Oliveros, he also brought a belief in personal choice that the latter found deeply impactful: “He was

⁹⁶ Pauline Oliveros, interview by Martha Oneppo, November 10, 1981, OHV 90 a-b, transcribed tape recording, Major Figures in American Music, Oral History of American Music (OHAM), Irving S. Gilmore Music Library, Yale University, New Haven, CT, 6, https://archives.yale.edu/repositories/7/archival_objects/3185016; Program for Composers' Workshop recital, San Francisco State College, May 18, 1954, Box 13, Folder 19, Oliveros Papers.

⁹⁷ Oliveros, interview by Oneppo, 6.

⁹⁸ Robert Erickson and John William MacKay, *Music of Many Means: Sketches and Essays on the Music of Robert Erickson*, Composers of North America, no. 17 (Lanham, MD: Scarecrow Press, 1995), 23, 48–53.

⁹⁹ Erickson and MacKay, *Music of Many Means*, 183–185, 189.

not going to take his pencil to my pages,” Oliveros recalls, “but was going to comment in ways that enlightened me [and] gave me validation for what I was doing.”¹⁰⁰ Just as important, Erickson did not perpetuate the sort of misogyny, both subtle and explicit, endemic to musical education.

Oliveros remarks that “he acted as though he thought simply, you’re the same as anybody else I may work with”; he didn’t “insult [her] intelligence” or “treat [her] as a little girl.”¹⁰¹ In the late Fifties, while working with Erickson, Oliveros quickly began producing original music, including a set of compositions—the *Three Songs for Soprano and Piano* (1957)—that Oliveros considers her “first professional work.”¹⁰² Perhaps taking after Erickson’s interest in poetry (in 1940, he had set three early songs to the work of Rainer Maria Rilke), Oliveros selected, for her *Three Songs*, two texts by the San Francisco Renaissance poet Robert Duncan (1919–1988), and one by Black Mountain College poet Charles Olson (1910–1970).¹⁰³

Whereas Oliveros’s early work with poetry proved a mere tributary in her practice, and one which seems to have dried up quickly, she experienced another radical renovation in her listening and performing habits via Erickson’s growing interest in “structured improvisation” in composition, and his recommendations that she “improvise [her] way through compositions rather than . . . rationalize.”¹⁰⁴ These suggestions most affected Oliveros’s thinking around the early stages of the compositional process; she would often remark, later in life, that she considered composition a “slowed-down improvisation.”¹⁰⁵ In 1958, however, an opportunity to improvise in real-time

¹⁰⁰ Oliveros, “Cues,” 377.

¹⁰¹ Pauline Oliveros, “An Interview with Pauline Oliveros,” by Jann Pasler, *AWC News/Forum* 9 (Spring/Summer 1991): 9–10.

¹⁰² Von Gunden, *Music of Oliveros*, 9–10.

¹⁰³ Von Gunden, 10–15; Erickson and MacKay, *Music of Many Means*, 183–185. Oliveros had encountered Duncan directly; she met him at the San Francisco State Poetry Center, where he had assumed the Assistant Director post following a stint at Black Mountain. See, for further details, Mockus, *Sounding Out*, 138–139.

¹⁰⁴ “Career Narrative: 1957–1972,” ca. 1972, in file labeled “Curriculum Vitae,” Box 29, Folders 11–12, Oliveros Papers.

¹⁰⁵ Duckworth, “Pauline Oliveros,” 166.

performance marked her indelibly, and found her drawing, again, on the power of the tape recorder's objective ear.

The opportunity arose thus: through Wendell Otey's Composers' Workshop, Oliveros had met two students—Terry Riley (1935–) and Loren Rush (1935–)—who shared with Oliveros both a relationship with Erickson, and an interest in improvisation.¹⁰⁶ Riley, who would become an important fellow-traveler in Oliveros's developing career, and an important node in the San Francisco Tape Music Center's expanded network, was a California-born musician who was just beginning to reconsider his early prospects as a concert pianist (variously on account of his “late start” to study, and “erratic practicing and nerves”).¹⁰⁷ Having exhibited an interest in jazz as early as age eleven or twelve, it is perhaps no wonder that Riley was inspired by Erickson's fondness for improvisation, and when in 1958, he was tasked, last minute, with providing a soundtrack for a documentary film on a local sculptor (Claire Falkenstein, 1908–1997), he decided he would improvise his way through the five-minute track—and enlisted Oliveros and Rush as fellow performers. At the time, Rush was working at KPFA as a program assistant, and Erickson had only recently finished his tenure as music director; these connections secured them access to the studio, and, more importantly, to the Ampex tape recorders at the station. Off the trio went to play together—without sheet music, and without prior discussion.¹⁰⁸

¹⁰⁶ Pauline Oliveros, “Memoir of a Community Enterprise,” in *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde*, ed. David W. Bernstein (Berkeley: University of California Press, 2008), 80–81.

¹⁰⁷ Keith Potter, *Four Musical Minimalists: La Monte Young, Terry Riley, Steve Reich, Philip Glass*, Music in the Twentieth Century (Cambridge: Cambridge University Press, 2002), 94–95.

¹⁰⁸ Oliveros, “Memoir of a Community Enterprise,” 80–81. While there is not sufficient space to fully historicize the practice described here, it is obligatory to note that what Oliveros, Riley, and Rush achieved together was not unprecedented. Insistent that the trio operated without models, Oliveros has remarked flatly that “a method of free improvisation was born at Radio KPFA in 1957.” Oliveros, “Reverberations,” 42. “Free improvisation,” much like “indeterminacy,” is a musical category that has been used to claim, for white musicians, a measure of historical precedence in the realm of real-time music-making; architects of the practice include AMM and the Spontaneous Music Ensemble, British collectives formed in the mid-Sixties, and British guitarist Derek Bailey (1930–2005). For his part, Bailey has explicitly attributed the “revitalization of improvisation” in the 20th century to the example of jazz; Oliveros has denied suggestions of jazz influence on several occasions, although she pointed to the free jazz of Cecil Taylor (1929–2018) and Ornette Coleman (1930–2015) as a “parallel development.” To acknowledge this racial politics of improvisation, about which George E. Lewis has written extensively and incisively, is not to accuse Oliveros and her

Oliveros recalls that “Loren played bass and koto, Terry, piano, and [she], French horn.”¹⁰⁹

Remarkably, this first-time effort proved generative, and one five-minute track became several as the trio continued to assemble for sessions.¹¹⁰ “What began,” she reflects, “as a conglomerate, sounding like . . . Bartók, Shonberg [*sic*], Webern mixed with us, began to change towards mixes much harder to identify.”¹¹¹ She continues:

Somehow we knew that the intuitive process was best activated directly and non-verbally through playing. Our responses to each other’s sounds took place at a much faster rate than could be rationally thought out as we went along. . . . We cultivated this non-rational mode through our improvisation, came to have confidence and rely on the supportive organizing nature of the unconscious and subsequently its relationship to conscious organizing.¹¹²

The “conscious organizing” that followed the improvising trio’s leaps into the depths of the unconscious came via the Ampex recorders stationed in KPFA’s studios. Standing by as unflinching and unfailing sentinels, these recorders functioned as crucial technical supplements in the absence of symbolic notation and verbal communication. Reflecting the musicians’ performances back to them with indiscriminate clarity, and thus prompting *post-facto* discussion of successes, failings, and possible routes of improvement, tape once again assumed the role of teacher: “We learned from the recorded feedback how to listen as we played,” Oliveros recalls.¹¹³ “We all felt that our hearing was expanded by the simple process of: 1) throwing ourselves into spontaneous music making, 2) getting immediate feedback in the form of recording, and 3) discussing the process and results.”¹¹⁴ The

peers of racial chauvinism—for we cannot verify the degree or nature of channeled influence, conscious or not, that informed the KPFA sessions; it is simply to point to a tendency towards black erasure in which even the most progressive of white experimentalists were complicit in the postwar and well beyond. Derek Bailey, *Improvisation: Its Nature and Practice in Music* (New York: Da Capo Press, 1993), 64–65; Pauline Oliveros, interview by Libby Van Cleve, June 8, 1998, OHV 90 f-k, transcribed tape recording, Major Figures in American Music, Oral History of American Music (OHAM), Irving S. Gilmore Music Library, Yale University, New Haven, CT, 18, https://archives.yale.edu/repositories/7/archival_objects/3185019. The canonical text by Lewis is George E. Lewis, “Improvised Music After 1950: Afrological and Eurological Perspectives,” *Black Music Research Journal* 22, no. Supplement: Best of BMRJ (2002): 215–246, <https://doi.org/10.2307/1519950>.

¹⁰⁹ Oliveros, “Memoir of a Community Enterprise,” 80–81.

¹¹⁰ Oliveros, 80–81.

¹¹¹ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

¹¹² “Theater Piece Book.”

¹¹³ Oliveros, “Software for People,” 181.

¹¹⁴ Oliveros, 182.

accumulative learning process to which Oliveros pins the term “feedback” is fully audible and palpable in the recordings of these group improvisations which, remarkably, have been archived online for posterity.¹¹⁵ Numbered one through five, they chart an evolution akin to the learning of a language, with phonemes, words, and then phrases taking shape and falling into place.

We can be fairly certain that Oliveros does not wield the term “feedback” in its freighted cybernetic sense, but rather intends it to capture the specular “mirroring” or reflecting she has elsewhere mentioned regarding tape. In cybernetics, feedback mechanisms, which respond to the transfer of information or stimuli between a system and its surrounding environment, are either “positive” in nature (functioning to amplify or increase whatever behavior a system is already engaged in), or “negative” (functioning to damp or correct the behavior of a system).¹¹⁶ However, the picture Oliveros has conjured of the now-storied “KPFA improvisations” does suggest a sort of feedback loop joining Oliveros, her fellow performers, and the Ampex machines stationed in KPFA’s studios. This loop served alternately to correct the direction of the improvisations and to reinforce it. As the sessions progressed, and the improvisers’ collective “system” reached a plateau of assured stability, they ceased to need the feedback, for it had already introduced changes into their muscles, minds, and ears: “Gradually because of this feedback,” remarks Oliveros, “we learned to bear differently through our participating in the improvisation. In other words, the recordings gradually were not necessary.”¹¹⁷

The perceptual retuning or expansion of perception that Oliveros invokes here is worth lingering on, and not only because these reflections suggest a sharpening of the startling “discovery”

¹¹⁵ The recordings of the improvisation sessions can be accessed via the Internet Archive: https://archive.org/details/C_1957_XX_XX. Note that the description of the recordings dates them to 1957; by seeming consensus, the accounts collected in David W. Bernstein’s edited Tape Center volume place them in 1958.

¹¹⁶ Regarding “positive” and “negative” feedback, see, for example, Norbert Wiener, *The Human Use of Human Beings: Cybernetics and Society*, The Da Capo Series in Science (New York: Da Capo Press, 1988), 96, 165–166.

¹¹⁷ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers (my emphasis).

she had previously made while listening to her window-sill recording. The KPFA improvisations definitively taught Oliveros how to take insight derived from technology and *absorb it into herself*. This process of growth, whereby “feedback,” or a relay between body and machine, spurs transformation, and at last, internalization, would come to structure all of Oliveros’s future engagements with media—though its logic of unfolding would bend and shift in each encounter. Thus, while Oliveros would soon cultivate a very different relationship with tape—one no longer characterized by a deference to its supposed objectivity—she would carry this earliest of tape lessons with her for decades.

Following the KPFA sessions, the musicians involved found new avenues along which to further their experiments in improvisation. In 1959, Riley enrolled in graduate courses at UC Berkeley, and soon after met a musician named La Monte Young (1935–).¹¹⁸ Young, an inveterate eccentric who had grown up on an Idaho dairy farm in a Mormon hamlet, had already, by the late Fifties, taken substantial steps towards a musical style anchored by the use of long, sustained tones; future critics and historians would call it “Minimalism.”¹¹⁹ Led in part by the example of Anton Webern, who suggested to him the possibility of a truly “static” music, Young cycled through experiments in austere simplicity and lengthy tonal durations until he arrived at *Trio for Strings* (1958), a work “comprised almost entirely of long sustained tones.”¹²⁰

Soon after Riley and Young met, the latter established a relationship with a dancer named Anna (then Ann) Halprin (1920–2021)—yet another future pillar of the Tape Center network (and important Oliveros collaborator). Halprin, who moved to Marin County, California in 1945, had in the mid Fifties formed the San Francisco Dancers’ Workshop out of a constellation of dance

¹¹⁸ Potter, *Four Musical Minimalists*, 21–24, 96–98.

¹¹⁹ Potter, 28–34. Keith Potter’s discussion of the term “Minimalism” (as it appears in music literature), its critical provenance, and its discontents, is unmatched in its clarity and concision. Potter, 1–20.

¹²⁰ Potter, 28–29, 34–41.

students she had been teaching at a rented studio in San Francisco.¹²¹ Having secured for the Workshop a new base of operations—the spectacular redwood deck jutting out from her home in Marin—she sought the collaboration of musicians, and found willing partners in Young and Riley. A believer in the virtue of “natural,” unscripted movement who had for years been placing students in improvised situations free of choreography, Halprin afforded Young and Riley the space to make music free of notation, pre-planning, and conventional instruments.¹²² The pair found themselves drawn to “very long and very live” friction sounds—“metal on glass, metal on metal.”¹²³ While Young, in recalling these collaborations, has emphasized the length and magnitude of the sounds, which “filled up the entire room of the studio,” Riley, in language echoing Oliveros’s KPFA recollections, has highlighted the elasticity offered by Halprin’s “free form and intuitive [approach],” mercifully free of “intellectual planning.” “I really liked swimming around in that way,” he has remarked.¹²⁴

In 1959–60, while Riley was “swimming” alongside Young and Halprin, Oliveros was composing a new work—*Variations for Sextet* (1960) for flute, clarinet, trumpet, horn, cello, and piano—and trying to manifest some of the immediacy she had experienced in real-time improvisation. “[I] wanted to listen my way through the composition [and] make all decisions by ear,” she later reflected.¹²⁵ In analyzing the work, Oliveros biographer Heidi von Gunden has singled out several characteristics for scrutiny: she points to the sparse patterning of pitches (whereby sound events are yoked together in groups of two or three with a care for textural or timbral mixing); a related rhythmic irregularity and the frustration of straightforward or linear time (via, for example,

¹²¹ Janice Ross, “Atomizing Cause and Effect: Ann Halprin’s 1960s Summer Dance Workshops,” *Art Journal* 68, no. 2 (Summer 2009): 63–65, <https://doi.org/10.1080/00043249.2009.10791346>; Janice Ross, *Anna Halprin: Experience as Dance* (Berkeley: University of California Press, 2007), 70–113.

¹²² Ross, *Experience as Dance*, 139–143

¹²³ Ross, 142.

¹²⁴ Ross, 143.

¹²⁵ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

the use of variable section lengths, *accelerandi* and *ritardandi*, and the overlaying of instrumental parts unfolding at different tempi, measured proportionally); and, at measure 70 of the work, the breathtaking use of a twenty-second cello drone.¹²⁶ While Oliveros has credited La Monte Young as the inspiration for her sustained cello tone (thinking, one imagines, of his *Trio for Strings*), one wonders what prompted her play with tone color and tempi, and her gestures of “speeding up,” “slowing down,” “superimposition,” and “juxtaposition.”¹²⁷

Until now, Oliveros scholars have ignored a compelling piece of the musician’s late Fifties chronology—namely, that in the years directly bracketing the composition of *Variations for Sextet*, Oliveros was making extra money by producing soundtracks for films. In December 1958, Oliveros completed a music sequence, arranged on tape, for a film called “The 4-H Leader”—a production of the national youth organization 4-H. Included among Oliveros’s associated papers are a draft music sequence with a numbered list of timed-out songs (several drawn from the musician’s unpublished *Eighteen Accordion Pieces for Children* of 1957), instrumental lead sheets, and a production sheet correlating numbered songs to timed-out film sequences (labeled, also, with their length in feet).¹²⁸

[Figure 7] Meanwhile, in 1961, Oliveros completed a soundtrack for a documentary film titled *The Art of The Woodcut* and narrated by German-Israeli artist Jakob Steinhardt (1887–1968). [Figure 8] Oliveros’s documents indicate not only that she was working to carefully sync film and music sequences (she has singled out phrases of dialogue, stamped with their time of occurrence, as functional cues), but also that she was working with fades and splices. “Splice flute into earlier take,” reads a parenthetical written on a sheet of scrap paper.¹²⁹

¹²⁶ Von Gundten, *Music of Pauline Oliveros*, 17–22.

¹²⁷ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

¹²⁸ “Four-H Leader,” 1958, Box 3, Folder 19, Oliveros Papers.

¹²⁹ “Art of the Woodcut,” 1961, Box 1, Folder 3, Oliveros Papers.

That these experiments should have received no scholarly attention is, to a certain extent, understandable—they are, after all, the products of part-time work undertaken for money, not creative nourishment. In the account we are constructing, however, they are important indeed: in the first place, they demonstrate that Oliveros was gaining practical experience with tape (beyond the basics of recording) prior to her execution of *Time Perspectives* (1961), to be discussed in the following section; what's more, they demonstrate that this experience included editing techniques (splicing, and, potentially, dubbing) not usually counted among Oliveros's early arsenal. Indeed, the composer has repeatedly underscored her rejection of editing from the start of her electronic explorations.¹³⁰ From her papers, however, it is evident that Oliveros was taking razorblades to reels, experimenting with splicing, fades, and synchronization, and familiarizing herself with what one electronics handbook terms “time-space relations in tape editing” (the calculation of duration from tape lengths and tape playback speed) as early as 1958–60.¹³¹

It is fair to speculate that in *Variations for Sextet*, with its combinatory logics of rhythmic overlay and juxtaposition, its use of proportional tempi, and its play with changing speeds, one already sees evidence of Oliveros putting tape-derived insights to compositional work—insights no longer related to objectivity and unvarnished perception alone. Having learned, from tape, to listen free of discrimination, and having trusted it to reflect her performances back to her, she was now, I suggest, extracting less straightforward lessons from the medium—picking up a fuzzier and more playful “feedback” than she had been accustomed to. As we will see, Oliveros's next experiments with tape will find her inverting her relationship with it entirely; we will follow the musician as she

¹³⁰ A characteristic exchange appears in David W. Bernstein's edited Tape Center book, for which Oliveros was interviewed by Bernstein and Maggi Payne. Payne asks whether Oliveros “did a lot of editing” while producing *Time Perspectives* (1961), and Oliveros responds, “No. Not at all. . . . I didn't like [using razorblades] at all. I would experiment and then I would play the thing. That was my modus operandi all along. I wasn't interested in cutting and splicing.” Pauline Oliveros, interview by David W. Bernstein and Maggi Payne, in *Tape Music Center*, ed. Bernstein, 101.

¹³¹ Trythall, *Principles and Practices*, 119–121.

subjects tape to a lesson of her own design, warping it, queering it, and teaching it unravel in step with her own embodied perspective.

3. Tape lesson two: queer temporality

On an evening in late May 1960, a shockwave rattled the walls and windows of homes across the Bay Area, jolting residents from their couches or beds, and sending them streaming into the streets; there, they wondered aloud whether they had just experienced an earthquake. The following day, area papers attributed the disruption to a “sonic boom”—a thunder-like *clap* produced when supersonic aircraft accelerate past the speed of sound.¹³² Air Force and Navy spokesman denied responsibility, although nearby Hamilton Air Force Base had taken credit for a sonic boom just months prior.¹³³ Half a year later, on December 15, 1961, the *San Francisco Examiner* announced a new concert series at the San Francisco Conservatory with the tag “Sonic ‘Boom’ at Conservatory” (and on a previous page, “THIS is a Birthday Serenade to Beethoven?”). Invoking the shudder-inducing threat of the sonic boom advisedly, the article struck a skeptical, if somewhat bemused, pose in relation to its subject:

MONDAY is the 191st anniversary of the birth of Beethoven, but THE concert of that day would make his harpsichord spin and stutter. “Sonics,” electronic music, will be presented at the San Francisco Conservatory of Music at 8:30 p.m. Monday in the auditorium at 19th Ave. and Ortega. . . . This is the new laboratory for electronics [*sic*] music, at first glance, a hodge-podge of sound boards, echo chambers, tape recorders, drums, a percussion rack with kitchen utensils, part of a car bumper and a shell casing. . . . Monday’s program, the outgrowth of composition studies under the nationally known composer and Conservatory faculty member Robert Erickson, will include a live improvisation by the four young composers, each recording on a separate machine.¹³⁴

¹³² “Sonic Boom Scares Bay Area,” *San Francisco Examiner*, May 24, 1960, 1; “Hear that Noise? 2 Sonic Booms Laid to Jets,” *San Francisco Examiner*, May 25, 1960.

¹³³ “AF Says Sonic Boom Speed Vital in Tests,” *San Francisco Examiner*, January 18, 1960, 20.

¹³⁴ Mildred Schroeder, “THIS is a Birthday Serenade to Beethoven?,” *San Francisco Examiner*, December 15, 1961, 25.

The “four young composers” referred to here are Pauline Oliveros, Ramon Sender, Terry Riley, and Philip Winsor (1938–2012), whose works comprised the inaugural program of the San Francisco Conservatory’s “Sonics” series (sometimes stylized, in booming all-caps, as “SONICS”). The creative brainchild of Sender and Oliveros, and an incubator in which some of the first artistic and philosophical tenets of the Tape Center would hatch, Sonics would hold six concerts between December 1961 and 1962, and—Beethoven be damned—force the San Francisco public to take seriously the promise of electronic music (liberally peppered with group improvisation, choreographed light shows, and brazen exercises in theater). The inaugural Sonics show would, meanwhile, provide a forum for the debut proper of Oliveros’s work with tape.

The *Examiner* article, especially intrigued by Oliveros and her “roommate” (read: partner), Laurel Johnson, provides a few compelling glimpses at what Oliveros had up her sleeve. While the piece’s accompanying photograph finds the musician seated behind a large drum, quotes from Oliveros suggest her involvement with more unconventional instruments: “I’m playing my bathtub,’ explained Miss Oliveros, a brown-eyed 29-year-old whose past honors have come from more conventional compositions. ‘That’s the sound of a soup ladle being bounced off the tub into the water, dropped a few octaves and distorted.’”¹³⁵ [Figure 9] Elsewhere, Oliveros remarks eloquently on her draw towards electronics: “Harmony has been pushed about as far as it can at the moment. I find the flexible time ratios and rhythm element in electronics fascinating—you can move at different tempos.”¹³⁶

This quote not only lends credence to the analysis of *Variations for Sextet* (1960) in the previous section, but also demonstrates a thorough change in Oliveros’s relationship with tape technology—one which, by December 1961, the composer could already confidently articulate. The

¹³⁵ Schroeder, “Birthday Serenade,” 32.

¹³⁶ Schroeder, 32.

rhetoric of magnetic indexicality has disappeared, and in its place, we have a discussion of tape-as-time-machine. How did we get here? That is, how did we get to the “playing” of bathtubs and the tape-assisted distortion of clanging soup ladles? The prehistory of “Sonics” that follows requires, first, that we briefly depart from Oliveros and zoom in on the singular character of Ramon Sender, to whose brazen initiative the concert series owes its existence.

Sender arrived in the United States in 1939 via Spain, where he had been born five years prior. He entered the world in the turbulent lead-up to the Spanish Civil War, his father a radical journalist, and his mother a concert pianist, and he speculates that the first sound he heard at birth was “machine gun fire.”¹³⁷ After Sender and his younger sister were forced to endure the assassination of their mother at the hands of a military firing-squad, their father, who himself fled to Mexico, secured them safe passage to the United States; there, in a town outside of New York, they were taken in by an adoptive mother.¹³⁸

Twenty years later, in 1959, Sender traveled to San Francisco to study with Robert Erickson, who was now teaching courses at the San Francisco Conservatory. This was not Sender’s first time in the Bay Area—two years earlier, he had drifted westward and gotten “caught up in Zen Buddhism. . .on the edge of the beat scene”—but now, he was prepared for a longer stay.¹³⁹ While he had, by this time, received more conventional musical training (in addition to studying privately with Elliott Carter (1908–2012) in high school, he had worked with George Copeland, 1882–1971, a classical pianist and lauded performer of Claude Debussy, 1862–1918), he had also been exposed to developing strands of the experimental and the electronic.¹⁴⁰ While in New York, he had attended a

¹³⁷ Ramon Sender, interview by Tessa Updike and Mary Clare Bryzta, April 14, 16, 21, 2014, Oral History Project, Library & Archives, San Francisco Conservatory of Music, San Francisco, CA, 6–7. <https://sfcm.edu/student-resources/library/archives/oral-history-project/ramon-sender>.

¹³⁸ Sender, interview by Updike and Bryzta, 8–14.

¹³⁹ Ramon Sender and William Maginnis, interview by David W. Bernstein and Maggi Payne, in *Tape Center*, ed. Bernstein, 53.

¹⁴⁰ Ramon Sender, interview by Updike and Bryzta, 17–24.

lecture by Bebe and Louis Barron (who, we will recall from Chapter 1, had graciously hosted John Cage’s *Project for Magnetic Tape*), he had heard Karlheinz Stockhausen’s work performed in concert, and he had taken Henry Cowell’s composition class at Columbia University.¹⁴¹ He even witnessed a performance of John Cage’s *Imaginary Landscape No. 4* (1952), an indeterminate work scored for 12 radios: “It turned out to be a night when the President was giving a weekly address, so all the stations were carrying the same message,” Sender recalls. “[T]he result that John wanted, of different stations interacting with different programs, just didn’t happen.”¹⁴²

Upon arriving at the Conservatory, Sender found in Erickson the same gracious and encouraging mentor that Oliveros so appreciated, and within two years, he was “branch[ing] out” from violin and string compositions into the realm of tape.¹⁴³ Working around the one-track functionality of the Conservatory’s reel-to-reel machine (“a home Ampex”) by flipping his tape over and recording on its underside (thus crudely approximating “sound-on-sound”), Sender set two or three hymns from the *Rigveda* for four cellos, four sopranos, percussion, piano (“used more like a percussion instrument”), and three tape recorders.¹⁴⁴ Titled *Four Sanskrit Hymns* (1961), the piece inaugurated a fertile period of experimentation for Sender; it meanwhile made clear that he would need a better production studio than Erickson’s classroom, which he had buried beneath a scrapheap of equipment. Soon after making friends with a Conservatory janitor, from whom he secured 24/7 access to the facilities, the musician saw an opportunity in the concrete expanse of the Conservatory attic. Taking “a cold chisel and a hammer” to the floor, he laid down a floor plate for a wall and installed a circuit breaker. Via a connection to a recording engineer, he then obtained his

¹⁴¹ Sender, interview by Updike and Bryzta, 37–38.

¹⁴² Sender, interview by Updike and Bryzta, 38.

¹⁴³ Sender, interview by Updike and Bryzta, 51.

¹⁴⁴ Sender, interview by Updike and Bryzta, 51.

attic studio's first pieces of equipment: a single-channel Ampex 403, and the slimmer, briefcase-scaled Ampex 601-2, which could record in two-track stereo.¹⁴⁵

Sender met Oliveros via the Conservatory as early as 1959. Having graduated from San Francisco State College back in 1957, the latter was continuing her studies with Erickson at the time.¹⁴⁶ In 1960, however, an even wider network took shape among Conservatory students and other area musicians, laying the foundation (floor plate?) for “Sonics,” and, ultimately, the Tape Center. Among the motors behind this development was a pair of American Composers’ Workshops (held in 1960 and 1961, respectively) that Erickson organized at the Conservatory. The weeklong workshops showcased both student work, and compositions by older or more established composers (e.g., Erickson’s mentor Ernst Krenek, and the ancestral American experimentalist Charles Ives).¹⁴⁷

The first Composers’ Workshop was a personal coup for Oliveros: the musician’s *Variations for Sextet* debuted to high praise, functioning as a series closer, and rounding out the Workshop on a high note. Oliveros earned especially gracious lauds from *San Francisco Chronicle* art and music critic Alfred E. Frankenstein, who deemed her piece “intensely serious, forceful, vastly dramatic in its implications, and truly symphonic in its breadth of values.” “[*Variations*] is, I think,” he continued, “the most remarkable [piece] I have yet heard by any of the younger American composers.”¹⁴⁸ Oliveros may have looked skeptically on Frankenstein’s invocation of Webern in his review (granted, he stated that Oliveros “transcend[ed]” Webernism), but she was emboldened by the writeup, which she would go onto quote or mention in biographical writings.¹⁴⁹ In any case, Frankenstein’s early

¹⁴⁵ Sender, interview by Updike and Bryzta, 51–54.

¹⁴⁶ Duckworth, “Pauline Oliveros,” 166.

¹⁴⁷ Erickson and MacKay, *Music of Many Means*, 60–65.

¹⁴⁸ Alfred Frankenstein, “Modern Music Festival Opens,” *San Francisco Chronicle*, June 21, 1960, 26. One year after the *Variations* Workshop performance, in July 1961, Oliveros was informed by the Pacifica Foundation (KPFA’s umbrella organization) that she was to receive its Directors’ Award in Musical Composition for her work. Pacifica Foundation correspondence and ephemera, Box 31, Folder 15, Oliveros Papers.

¹⁴⁹ “Career Narrative: 1957–1972,” ca. 1972, Oliveros Papers.

notice of Oliveros was auspicious, for the *Chronicle* critic would, in years following, emerge as a vocal proponent of Tape Center activity in a critical climate sometimes unfriendly to the institution's experiments.¹⁵⁰

The 1960 Composers' Workshop is also notable for placing Oliveros on the same program as Morton Subotnick (1933–), who, alongside Ramon Sender, would formally establish the first iteration of the Tape Center. Having attended Mills College in Oakland as a graduate composition student, Subotnick was, at this moment, channeling experimental inclinations into his work with the San Francisco Actor's Workshop, a theater troupe led by the visionary director and theorist Herbert Blau (1926–2013).¹⁵¹ For the Actor's Workshop's 1961 performance of *King Lear*, Subotnick meticulously cut and collaged voice recordings of the production's male lead until he had convincingly rendered a “the raging turmoil of Lear’s mind.”¹⁵² The work Subotnick contributed to the Composers' Workshop, *Serenade* (1958), was non-electronic and comparatively conventional. Erickson's follow-up workshop in 1961 pooled together still more works by future Sonics and Tape Center participants, presenting Sender's *Four Sanskrit Hymns*, and an absurdist work by electronic musician Richard Maxfield (1927–1969) for whose performance Terry Riley “poured marbles into the piano, set its strings vibrating with a child’s gyroscope, and dropped all manner of objects.”¹⁵³ Remarked Frankenstein: “All we needed was the fur-lined tea-cup and the piece of porcelain plumbing signed ‘A. Mutt’ [sic] and we’d have been right back in the Twenties.”¹⁵⁴

Paths were continually intersecting, and sympathetic resonances were building. Oliveros and Sender were regularly discussing the electronic music they heard via KPFA and improvising in the

¹⁵⁰ Critic Alexander Fried of *Chronicle* competitor the *San Francisco Examiner* would cover the Tape Center regularly over the Sixties, counterbalancing Frankenstein's sympathy and excitement with a dour skepticism.

¹⁵¹ Morton Subotnick, “Music as Studio Art,” in *Tape Center*, ed. Bernstein, 112–113.

¹⁵² Subotnick, “Music as Studio Art,” 112–113.

¹⁵³ Alfred Frankenstein, “New Music—Wacky and Interesting,” *San Francisco Chronicle*, June 15, 1961, 36.

¹⁵⁴ Frankenstein, “Wacky and Interesting,” 36.

attic, on occasion with Terry Riley.¹⁵⁵ Interests in real-time performance were dove-tailing with tape experiments and a curiosity around mixed-media, and by the end of 1961, Oliveros, Sender, and Riley had a sufficiently clear vision (and sufficiently potent electronic music of their own) to launch their Sonics concert series. Before turning to this debut in earnest, with a particular ear towards Oliveros and her tape work *Time Perspectives* (1961), presented at Sonics #1, we should work to situate Sonics in the wider twentieth-century development of electronic music, and enumerate the plural approaches to the craft that lay on offer for Oliveros and her peers c. 1961; thus, the force of their individual interventions, and the artistic context for Oliveros's next evolutionary step, can be appreciated with greater clarity.

Historians of electronic music are of two minds regarding electronic music's "origin," with some siting it circa 1950, and some rooting it as far back as Thaddeus Cahill's Telharmonium, discussed in the previous chapter.¹⁵⁶ We can confine ourselves, here, to the music of the postwar, which is what Oliveros and Sender had heard filtering through their radios on KPFA's airwaves.¹⁵⁷ The years following World War II saw not so much the emergence of a monolithic "electronic

¹⁵⁵ Oliveros, interview by Bernstein and Payne, 101; Sender and Maginnis, interview by Bernstein and Payne, 58.

¹⁵⁶ Those who argue for a prewar provenance will tend to point to the early example of the Telharmonium and then to a string of electronic instruments invented in the decades following the invention of the vacuum tube—these include the "Sparophon," the "Kaleidophon," the "Ondes Martenot," the electric Hammond organ, and, most notably, the "Theremin" (introduced in 1920), which one plays by moving their hands in the vicinity of an antenna. In response to these examples, naysayers will remark "new sounds, but not new music," arguing that these instruments, while technically electronic, were simply used to play a traditional repertory. Such accounts, it must be emphasized, not only lay waste to decades of remarkable technological innovation, but ignore earlier experiments that subverted the conventions of traditional instrumental performance, *détourning* workaday media such as variable speed gramophones (Paul Hindemith, 1895–1963, and Ernst Toch, 1887–1964), "optical sound" used in film (Oskar Fischinger, 1900–1967), and, as we saw in the previous chapter, radios and phonograph test records (John Cage). In view of space constraints, however, I have chosen to focus on the electronic music of the postwar, with which Oliveros, Sender, and their peers would have been most keenly familiar. For two excellent syncretic accounts of prewar experiments, see Otto Luening, "Origins," and Gordon Mumma, "Live-Electronic Music," in *The Development and Practice of Electronic Music*, ed. Jon H. Appleton and Ronald C. Perera (Englewood Cliffs, NJ: Prentice Hall, 1975), 1–21, 286–335. For an account preferential to the postwar period, see Joel Chadabe, *Electric Sound: The Past and Promise of Electronic Music* (Upper Saddle River, NJ: Prentice Hall, 1997). For a shrewd recuperation of the prewar, see Thomas Patteson, *Instruments for New Music: Sound, Technology, and Modernism* (Oakland: University of California Press, 2016). Finally, regarding the creative appropriation of vinyl and film by the prewar avant-garde, see Peter Manning, "The Influence of Recording Technologies on the Early Development of Electroacoustic Music," *Leonardo Music Journal* 13 (2003): 5–10,

<https://doi.org/10.1162/096112104322750719>.

¹⁵⁷ Oliveros, interview by Bernstein and Payne, 101.

music” as the warning shots of different counterposed schools who would only be brought under one terminological umbrella in the later Sixties. Historians have given France the slight historical edge: it is in Paris that radio engineer Pierre Schaeffer, in 1948, set to work mixing and manipulating several phonograph records on which he had recorded the sounds of trains at the Gare des Batignolles.¹⁵⁸ Equipped with multiple turntables, an echo chamber, and a disc-cutting lathe, he created several collage-like compositions for radio broadcast that used variable playback speed, cuts, and loops to alchemically transform the train sounds, such that they were severed from their referents and reduced to “discrete and complete sound objects [*objets sonores*].”¹⁵⁹

This process of alchemical transformation and commitment to the use of “given” experimental sound” functioned as the conceptual cornerstone for what Schaeffer ‘termed *musique concrète* (“concrete” because untethered from the abstraction of the tonal system), and in the late Forties and early Fifties, Radiodiffusion Télévision Française (RTF) provided a base of operations for the increasingly elaborate experiments of Schaeffer and his colleagues, who together constituted the Groupe de Recherche de Musique Concrente (GRMC, later GRM).¹⁶⁰ A newly outfitted studio in 1951 provided the *concrète* cohort with tape recorders (annulling the need for phonographs), and proprietary machines such as the *phonogène*, which, in one of its various guises, allowed one to rapidly modulate the speed of looped tape segments.¹⁶¹ In Cologne, whose relevant history has been gestured to in the previous chapter, three different figures—Werner Meyer Eppler, Herbert Eimert, and Robert Beyer—served as the architects of a studio very much opposed to the *concrète* methodology. Operational by 1953, the Cologne studio, according to *concrète* composer Luc Ferrari

¹⁵⁸ Lowell Cross, “Electronic Music, 1948–1953,” *Perspectives of New Music* 7, no. 1 (Autumn–Winter 1968): 32–33, <http://doi.org/10.2307/832425>.

¹⁵⁹ Cross, “Electronic Music,” 40–43; Chadabe, *Electric Sound*, 46–48; Pierre Schaeffer, *In Search of a Concrete Music*, trans. Christine North and John Dack, California Studies in 20th-Century Music 15 (Berkeley: University of California Press, 2012), 12–14.

¹⁶⁰ Schaeffer, *Concrete Music*, 14; Chadabe, *Electric Sound*, 27–28, 31–33.

¹⁶¹ Manning, “Influence of Recording Technology,” 6–7.

(1929–2005), perhaps an unreliable narrator, rejected “given” sound as “dirty” and impure.¹⁶²

Certainly, they evangelized an electronic music (*Elektronische Musik*) constructed *ex nihilo* using oscillators, filters, custom circuits, and white-noise generators.¹⁶³ Yet another major studio, housed at the Nippon Houso Kyokai, or NHK (Japanese Broadcasting Corporation) in Tokyo, Japan, coalesced between 1953 and 1954. Composers working at NHK, among them future Tudor collaborator Toshi Ichianagi (1933–, see Chapter 3), drew variously on *concrète* methods, the Cologne style, and the live-electronic processing of sounds, while also combining their work with performance idioms such as that of traditional Noh theater.¹⁶⁴

In the United States, an approach to electronic music known simply as “tape music” was popularized by Otto Luening (1900–1996) and Vladimir Ussachevsky (1911–1990), two individuals whose deep European roots, and experience with conventional instruments and repertoires (Luening played flute, and Ussachevsky, piano) mark them, per musicologist Kyle Gann, as “unlikely pioneers” of American electronic music.¹⁶⁵ Luening, for his part, boasts a personal connection that justifies his draw to electronic music: while seeking refuge in Zürich during World War I, he found himself marooned beside Ferruccio Busoni, who mentored him, and pressed him towards an interest in new technologies of music-making.¹⁶⁶ However, as Gann has noted, it seems much more mundane circumstance that set Luening and Ussachevsky on their pioneering path.

In 1951, at which time both composers were teaching at Columbia University, the school acquired an Ampex tape recorder and tasked Ussachevsky with its safekeeping. By 1952, a curious Ussachevsky had already produced several experiments showcasing the manipulation of taped piano

¹⁶² Luc Ferrari, “Luc Ferrari: Interview with an Intimate Iconoclast,” by Brigitte Robindoré, *Computer Music Journal* 22, no. 3 (Autumn 1998), 10. <https://doi.org/10.2307/3681154>.

¹⁶³ Cross, “Electronic Music,” 48–54.

¹⁶⁴ Chadabe, *Electric Sound*, 43–44.

¹⁶⁵ Gann, *American Music*, 256.

¹⁶⁶ Erinn E. Knyt, *Ferruccio Busoni and His Legacy* (Bloomington: Indiana University Press, 2017), 189–191, 212–215.

(and presented them at the Composers' Forum in New York), and he soon teamed with an intrigued Luening for a period of experimentation in a "primitive laboratory" in upstate New York.¹⁶⁷ The two emerged with compositions foregrounding their respective instruments (flute and piano) but subjecting them to effects and alterations, including dubbing and slow-motion playback, achievable via tape.¹⁶⁸ These saw their 1952 premiere at New York's Museum of Modern Art, where conductor Leopold Stokowski (1882–1977), who had organized the "concert," "departed temporarily with his soloists and small orchestra" in favor of a tape recorder and loudspeaker.¹⁶⁹

In branding their electronic work with the innocuous label "tape music," which Sender and Subotnick would adopt for the San Francisco Tape Music Center, Ussachevsky and Luening were making two shrewd points—one practical, and one political. In the first place, they were underscoring the fact that for all their supposed aesthetic and ideological differences, all the postwar "schools" of electronic music shared a key common denominator: tape. While Schaeffer's *objets sonores*, extracted from lord knows what corners of the Parisian metropolis, and Stockhausen's scintillating sine tones, captured within the safe, sanitized limits of a studio-laboratory, were very different indeed, both classes of sound needed to be committed to tape in order to be edited and reproduced. To use the terminology of the time, while the Cologne, Paris, New York groups wielded different *sound sources* ("material of acoustical origin"), *modification apparatus* (filters, oscillators, mixers, and *phonogènes*), and studio accessories (loudspeakers, splices, and meters), they relied on a common recording medium with which to fix their productions in time and space and act upon them.¹⁷⁰

¹⁶⁷ Luening, "Origins," 16–17; Gann, *American Music*, 257–258. See, for a keen firsthand account of Ussachevsky's early Composers' Forum concert, Henry Cowell, "Current Chronicle," *The Musical Quarterly* 38, no. 4 (October 1952): 599–600, <https://www.jstor.org/stable/740141>.

¹⁶⁸ Gann, *American Music*, 258–260.

¹⁶⁹ Howard Taubman, "U.S. Music of Today Played at Concert: Two Works Presented on Tape Recorder Provide Novelty—Stokowski Is Conductor," *New York Times*, October 29, 1952, 35.

¹⁷⁰ I borrow this terminology from Gordon Mumma. See Gordon Mumma, "An Electronic Music Studio for the Independent Composer" (1964), in Gordon Mumma, *Cybernetic Arts: Adventures in American New Music*, ed. Michelle Fillion, *Music in American Life* (Urbana: University of Illinois Press, 2015), 15.

Ussachevsky puts it thus: “The sounds, no matter what their origin, have to be ‘captured,’ i.e. recorded on tape, to become materials for creative manipulation.”¹⁷¹ In the second place, a label so literal as “tape music” allowed Ussachevsky and Luening to glibly reject the geopolitical “sectarianism” of the European camps, which they felt had “endangered” a common cause.¹⁷²

The tape music that Oliveros, Sender, Riley, and others would debut at Sonics scarcely made use of any technology *not* available in the early Fifties; and yet it could not have existed at any other point in time. Positioned at a ten year remove from electronic music’s initial manifestations, and based in the American context (which, as Ussachevsky and Luening show us, was marginally less mired in obsessive factionalism), the Sonics/Tape Center cohort was faced with distinctions that stylistic cross-pollination was quickly rendering obsolete; the associated practices of Paris, Cologne, et al. appeared not as binding ideological commitments, but rather as techniques ripe for appropriation, recombination, or wholesale scrapping. And most importantly, spared the headache of national “alignment” from the outset, the practitioners considered herein opted, more often than not, to simply follow what moved them, and to model their music on dream states, the psychic flotsam of drug intoxication, and the bends and folds of subjectivity.

These are the historical circumstances that conspired with Oliveros, already an aggressively individual and anti-factional composer, to produce *Time Perspectives*, her first proper tape work. A four-channel piece, *Time Perspectives* was recorded track-by-track using Oliveros’s one-track home recorder (that of the windowsill listening experiment), and later dubbed onto two stereo tapes with some assistance from Sender, and the Ampex in his modest Conservatory studio.¹⁷³ Historically, the work has attracted less attention for its actual sounds (which only one Oliveros scholar, Martha

¹⁷¹ Vladimir Ussachevsky, “Music in the Tape Medium,” *The Juilliard Review* 6, no. 2 (Spring 1959): 8.

¹⁷² Ussachevsky, “Tape Medium,” 19.

¹⁷³ David W. Bernstein, liner notes for Pauline Oliveros, *Reverberations: Tape & Electronic Music 1961–1970*, Important Records IMPREC352, 2012, compact disc; Pauline Oliveros, “Reverberations: Eight Decades,” *Jefferson Journal of Science and Culture*, no. 2 (July 2012): 42–43, <https://journals.sfu.ca/jjsc/index.php/journal/article/view/12>.

Mockus, has described at any length) than for Oliveros's unusual working methods. Notable, first, is the recording's site of production: choosing to work at home rather than in the Conservatory studio, Oliveros produced the entirety of *Time Perspectives* in the Hoffman Street apartment she shared with her partner, Laurel Johnson.¹⁷⁴ Here, in a makeshift studio, she used resonant wooden apple-crates (an enduring Oliveros favorite), automobile curb scrapers, cardboard-tube "filters," and, yes, the "steel bowls" of soup ladles, to construct her sonic palette. The Cologne musicians would have been aghast.¹⁷⁵ In the reflective surfaces of her bathtub, meanwhile, Oliveros found a reasonably effective substitute for a reverberation chamber.¹⁷⁶ Oliveros and Johnson's laughter, which surfaces fleetingly in *Time Perspectives* (always playfully distorted), lends a final, intimate touch to the proceedings.

As notable as Oliveros's choice of sound sources is the means by which she recorded and "edited" them. While all the prevailing methodologies of the time would have dictated that Oliveros 1) record her sounds onto discrete lengths of tape, 2) subject them to modification and/or recombination (via cutting and splicing), and 3) dub or mix them onto a desired number of channels, Oliveros chose to collapse steps one and two into the live act of recording, and worry about step three afterwards. By manually hand-winding the tape of her machine (equipped with the two standard speeds of 7 ½ inches-per-second, or IPS, and 3 ¾ IPS) while "record" mode was engaged, Oliveros was able to modulate the speed (and thus pitch) of her recording in *real time*.¹⁷⁷ Using her fingers to physically manipulate the passage of recorded time, Oliveros could drag her tape to a near-standstill, and force it past its hard-wired speed limits, achieving the chattering "chipmunk" sounds,

¹⁷⁴ Mockus, *Sounding Out*, 19–22.

¹⁷⁵ Bernstein, liner notes, *Reverberations*.

¹⁷⁶ By 1961, artificial means of achieving echo and reverberation effects had been invented; in decades previous, however, musicians had needed to rely upon physical spaces known as reverberation or echo chambers. Electronic musician Allen Strange describes these spaces thus: "[These are] . . . acoustically 'live' room[s] which contain[n] a speaker and a microphone. The sound to be subjected to reverberation is routed to the speaker at one location in the room and is then received by the microphone at another location in the room and finally routed back to the recording or monitoring circuit." Allen Strange, *Electronic Music: Systems, Techniques, and Controls*, 2nd ed. (Dubuque, IA: W.C. Brown Co., 1983), 87.

¹⁷⁷ Bernstein, liner notes, *Reverberations*.

and *mollllassssssss*-like drawls that anyone who has experimented with high- and low-speed tape playback is familiar with. But to be sure, focused on the sort of careful shifts of timbre and coloration that *Variations for Sextet* accomplished without tape, *Time Perspectives* is delicate and subtle in its execution. The piece takes on a remarkable new cast in consideration of its real-time production, and Oliveros's routine claims that hardly any splicing was involved in construction.¹⁷⁸

What does *Time Perspectives* sound like? One might say: wet, sparse, and nocturnal. Sundry as her performance instruments may have been, Oliveros's sounds in *Time Perspectives* are consistent and restricted in number, with just several species of noise surfacing regularly like returning characters: there are rapid *pops* resembling droplets (which manipulation of *Time Perspectives* via downward pitch-shifting suggests were derived from the striking of metal implements on solid surfaces), *whooshes* of air and whistles that by turns recall windy drafts and the escaping of steam, chime- and bell-like resonances, and, more sparingly, snatches of identifiably human (but speed-shifted) noises. The available recording of *Time Perspectives* is a stereo mixdown that collapses its original four tracks (dubbed, we will recall, onto *two* stereo tapes), into just two: we can thus not be entirely sure of how Oliveros's sounds were originally distributed across tracks. Even so, a waveform analysis of the work (that is, a graphing of its variations in amplitude against the time domain), provides some insight into Oliveros's approach to compositional structure, and reveals certain tics and techniques consistent with later productions.

Two characteristics are notable: first, in [Figure 10] and [Figure 11], one can see two demonstrations of Oliveros's fondness for placing *staccato* activity, or small and varied musical gestures, in counterpoint to *steady-state* activity, or sustained, drone-like sounds. Pictured in [Figure 11] is a roughly thirty-second sequence in which a low whirring and whooshes of air on the right channel are set against shrill chimes and erratic, unidentifiable sonic shrapnel on the left channel.

¹⁷⁸ Oliveros, interview by Bernstein and Payne, 101.

This care for contrasts between sound events, in terms of both incidence and texture, will return in Oliveros's choral work *Sound Patterns* (1961–62), analyzed in the following section. While perhaps not so notable in and of itself, it is remarkable that Oliveros was able to apportion sounds so consciously and carefully without meticulous editing. Equally remarkable is that Oliveros was able to achieve a precise *staggering* of attacks between channels, as in the passage pictured at two scales in [Figure 12]; here, one can appreciate the musician's efforts to stack sounds against one another in time, such that any clarity and distinction that might obtain between them is obliterated. This effect, which Oliveros aggressively deploys in a sequence comprised of popping "droplets," powerfully elicits frustration and confusion—of both anticipation and ready sense-making.

Of Oliveros's commentators, Martha Mockus has provided the closest and most convincing analysis of *Time Perspectives*; in the context of Mockus's broader monograph on Oliveros, which seeks to trace a specifically "lesbian subjectivity" and "lesbian musicality" throughout her body of work, this tape piece, produced at home with Laurel Johnson, is posited a "sonic testimony to the initial joys of improvising—at home—with musical ideas and a lesbian life."¹⁷⁹ Advisedly produced *away* from the studio, *Time Perspectives* emerges, per Mockus, from a "*lesbian domestic space*," and one that "stands in marked contrast to the Cold War era's script for white middle-class married women whose experience of domestic life was often one of confinement and conformity."¹⁸⁰ While I want to follow Mockus in locating an enacted queerness in *Time Perspectives*, I do not hear in it precisely what she does, and in the context of my own, technology-focused account, I derive a slightly different lesson from it.

Laying particular emphasis on the shared laughter in *Time Perspectives*, Mockus hears in the work a pure and powerful expression of joyous domesticity. But this laughter, it must be noted, is a

¹⁷⁹ Mockus, *Sounding Out*, 2, 20.

¹⁸⁰ Mockus, 20.

fugitive sound in *Time Perspectives*—one which, appearing only under conditions of distortion, is torn away just as soon as it appears. As for the sonic cosmos through which it passes, it is sparse, dark, and disorienting: a kitchen-sink symphony of “house sounds” and phantom puttering that richly evokes the *time* of the nocturnal. The plural *perspectives* on this time, achieved via Oliveros’s speed-modulations and counter-positioning of sound events, discussed above, are largely responsible for the disorientation: without communicating either “fast” or “slow” movement through time (this ambiguity is a stunning feat), Oliveros’s perspectival distortions oscillate, in effect, between claustrophobic compression, and fleeting release. At all points, time is constructed as something cryptic, tyrannical, and defiant of stable possession—a kind of dark matter.

Jack Halberstam’s notion of a “queer temporality”—a “use” of time developed in partial opposition to “institutions of family, heterosexuality, and reproduction,” offers a productive way into what Oliveros’s temporal perspectives amount to.¹⁸¹ While Halberstam’s notion has most potently and painfully been used to capture the feelings of transience, contingency, and compressed mortality experienced at the height of the AIDS crisis, it can also evoke the temporalities, playful (“ludic”) or painful, constructed in the interstices and margins of “repro-time” and “family time”: the “early to bed, early to rise” rhythms that hew to “strict bourgeois rules of respectability.”¹⁸² It is in virtue of *this* interstitial or liminal character that *Time Perspectives* evokes something like a “queer temporality.” While this temporality is bound foundationally to Oliveros’s lesbian domesticity, I would submit that this domesticity is constructed as something occasionally ecstatic, but also frustrating, fleeting, and increasingly pressed into the framework of the PM hours, altogether removed from a quasi-professional sphere in which Oliveros was only selectively and ambiguously

¹⁸¹ Jack Halberstam, *In a Queer Time and Place: Transgender Bodies, Subcultural Lives* (New York: New York University Press, 2005), 1–2.

¹⁸² Halberstam, *Queer Time and Place*, 1–2, 5.

“out.”¹⁸³ I am not suggesting a definitive reading of the queerness that marks *Time Perspectives*, for such a thing could never exist; in the present account, it is more important to establish that Oliveros consciously and skillfully *impressed* this her queer subjectivity onto tape—a medium she had previously valued for its untempered objectivity.

Where before Oliveros was learning to improvise with the aid of tape’s indexically precise witnessing, here she is subjecting tape *itself* to improvisation. Before, she was tape’s student; here, she is sufficiently confident to teach tape a new lesson. This about-face is decisive, for it completes the circuit of influence, or “relay” (tape → Oliveros → tape) begun with the musician’s windowsill recording and the KPFA improvisations. Whether one reads *Time Perspectives* as a statement of unadulterated joy, or as something considerably more conflicted, it is thus that the work represents an expression of power. Oliveros’s established familiarity with tape, and her already expanded perception, here supports a subordination of the medium to the idiosyncrasies of mind and body. The image of Oliveros *hand-winding* her recorder, digging her fingers into its temporal fabric, could not be more fitting, and it calls to mind an epigraph (attributed to Mills College graduate Peter Musselman) she would use, decades later, in a 2011 article: “How can I translate the sense of corporeal fallibility and virtuosity present in acoustic performances into performances of electronic sounds that have no previously established gestural analog?”¹⁸⁴

The sounds of “corporeal fallibility” and psychic idiosyncrasy were richly on offer in the first Sonics program, which, while prepped in the cramped confines of Ramon Sender’s attic studio, was

¹⁸³ As Mockus notes, and as we will discuss in Chapter 4, Oliveros publicly came out in 1971, announcing herself as a “two-legged human being, a female, lesbian, musician, [and] composer” in issue 10 of the publication *Source: Music of the Avant-Garde* (or *Source Magazine*). Mockus, *Sounding Out*, 76. It is unclear to what extent Oliveros was out among the Sonics/Tape Center cohort, but certainly, Sender knew early on. Interestingly, Sender has recalled that at the time he was assembling materials for his studio in the Conservatory attic, Oliveros had just come back from Houston, where she had traveled with her partner, Laurel Johnson, to tell her mother she was a lesbian. The trip, Sender remembers, “had been a disaster”—one which left Oliveros “totally depressed.” That Oliveros likely recorded *Time Perspectives* not long after this trip is highly suggestive. Sender, interview by Updike and Van Cleve, 51, 54.

¹⁸⁴ Oliveros, “From Outside the Window,” 470.

an impressively elaborate affair. *Time Perspectives* was one of five total works presented: also featured were Phil Winsor's *Sound Study Number One* (1961), Sender's *Traversals* (1961), Terry Riley's *M . . . Mix* (1960–61), and an “Improvisation for Mixed Instruments and Tape” that included Oliveros, Laurel Johnson, Sender, and Winsor. To Robert Erickson, who, according to a Sonics press release, was manning the “central controls” that night, this group improvisation must have seemed a personal tribute.¹⁸⁵ Presented in a Conservatory auditorium, the concert employed a spatial-audio rig comprising fifteen speakers, and a keyboard wired such that different keys could pan sounds to different speakers; Sender credits his audio-engineer friend Ellis with the invention.¹⁸⁶ Per Sender, who evidently “confiscated” the practice keyboard from the Conservatory, the composers were meant to “play [their] piece[s] around the room.”¹⁸⁷

The winding and bending of the spatialized audio befitted compositions which, like *Time Perspectives*, were disorienting—and even proto-psychadelic—in nature. Riley’s composition, whose titular “M” is short for “mescalin,” is a case in point: an outgrowth of tape experiments produced for Anna Halprin’s 1960 dance *The Three-Legged Stool*, the work employs different “looping” techniques to achieve echo-like effects, drawing out sounds into trails of repetitions.¹⁸⁸ Loops, which will assume a key place in the Tape Center’s musical vernacular (and Oliveros’s own work) can be achieved via several different procedures: a musician equipped with only one reel-to-reel recorder can take a tape segment of any length, splice its ends together, and stretch it between their machine’s heads, and some sort of stationary cylindrical object providing tension; instead of winding from the machine’s supply reel into the take-up reel, the loop will continue to circulate past the playback head and around the cylindrical anchor.¹⁸⁹ **[Figure 13]** Armed with two reel-to-reel machines, one can set

¹⁸⁵ “SONICS 1” press release, 1961, Box 13, Folder 24, Oliveros Papers.

¹⁸⁶ Sender, interview by Updike and Van Cleve, 54.

¹⁸⁷ Sender, interview by Updike and Van Cleve, 54.

¹⁸⁸ Potter, *Four Musical Minimalists*, 98–99.

¹⁸⁹ Gustave Ciamaga, “The Tape Studio,” in *Development and Practice of Electronic Music*, ed. Appleton and Perera, 104–105.

a first machine to “record,” and a second to “play,” and stretch a tape loop between the two machines, whose distance from one other will determine the time of the delay.¹⁹⁰ [Figure 14] such a configuration can broker a *cumulative* overlapping of sounds and their repetitions. Riley evidently employed the latter technique, using wine bottles to achieve loop tension. Further effects were achieved with help from Sender, who owned a commercial device designed for delay, or echo, effects.¹⁹¹

If Oliveros’s improvisatory approach to *Time Perspectives* flew in the face of Paris and Cologne’s distinct, but equally interventionist editing methodologies, which entailed endless cutting, splicing, and *post-facto* manipulation of sound materials, Riley’s *M . . . Mix* (and Sender’s similarly echo-laden *Traversals*) plucked a classic technique from the electronic-music handbook and bent it towards devious or subversive ends. Pierre Schaeffer, originator of *musique concrète*, had notably used tape loops (and before them, “closed” or “locked” phonograph grooves in which a stylus could catch and stick), to isolate and better scrutinize his *objets sonores*, making of a given “sound fragment” a “clean-edged time crystal, made of time that now belongs to no time.”¹⁹² For Schaeffer, loops could be used as a means towards mutation and manipulation, particularly when cycled through his proprietary machines, but in their simplest form, they allowed one to clearly glimpse a sound as if it were being turned repeatedly over beneath a magnifying glass. Caring not for operations of sonic isolation and extraction rooted in high concepts, Riley and Sender were far more interested in the rendering of fugitive interior states, however warped or even disturbing. Riley has remarked that his echo effects sounded “just like an acid trip,” and *M . . . Mix*’s wraith-like swirls of piano keys and pitch-shifted, nearly demonic laughter lend substance to this characterization.¹⁹³

¹⁹⁰ Ciamaga, “Tape Studio,” 106–107.

¹⁹¹ Potter, *Four Musical Minimalists*, 98.

¹⁹² Kane, “Relays,” 67–68. Schaeffer, *In Search of a Concrete Music*, 131–135.

¹⁹³ Potter, *Four Musical Minimalists*, 99.

While such sounds wielded the potential to send audiences reeling or scrambling, they evidently struck a sympathetic chord, for reasonable critical and popular success held the Sonics series aloft for five more showings over the six months following the December 18, 1961 debut. Subsequent shows found Sender, Oliveros and their peers drawing on the sounds of practitioners all over the country, and indeed, the world: presenting tapes from such a European powerhouse as Milan's Studio di Fonologia Musicale RAI, and grassroots American operations, the Sonics concerts retained a distinct and distinctly local character while also helping to construct an enduring collaborative network.¹⁹⁴ A batch of tapes received from two Ann Arbor, Michigan musicians named Gordon Mumma and Robert Ashley (1930–2014), would, as we will see in Chapter 3, inaugurate a particularly long-lasting friendship.¹⁹⁵ The extramusical ambitions of Sonics developed rapidly as well: in an anticipation of the Tape Center soon to come, concerts came to involve film projections, the improvised choreography of Anna Halprin dancers Lynne Palmer, John Graham, and A.A. Leath, and the shuttling of audience members to different locales in stabs at participatory theater.¹⁹⁶ The taped creations of Sonics had derived from deeply personal interior states and plural perspectives, but they had resonated among a Bay Area populace increasingly eager to explore these fringes of consciousness. Where was tape, now a viable vehicle for this exploration, to take Oliveros and her peers next?

4. Lips, Tongue, and Glottis

Even the steadfast faith of Alfred Frankenstein, whose March 1962 Sonics review spoke of “Stimulating Sounds Too New to Be Named,” could not keep the concert program alive forever, for

¹⁹⁴ Sender, interview by Updike and Van Cleve, 55.

¹⁹⁵ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

¹⁹⁶ Sender, interview by Updike and Van Cleve, 55–56; Tony Martin, “Composing With Light,” in *Tape Music Center*, ed. Bernstein, 137.

Ramon Sender needed more than just a janitor's keys in order to remain camped out in the Conservatory.¹⁹⁷ After one successful season, Conservatory Director Robin Laufer informed Sender amicably that there could not be another, and that was that.¹⁹⁸ This could have easily presented a space problem for Sender, who all throughout Sonics, had been cobbling together a sizable store of equipment. Donation requests sent out to an array of electronics companies yielded, from local Hewlett-Packard, a sine-wave oscillator and a square-wave oscillator, and Sender had meanwhile signed the Conservatory up for a federal "Penny A Pound" program, which enabled the purchase of old and used electronics equipment for literal cents—this yielded a pair of patch-boards, and likely much more. There was, too, the non-electronic gear: the brake-drums, coiled-springs, and automobile bumper (suspended from the ceiling in the Conservatory attic).¹⁹⁹

Intent on continuing (and growing) his operation in the absence of Conservatory support, Sender suggested to Morton Subotnick, who had been lining a garage studio with his own equipment, that they pool materials and strike out on their own.²⁰⁰ While not involved in the Sonics debut, Subotnick had taken part in subsequent shows, and was keenly aware of the endeavor's potential for expansion. Fortune blessed Sender and Subotnick at the right moment: in Summer 1962, the pair were told of a Victorian house out in North Beach-adjacent Russian Hill that was slated to be torn down, and through a deal with the relevant construction company, secured permission to take up roost in the home until its demolition—they just had to pay the insurance. The two musicians thus began lugging their equipment to 1537 Jones Street, near the corner of Pacific Avenue, and set about incorporating as a non-profit (for the small fee of \$125).²⁰¹ Without much fanfare, the San Francisco Tape Music Center, in its first of two iterations, was born.

¹⁹⁷ Alfred Frankenstein, "Stimulating Sounds Too New to be Named," *San Francisco Chronicle*, March 26, 1962, 40.

¹⁹⁸ Sender and Maginnis, interview by Bernstein and Payne, 61.

¹⁹⁹ Sender, interview by Updike and Van Cleve, 57–58.

²⁰⁰ Subotnick, "Music as Studio Art," 113.

²⁰¹ Sender, interview by Updike and Van Cleve, 58–59.

Here, we should address an oft-repeated falsehood: namely, the suggestion that Oliveros was a “founding member” of this first Tape Center in the most literal sense.²⁰² While Oliveros has as much right to anyone, Sender and Subotnick included, to honorary founder’s status—she was, after, all, one of the key motors behind Sonics—she was likely in Europe at the time of the Jones Street move-in, on her way to a music festival to hear a prize-winning piece of hers performed. Once back in San Francisco in Winter 1963, she would not closely involve herself with Jones Street’s bustling “first-season” activity; only with the Tape Center’s move to 321 Divisadero Street in May 1963 would she take her place among the institution’s most active and vibrant composer-residents.

I do not raise this clarification to deal any sort of blow to Oliveros’s stature within this history, nor of course, to subordinate her to her male colleagues. This is an important distinction to draw because Oliveros’s remove from the Jones Street Tape Center was voluntary—largely motivated, she has suggested, by her discomfort with a technology-centric culture of “male bonding” present there. Further, as I will argue below, the composition that brought her to Europe—the major career milestone *Sound Patterns* (1961–62)—is entangled with that same technological discomfort. It should surprise anyone tracking Oliveros’s early-Sixties development chronologically that *Sound Patterns*, arriving so soon after *Time Perspectives* (1961), involves no tape—only the sounds of a four-voice choir. An unusual pivot in Oliveros’s work, but one legible in the narrative we are constructing here, it adds another relay to our circuit, resulting in the following configuration: tape → Oliveros → tape → Oliveros. *Sound Patterns* finds Oliveros internalizing her work on *Time Perspectives* and stepping back from the medium she sculpted with her fingers. A

²⁰² Oliveros is credited as having “founded” the Tape Center along with Sender and Subotnick in Katherine Marie Setar, “An Evolution in Listening: An Analytical and Critical Study of Structural, Acoustic, and Phenomenal Aspects of Selected Works by Pauline Oliveros” (PhD diss., University of Southern California, 1997), 19–20. Note that Oliveros deems herself a “founding member” of the Tape Center in Mary Simoni, “Profiles of Determination,” *Computer Music Journal* 22, no. 4 (Winter 1998): 23, <https://doi.org/10.2307/3680891>.

composition that trains its human chorus to emulate electronic sounds, it is a shrewd and subversive technological critique veiled as yet another “tape lesson.”

Even given Oliveros’s non-involvement in the Jones Street Tape Center, it is necessary, here, to offer a brief précis of the 1962 season, which helped build the artistic, social, and political cosmos that she would enter just a year later. Regarding general philosophy: Sender has written that the first Tape Center was born primarily of “the immediate need for a studio for the production of sounds by electronic means,” flatly painting Jones Street as a personal recording space and front-facing concert venue, and casting doubt on the existence of any clear founding ethics or program.²⁰³ However, it is probable that he and Subotnick had carried away *some* aesthetic and operational principles from their time in Sonics. In a 1964 report on Tape Center activities textured by considerable hindsight, Sender looks back upon three years of success with an exquisite clarity as to philosophy, suggesting some of what might have been embryonically present at Jones Street:

We have felt that somewhere there should be a place where the composer can find brought together all the necessities of his art in an atmosphere conducive to his developing his own personal utterance free from the pull and the tug of stylistic schools. . . . Somewhere there should be a place where the fragmented elements of our musical life could be melted together and recast through the reestablishment of the artist's dialogue with his community in a new and vital way.²⁰⁴

That Sender and Subotnick were already seeking insulation from the “pull and the tug of stylistic schools” when they hauled their gear to the old Victorian is evident in the name they chose for themselves: “Tape Music Center.” Almost certainly an appreciative nod to Ussachevsky and Luening’s polemically bland coinage, the name had the effect of both foregrounding the technology at the heart of the institution—tape—and distancing the operation from tedious power-struggles between then-reigning production hubs and their associated styles. Echoing Ussachevsky’s language quite closely, Subotnick has reflected that he and Sender

²⁰³ Ramon Sender, “The San Francisco Tape Music Center—A Report, 1964,” in *Tape Music Center*, ed. Bernstein, 42.

²⁰⁴ “Sender, ‘A Report, 1964,’ 42–43.

decided to call it the Tape Music Center because Cologne and the Paris Studio and Columbia-Princeton were involved in this big argument about *musique concrète* and pure electronics and everyone hated everyone else. . . . It seemed to us that we were really not interested in the academic dispute, and since everything ended up on tape, we called it the Tape Music Center, so that it could include everything.²⁰⁵

Subotnick's invocation of the New York studio Columbia-Princeton Electronic Music Center (CPEMC) is in this context distinctly ironic. A latecomer to the circle of institutional heavy-hitters, having been founded only in 1959, the CPEMC coalesced with the help of a lavish five-year grant (\$175,000) from the Rockefeller Foundation, and claimed, as a point of pride, the stewardship of a sophisticated new RCA synthesizer known as the Mark II, whose 750 vacuum tubes occupied an entire room; the operation was directed by composers Milton Babbitt (1916–2011) and Roger Sessions (1896–1985) of Princeton University, and none other than Columbia's Ussachevsky and Luening, who had drifted far indeed from their “primitive laboratory” in upstate New York.²⁰⁶

[Figure 15]

A place where “highly qualified composers” assuring “standards of accomplishment” could experiment with new technology with the “assistance of technicians,” the CPEMC was everything the Tape Center was *not* to be.²⁰⁷ Sheltered by the turreted walls of the academy, it promised a place where the contemporary composer could strike the self-isolating pose recommended in Babbitt’s widely criticized 1958 article “The Composer as Specialist,” which inveighed against the crude, confused taste of the public and the tyranny of the “concertgoer’s critical authority”—barriers to the honest pursuit of serious and “specialized” music.²⁰⁸ “I dare suggest,” Babbitt infamously wrote,

²⁰⁵ Morton Subotnick, interview by David W. Bernstein and Maggi Payne, in *Tape Music Center*, ed. Bernstein, 125–126.

²⁰⁶ Gann, *American Music*, 258–260; Luening, “Origins,” 19–21.

²⁰⁷ Luening, “Origins,” 19–20; Vladimir Ussachevsky, “Columbia-Princeton Electronic Music Center,” *Rivue Belge de Musicologie/Belgisch Tijdschrift voor Muziekwetenschap* 13, no. 1/4 (1959): 130, <https://www.jstor.org/stable/3685960>.

²⁰⁸ Milton Babbitt, “The Composer as Specialist” (1958), in *The Collected Essays of Milton Babbitt*, ed. Stephen Peles (Princeton, NJ: Princeton University Press, 2003), 52. Babbitt’s essay was originally published in *High-Fidelity* (February 1958), where it appeared under a far more inflammatory title chosen by the magazine’s editors: “Who Cares if You Listen?” For a fine analysis that draws compelling parallels between the artistic withdrawal recommended by Babbitt and the avant-gardism described in art critic Clement Greenberg’s “Avant-Garde and Kitsch” (1939), see Martin Brody, “‘Music for the Masses’: Milton Babbitt’s Cold War Music Theory,” *The Musical Quarterly* 77, no. 2 (Summer 1993): 161–192, <https://doi.org/10.1093/mq/77.2.161>.

“that the composer would do himself and his music an immediate and eventual service by total, resolute, and voluntary withdrawal from this public world to one of private performance and electronic media, with its very real possibility of complete elimination of the public and social aspects of musical composition.”²⁰⁹ The Tape Center countered Babbitt’s call for “withdrawal,” underwritten by ivy-league patronage, with an insistence upon “[independence] of any university or college connection,” and an open door to the public.²¹⁰ At once a studio space, “salon,” and shelter for “associated and needy artists,” it was, Oliveros would later reflect, “the prototype Alternative Space.”²¹¹

Meanwhile, if Babbitt so anxiously emphasized “specialization,” Subotnick and Sender enthusiastically encouraged diversity and mixing: of the “avant-garde” with the grit of the popular counterculture, and of different artistic disciplines. To be sure, the Tape Center’s 1962 season made good on the institution’s name, providing a forum for the presentation of Sender and Subotnick’s evolving musical experiments, and electronic fare from composers both well-known (Stockhausen, Henri Pousseur, 1929–2009, and Luigi Nono, 1924–1990) and rising (James Tenney, 1934–2006, Robert Ashley). Notably, in an effort to expand the technical infrastructure supporting their experiments, Sender and Subotnick made several profitable connections with representatives from Ampex, who both gifted and lent them several pieces of recording equipment.²¹² However, at the new Tape Center, as in Sonics, music was but one facet of an increasingly polyglot and interdisciplinary artistic vernacular.

Building on the integration of improvised dance, projection, and audience participation begun with Sonics, Sender and Subotnick made space for increasingly elaborate performances that

²⁰⁹ Babbitt, “Composer as Specialist,” 53.

²¹⁰ Sender, “A Report,” in *Tape Music Center*, ed. Bernstein, 42.

²¹¹ Oliveros, “On the Need for Research Facilities for New Music and the Related Arts” (1979), in *Software for People*, 196.

²¹² Subotnick, interview by Bernstein and Payne, 127; Sender and Maginnis, interview by Bernstein and Payne, 63.

they termed “theater composition[s],” and that some, to the evident distaste of certain Tape Center associates, have called “happenings.”²¹³ A novel art form then experiencing its heyday on the East Coast, the capital-H “Happening” had been codified by Artist Allan Kaprow (1927–2006) in the late Fifties. Happenings, which Kaprow defined as “events which, put simply, happen” at a “specific time and a specific location,” superficially resembled theater, but jettisoned dialogue, exposition, and even the creation of the diegetic “scene” (what performance theorist Michael Kirby has termed a performance “matrix”) in favor of rote, absurdist, or poetic activities, carried out by people, not “characters.”²¹⁴ Kaprow came to the Happening from the visual arts, having seen in the embodied “action painting” of Jackson Pollock, who danced about his canvases flicking drips, the possibility of a painting extending *beyond* the borders of the frame into its enclosing room and the world beyond.²¹⁵ Thus Happenings were often richly imagistic and collage-like—defined by evocative conglomerations of props, visual flourishes, and, often, sounds, either live or tape-recorded.

What crucially distinguished the kitchen-sink performance activities of the early Tape Center was that they were driven by individuals coming out of dance, theater, and mime—not the visual arts. The Jones Street location enjoyed a close link to all those involved in the American Cooperative Theatre (ACT), a short-lived collaborative association comprising Anna Halprin, Ken Dewey (1934–

²¹³ The term “theater compositions” is Sender’s. See Sender, “A Report,” in *Tape Music Center*, ed. Bernstein, 49. Sender has frequently used the term “happening” with reference to the Tape Center’s theatrical activities—see, for just one example, Sender and Maginnis, interview by Bernstein and Payne, 62. Sender, however, would seem unique in his approval of the term; Tape Center projection artist Anthony (Tony) Martin and Anna Halprin take issue with the classification on different grounds. Regarding her practice more broadly, Halprin has remarked, “I never wanted to call events Happenings like Kaprow. I wanted whatever I did to be organic, not clever. I really like Allan Kaprow as a person, but his Happenings were nonsensical to me. I thought, why are we doing this?” Ross, *Experience as Dance*, 237–238. Martin questioned the application of the term “Happening” to a Tape Center event in a brief exchange with the author at a public event on November 9, 2019.

²¹⁴ Dick Higgins, “The Origin of Happening,” *American Speech* 51, no. 3/4 (Autumn–Winter 1976): 268–270, <https://doi.org/10.2307/454975>; Michael Kirby, *Happenings: An Illustrated Anthology* (New York: E.P. Dutton & Co., Inc., 1965), 14–15.

²¹⁵ Allan Kaprow, “The Legacy of Jackson Pollock” (1958), in *Essays on the Blurring of Art and Life*, ed. Jeff Kelley (Berkeley, CA: University of California Press, 2003), 5–8

1972), Lee Breuer (1937–2021), and Ronald Guy (R.G.) Davis (1933–).²¹⁶ Of the ACT cohort, Dewey skews closest to the world of Kaprow and the “happeners” (Red Grooms, 1937–, Robert Whitman, 1935–, Jim Dine, 1935–, and Claes Oldenburg, 1929–), whom he would sometimes intersect with in his relatively short lifetime.²¹⁷ However, having studied playwrighting at Columbia University (graduating in 1959), and having entered the fold of the San Francisco Actor’s Workshop after arriving in the Bay Area, he was unambiguously a product of theater, even if he was to shortly “cross over” (his phrase) into the expanded arts.²¹⁸ Dewey’s breakthrough as a creator-director came with his 1962 “dance-drama” *The Gift*, a one-act production starring Halprin dancers Lynne Palmer and John Graham and staged in the streets of San Francisco. With minimal dialogue, which Dewey instructed Palmer and Graham to interpret as “music,” he traced out a perverse retelling of the Prometheus myth, and managed to elicit “bewilderment, fascination, and revulsion” among the general public.²¹⁹

Meanwhile, ACT’s R.G. Davis, who will resurface in the following chapter as an Oliveros collaborator, brought to the Tape Center the exaggerated physical theatrics of his very own R.G. Davis Mime Troupe, which drew on the technique of French mime Étienne Decroux (1898–1991), the “poor theater” of Jerzy Grotowski (1933–1999), and a well of radical political sympathies that would lead to Davis’s arrest later in the Sixties.²²⁰ Sender recalls one 1962 Davis performance involving two actors seated on toilets, a “soliloquy about taking a crap,” and waist-down nudity.

²¹⁶ David W. Bernstein, “The San Francisco Tape Music Center: Emerging Art Forms and the American Counterculture, 1961–66,” in *Tape Music Center*, ed. Bernstein, 15.

²¹⁷ Ken Dewey died at age 38 in a private-plane crash. For an overview of his career, see Barbara Moore, “Dismembered Media and the Lost Art of Happenings,” in *Action Theatre: The Happenings of Ken Dewey* (New York: Franklin Furnace Archive, Inc., 1987), Box 53, F6, Ken Dewey Collection (hereafter Dewey Collection), T-Mss 1991–010, Billy Rose Theatre Division, The New York Public Library, New York, NY.

²¹⁸ Dewey recalls, “In 1961, when the prevailing cross-over was into theatre (having been there myself, for seven years, as student, technician, and playwright), I was trying to get out. I mean that literally: out of the text, out of the building, and, most earnestly, out of theatre’s way of doing things.” Ken Dewey, “X-Ing,” *The Tulane Drama Review* 10, no. 2 (Winter 1965): 220, <https://doi.org/10.2307/1125250>.

²¹⁹ Program note for *The Gift*, 1961, Box 9, Folder 10, Dewey Collection; Dean Wallace, “‘The Gift’—Nightmarish Material in Bizarre Play,” *San Francisco Chronicle*, March 12, 1962, 42.

²²⁰ Susan Vaneta Mason, ed., *The San Francisco Mime Troupe Reader* (Ann Arbor: University of Michigan Press, 2005), 9–12.

Present at this performance was, unfortunately, a representative from Ampex, whom Subotnick had approached for a potential grant; Bing Crosby this was not, and the scandalized representative walked out of the show—taking with him any prospect of an Ampex grant.²²¹

Where was Oliveros during all of this? In truth, the chronology is fuzzy, for we do not know exactly when, during the summer of 1962, the Tape Center was founded; we know only that the last Sonics performance was held on June 11 of that year, and the Tape Center's first season commenced on October 1.²²² It seems probable, from Oliveros and Subotnick's respective accounts, that the Jones Street move-in took place around late August or early September 1962, around which time Oliveros departed for Holland to hear her prize-winning *Sound Patterns* performed at Gaudeamus Muziekweek in Bilthoven, Netherlands.²²³ Oliveros's departure was neither sudden nor unexpected. Available accounts and chronologies suggest that she had been at work on *Sound Patterns* since the beginning of the Sonics run (Winter 1961) and had finished it by the Spring of 1962.²²⁴ And while

²²¹ Sender, interview by Updike and Van Cleve, 59.

²²² The dates of all Sonics and Tape Center performances are recorded in Thomas M. Welsh, "Chronology," in *Tape Music Center*, ed. Bernstein, 265–282.

²²³ Oliveros recalls that "After that first year [of Sonics], [she] went away for a while, because [she] had won a prize for a piece from the Gaudeamus Festival," and that by the time she returned, "Ramon and Mort had cofounded the San Francisco Tape Music Center." Oliveros states that she was gone for roughly six months. Oliveros, interview by Bernstein and Payne, 103. Subotnick, meanwhile, has stated that by the time he and Sender "left the conservatory. . .to find a new place," "Pauline had gone [to Holland]." Subotnick, interview by Bernstein and Payne, 125.

²²⁴ In claiming that Oliveros composed *Sound Patterns* in 1961–62, I deviate from the chronology settled upon in existing histories, which place the work squarely in 1961. This re-dating—slight as it is—may seem a relatively insignificant gesture, but in the present narrative, it carries a certain weight. In her own writing, and on curriculum vitae filed in her papers, Oliveros has consistently dated *Sound Patterns* to 1961: see, variously, Oliveros, "Memoir of a Community Enterprise," 83; Oliveros, "Reverberations," 42; and, for example, "Biographical Information," 1967, filed with Oliveros's "academic biographies," Box 29, Folder 6, Oliveros Papers. Oliveros's commentators have generally observed her dating of the work: see Oliveros, interview by Bernstein and Payne, 100; and Von Gunden, *Music of Pauline Oliveros*, 26. Only William Duckworth has placed the work in 1962: see Duckworth, "Pauline Oliveros," 160. As we will see in subsequent chapters, Oliveros is not always a reliable narrator as regards the dating of her own compositions, and in this case, I suspect that she is incorrect in placing *Sound Patterns* in 1961 full stop. While Oliveros has been consistent in her dating of the work, she has also stated that her experience crafting *Time Perspectives* (1961)—her earliest electronic composition—inspired the choral composition in the first instance. "After *Time Perspectives* (1960) I wrote *Sound Patterns for Mixd [sic] Chorus* (1961)," she recalled in 2012, curiously providing an incorrect date for the former work. "My intention," she noted, "was to have the chorus sound electronic." Oliveros, "Reverberations," 43–44. While dates can grow confused as they recede into memory, I think it unlikely that Oliveros misremembered the causal relationship between these works, and indeed, the impress of *Time Perspectives* can be clearly heard in Oliveros's chorus. The electronic influence dwelling within *Sound Patterns*—discussed by both Heidi Von Gunden and Katherine Setar—is key in this account, and thus this causal chain must be clearly represented. *Time Perspectives* was premiered at the inaugural Sonics concert on December 18, 1961 and finalized in Ramon Sender's conservatory studio in the weeks leading up to the

she was informed of her piece's top honors only on August 29, she seems to have resolved to attend Gaudeamus as early as May-June, regardless of the jury's decision.²²⁵

What motivated the writing of *Sound Patterns* is similarly open to speculation. In an early Eighties interview, Oliveros cites an eminently practical reason for the work's creation, stating that she was wanting for money at the time, and sought out contests with cash prizes: "I looked around at the contests," she recalls, "and a lot of them were for vocal music. So I thought, 'Well, I'll write a chorus.'"²²⁶ However, in that same interview, Oliveros indicates that *Sound Patterns* also grew out of a desire to write a chorus *without a text*. "I liked the sounds that choruses made in between their articulations of words," she remarks.²²⁷ It is clear that this particular creative choice—a bold one, no doubt—was closely bound up with Oliveros's changing relationship to notation circa 1961–62: the musician's experiments with group improvisation, on the one hand, and real-time composition with tape, had convinced her of the inessentiality of the staff to the music she wanted to write, and the 1961 work *Trio for Flute, Piano and Page Turner* proved to be her last "conventionally notated work."²²⁸ Even *Trio*, which required two performers at the piano—one to play as per normal, and one to turn the sheet-music, and silently depress certain keys, activating harmonics—found her smuggling a bit of extra-musical theater into the limits of "conventional" composition.²²⁹

performance; thus if *Sound Patterns*, a work of considerable complexity, came "after" *Time Perspectives*, Oliveros was almost certainly working on it into 1962. While Oliveros may well have begun composing *Sound Patterns* after she made her initial home recordings for *Time Perspectives* at some point in 1961, but before the Sonics debut, it seems far more likely that she commenced work on her chorus after synchronizing those recordings in Sender's studio, experiencing *Time Perspectives* in its final, four-channel state, and premiering that work in concert on December 18. Her cited date notwithstanding, Oliveros has corroborated my chronology by recalling that "as Sonics continued, [she] was busy composing . . . *Sound Patterns for Mixed Chorus* (1961)." Oliveros, Memoir of a Community Enterprise," 83 (my emphasis). After its December 1961 debut, "Sonics" did not "continue" until late March of 1962, when the second concert of the series was staged.

²²⁵ The timeline of Oliveros's travel plans can be reconstructed from correspondence with the Gaudeamus Foundation contained in Box 31, Folder 7, Oliveros Papers.

²²⁶ Duckworth, "Pauline Oliveros," 168.

²²⁷ Duckworth, "Pauline Oliveros," 168.

²²⁸ Oliveros, "MMM: Meditation/Mandala/Music" (1980), in *Software for People*, 230.

²²⁹ Von Gundten, *Music of Oliveros*, 22–23.

With its pitch-less “mouth noises” and “vocables” (phonemes), which demanded creative graphical workarounds, *Sound Patterns* commenced, but did not consummate, the “dissolution of notation” Oliveros so desired.²³⁰ In its published form, the work reveals a skeletal reduction of traditional SATB (Soprano-Alto-Tenor-Baritone) notation. Lined staves have been replaced with barred rectangular bands in which noteheads are floated along three different registers (low, medium, high); “normal notes,” writes Oliveros in the performance directions, “are for definite pitches to be improvised by singers within the range indicated by the staff.”²³¹ This registral treatment of pitch, which dimly recalls the mechanics of Morton Feldman’s graph notation, is the most tame of Oliveros’s notational idiosyncrasies: we learn from the performance directions, for example, that notes with x’s for heads require singers to “pop lips” (“sounds like a cork popping out of a bottle”) or “cluck” tongues, flagged s-curves and circled crosses (floated *above* the staff) mean, respectively, to “snap fingers in front of mouth” and “mute sound by placing palm of hand over the lips,” and a bracketed apostrophe denotes a “glottal stop.”²³² **[Figure 16]**

The varied phonemes (“vocables”) that comprise the work’s “textual” material and are interspersed with the more exotic “mouth noises” enumerated above, are written out in accordance with the Webster’s Collegiate Dictionary pronunciation guide (not the more arcane morphology of the International Phonic Association). Thus, anyone familiar with the relevant diacritics could maneuver their way around the work’s component phonemes: “pow,” “wä,” “päh,” “hä,” “d-dup,” “shēōō,” “zzzt,” and so on. A highly unusual sound palette *drawn from* language, but stripped of meaning, distinguished *Sound Patterns* as a daring formal intervention; but its raw material alone did not ensure its dynamic effect. What elevates the four-minute composition is Oliveros’s integration of delicate variation via structured improvisation, and her ability to construct macro-level clouds of

²³⁰ Oliveros, “Reverberations,” 43–44; Oliveros, “MMM,” 230.

²³¹ Pauline Oliveros, *Sound Patterns for Mixed Chorus* (Darmstadt: Edition Tonos, 1964), Box 6, Folder 19, Oliveros Papers.

²³² *Sound Patterns for Mixed Chorus*, Oliveros Papers.

textural, or timbral, transformation (what Oliveros scholar Katherine Setar has termed “timbral gestures” and “gestural gestalts”) from small-scale collisions among sounds.²³³

While the proliferation of unpitched speech sounds and noises present in *Sound Patterns* frustrates efforts towards standard compositional analysis, that same reliance on raw phonic matter makes it an unusually apt candidate for spectrographic analysis (or, a visual graphing of frequency against the time-domain, with amplitude denoted by visual contrast). Developed at Bell Laboratories prior to and during World War II, when it presented as a viable means of message decoding, the spectrogram (still widely used in speech science) affords a better glimpse at Oliveros’s highly structured and considered treatment of noise and texture.²³⁴ Measures 29–32 feature the interaction of sustained nasals and vowels, modulated by the clenching of teeth, and ornamented with lip-flutters (“bbbb”). This interaction is especially legible in a spectrogram because vowels and nasals, produced via the forcing of air through the glottis, and the vibration of the vocal chords, are straightforwardly harmonic, and can be observed as sustained activity in the frequency domain; in measures 29–30, “āh” sounds in the alto and tenor registers held from measure 28 (the alto held to measure 30, and the tenor broken off before a “bbbb”) interact with a baritone nasal (“ān”) in a layering of resonances visible as wavering parallel lines. **[Figure 17]**

This passage is somewhat exemplary; because of the liberal use of fricative and plosive consonants in *Sound Patterns*, one more often encounters very subtle spectral activity. Fricative consonants are formed when air is forced through a narrow passage between two articulators (as between the top teeth and the lower lip, for the “f” of “firm,” or between the tongue and alveolar

²³³ Setar, “Evolution in Listening,” 42–43.

²³⁴ See, for a compact introduction to spectrographic analysis, Stephen McAdams, Philippe Depalle, and Eric Clarke, “Analyzing Musical Sound,” in *Musicology: Aims, Methods, Prospects*, ed. Eric F. Clarke and Nicholas Cook (Oxford: Oxford University Press, 2004), 157–196. Regarding the spectrogram’s historical origins, see Brad H. Story, “History of Speech Synthesis,” in *The Routledge Handbook of Phonetics*, ed. William F. Katz and Peter F. Assmann, Routledge Handbooks in Linguistics (New York: Routledge, Taylor & Francis Group, 2019), 17–18.

ridge, for the “sh” of “shoo”). Plosive consonants, meanwhile, are formed when the passage of air from the oral cavity is blocked (using, for example, the lips, as in the “p” of “pit”), and then released. The “glottal stop” (also known as the “glottal plosive”), used by Oliveros throughout *Sound Patterns*, is created when air is obstructed in the glottis, or the folds of the vocal-cords, and released. The work’s delicate play with fricatives is illustrated in measures 50–54, where staggered attacks of “sh” sounds (“shi,” “shōō”), beginning in the baritone register and ending in the soprano register, form an ascending flurry of susurration in which distinction between voices is all but obscured. In the spectrogram, this activity is represented by an arcing cloud which steeply drops off in response to a second baritone “shōō” (end of measure 52). [Figure 18]

We have seen this same attack staggering in *Time Perspectives* (1961), where pitch-distorted clangs formed dense clusters of “pops” or “droplets.” Similarly, the strong sense of coalescing and dispersing flurries in *Sound Patterns*—what Oliveros has referred to as “a fluid, expanding and contracting kind of meter”—was anticipated by the “manual” speed-shifts in *Time Perspectives*, which seemed to pull sound events together and then pry them apart.²³⁵ This exchange of technique between a tape work and a voice work, striking in its effect, was entirely conscious on the part of Oliveros, whose last stated reason for writing *Sound Patterns* clarifies its place in her development, and our media-focused account: “My intention,” she reflected in 2012, “was to have the chorus sound electronic.”²³⁶ As Katherine Setar has pointed out, this key component of *Sound Patterns* was first remarked on by musician Alvin Lucier as late as 1967, when Lucier, director of the choral union at Brandeis University, had his chorus record a rendition of *Sound Patterns* for a Columbia “Music of Our Time” record called *Extended Voices*.²³⁷ On *Extended Voices*, *Sound Patterns* sat side-by-side with

²³⁵ The quoted description of *Sound Patterns* appears in a Gaudeamus document in Box 31, Folder 7, Oliveros Papers.

²³⁶ Oliveros, “Reverberations,” 44.

²³⁷ Setar, “Evolution in Listening,” 44. The full details of the *Extended Voices* record are as follows: Various artists, *Extended Voices*, Odyssey 32 16 0155, Music of Our Time Series, 1967, vinyl LP. Note that Columbia Records is the parent label of Odyssey.

Lucier's *North American Time Capsule 1967* (1967), which featured the real-time manipulation of speech by a Vocoder, and *Solo for Voice 2* (1960), a work by John Cage in which the composer's voice was processed live by David Tudor and Gordon Mumma's engineered circuitry. Featuring no real-time "processing" other than that accomplished by the lips, tongue, and glottis, *Sound Patterns* forgoes prosthetic "extension" of the voice, and instead nominates the human body as a prosthesis. "This piece," Oliveros has stated, "was a turning point in *absorbing the sounds of tape and electronic music that I had heard and was my way of expressing my relationship with these new sounds.*"²³⁸

The techno-logic layer of *Sound Patterns* is not readily legible from the work's score alone (the performance instructions make no mention of electronics), and if Setar is correct, Oliveros called attention to it only in retrospect. However, this aspect of the work, which, as Oliveros points out, is clearly audible in recorded renditions, is decisive for our account, for it extends our circuit of medial relays still further and brings us to another culminating moment. Oliveros's remark that *Sound Patterns* saw her "absorbing the sounds of tape and electronic music" strongly calls to mind her recollections of the "feedback" that she experienced throughout the KPFA improvisations, during which the objective testimony of tape recalibrated her performing mind and body. What distinguishes this particular "turning point," or relay, however, is the leveraging of the mediated (and mediating) body towards more critical ends. Setar and Oliveros biographer Heidi von Gunden have both exhaustively catalogued the gestures of electronic emulation they hear operating in *Sound Patterns*, observing, for example, that the work's nasal phonemes evoke sawtooth and square-wave oscillators, that the varied "sh" sounds resemble the filtering of electronically generated "white noise," and that the electronic effect of "ring modulation," whereby two input signals are "multiplied" together, is audible in the rapid modulation of vowel sounds ("ōō_ē_ōō_ē_ōō").²³⁹

²³⁸ Oliveros, "Reverberations," 44 (my emphasis).

²³⁹ Setar, "Evolution in Listening," 44–53; Von Gunden, *Music of Oliveros*, 26–29.

Even though we have no evidence of Oliveros employing these techniques in her own work (the limited equipment of the Conservatory studio—recorders and oscillators—precluded many of them, at any rate), she likely heard them used on tapes provided for Sonics.

I could not hope to add much to these analyses, and I will not try to extend them, for Setar and von Gunden focus entirely on the success, or verisimilitude, of the electronic emulation in *Sound Patterns*; I am more interested in moments of breakdown, friction, or tension—between the seamy flesh of the body, and the seamless textures of electronic synthesis. Indeed, if Oliveros had wanted to sustain a wholly unbroken sense of the electronic in *Sound Patterns*, she likely would have restricted herself to nasals and vowels, which most convincingly evoke the steady-state tones of oscillators, and, when precisely modulated through lip movement or vibrato, can sound a great deal like electronic frequency modulation (FM). Interestingly, vowels and semi-vowels are precisely the sounds that early speech synthesizers, like John Q. Stewart's electrical “vocal organ” of 1922, and Homer Dudley's later, more sophisticated “Vocoder” (later “Voder”) of 1936–39, imitated with the most ease.²⁴⁰ However, in *Sound Patterns*, which represents a comical inversion of “speech synthesis” or “artificial speech,” more convincing efforts towards emulation are, I would argue, continually undercut by the emphatic plosives (for example, the recurring “pow”), lip “pops” and “flutters” (“bbbb”), and tongue “clucks.” These plosives are deployed both frequently (in select cases, in unison), and at punctuating hinges in the work, including at its very end. **[Figure 19]**

Along with the more obviously extra-vocal noises in the work (notably, the snapped fingers called for in measure 15), these unpitched sounds resist assimilation into the classic (and fundamentally techno-logical) “source-filter” model of speech production, in which airflow from the larynx (the “source”) is shaped and filtered by vocal-tract resonances and articulators (lips, tongue,

²⁴⁰ Story, “History of Speech Synthesis,” 13–18; John Q. Stewart, “An Electrical Analogue of the Vocal Organs,” *Nature* 110, no. 2757 (September 2, 1922): 311, <https://doi.org/10.1038/110311a0>.

teeth, glottis, palate, and so on).²⁴¹ Gestures throughout *Sound Patterns* call attention to articulators *themselves*, bidding the tongue and the lips to announce their physicality and fleshy excess independent of “source” vibrations. As important as the noises of these gestures is their repeated assertion that a human body is making them. While these moments in the work emphasize a playful quality in *Sound Patterns* that is nowhere more present than in measure 46 (“pop lips or cluck tongue 5 times anywhere within this measure”), they also have a self-critical grounding effect that disrupts attempts to experience the work *as* “electronic.”

In a letter to an unidentified “L.” dated March 1974 and published in *Software for People* (1984), Oliveros’s first collection of writings, the musician points, for the first time, to a feminist dimension of the work, stating that “At the time [I wrote *Sound Patterns*], I could find no words with which to identify! . . . I was rejecting all of those messages which spoke *not* to me. The idea that MAN, the term, refers to all human beings, was too abstract for me.”²⁴² While Katherine Setar has argued against interpreting this comment as a “literal, historical accounting” for the thinking behind *Sound Patterns*, deeming it an artifact of Oliveros’s Seventies involvement in feminist activism, there is sufficient reason to place a feminist body politics at the root of the work.²⁴³ What would seem a coded message in the pronunciation key included in *Sound Patterns* (in the first column, the example words, read in descending order, spell out “father/at/she/bite/bit”) strongly begs a reading of the work as a valorization of what Julia Kristeva terms the “semiotic.” This is the space of the preverbal and the pre-symbolic, of infant “echolalia” and “gestural and vocal play,” that precedes the paternal law structuring linguistic signification (Jacques Lacan’s “name of the father”).²⁴⁴ But there is, I think,

²⁴¹ Regarding the “source-filter” model, see Chiara Meluzzi, “Sound Spectrography,” in *Manual of Clinical Phonetics*, ed. Martin John Ball (London: Routledge Taylor & Francis Group, 2021), 419–420.

²⁴² Oliveros, “Rags and Patches,” in *Software for People*, 63.

²⁴³ Setar, “Evolution in Listening,” 37.

²⁴⁴ Julia Kristeva, “The Semiotic and the Symbolic,” in *The Portable Kristeva*, ed. Kelly Oliver, European Perspectives (New York: Columbia University Press, 1997), 32–69.

another vein of embodied feminism that threads throughout *Sound Patterns*—one interwoven with the subtle technological critique discussed above.

Oliveros, it was mentioned, returned to San Francisco from Europe months after Gaudeamus, having used her prize money to rent a Volkswagen bug and travel through Germany, Scandinavia, Switzerland, and France.²⁴⁵ Upon her return, the Jones Street Tape Center was in full-swing—but Oliveros did not work there or, it seems, go there with great regularity. “Jones Street was not for me,” she has said, acknowledging Sender’s efforts to help her feel at home, but remarking that the location “felt like a messy ‘boy’s club’ with a lot of transients sleeping over and working in the studio.”²⁴⁶ Speaking to subsequent years at the Tape Center, Oliveros has expressed her discomfort with the exclusionary male “way” of “bonding around technology” that erects an “invisible barrier” between women, cast as “helpless or hapless,” and the “latest gadgets.”²⁴⁷ I would argue that *Sound Patterns*, while written before this string of difficult experiences, represents the first expressions of the discomfort described here. Wrestling with the “abstract” nature of male-coded language, the work would just as clearly seem to press against the abstraction of *technology*, held back behind a force-field of chauvinism. “I existed but had no role,” Oliveros told the mysterious “L,” speaking of her time writing *Sound Patterns*, and these words suitably capture the musician’s most trying moments at the Tape Center.²⁴⁸

In its insistence on *embodied* articulation, and on a corollary subversion of a techno-logical program, *Sound Patterns* also seems to anticipate Oliveros’s rejection, in the later Sixties of a “complex and intellectual” and “disembodied” music written by (presumably male) colleagues under the influence of the “scientific method.”²⁴⁹ The product of taped and electronic sounds “absorbed”

²⁴⁵ Oliveros, “Memoir of a Community Enterprise,” 83–84.

²⁴⁶ Oliveros, 83–84.

²⁴⁷ Oliveros, 88.

²⁴⁸ Oliveros, “Rags and Patches,” 63.

²⁴⁹ Oliveros, “My ‘American Music,’” 392.

and internalized, but far from a rote response to such absorption (the studious and subdued observance of a “lesson”) the work is another inspired assertion of embodied perspective that works with and against the affordances of media. *Time Perspectives* proved to Oliveros that she could impress her own queer experience, temporal idiosyncrasies and all, onto the medium of tape; with *Sound Patterns*, Oliveros brings technics to bear upon the body, but asks the body to stand its ground, delighting in the frictional collisions between the pitch-perfect language of the oscillator and the unpitched sounds of “popped” lips.

Conclusion: Endless Loops

Above, two stories have been told: the first, primary tale has concerned Oliveros’s early artistic development, and the circuit of relays between tape (media) and the body that drove a significant part of this development. For those keeping track of these back-and-forth relays, *Sound Patterns* brings us to: tape → Oliveros → tape → Oliveros. The second story has concerned the techno-cultural context of these relays—San Francisco in the age of tape (and on the eve of the properly psychedelic Sixties)—and the relationships of personal and professional significance that helped Oliveros to navigate this context, not without the occasional moments of friction. Let us loop back to the first tale: our disambiguation of Oliveros’s continued interaction with media into discrete moments of exchange, or one-way assertions of agency, has helped us to make sense of a densely patterned and fast-oscillating phrase of the musician’s early development; however, having now navigated this labyrinth and come out the other end, we should kick some dirt on the cleanliness of this analysis and point out its obvious deficiencies. We can begin with the graphical arrows used to denote our moments of relay (“→”), which suggest a linearity of relation that is misleading in two respects.

In their crudest sense, these arrows posit a straightforwardness of exchange or effect that is not obviously present in any of the moments of relay assessed above. It is true that in the course of the KPFA improvisations (1958), and the windowsill epiphany that preceded them, the objective or indexical witnessing of tape forced Oliveros to literally *open up* her ears and “hear differently” (her words). During the improvisations, continued recourse to the session tapes encouraged a cutting-loose of subjective whim, and evolution through unblinking self-criticism: Oliveros, Riley, and Rush learned to listen magnetically. But recall Oliveros’s invocation of the “feedback” dynamic that came to structure these sessions: while the improvisations may have first used tape for objective assessment, repeat recordings served a different purpose for the trio, allowing their own idiosyncratic performance directives to take shape before their ears, and affirming their movements towards a particular sonic vernacular that was not tangible, or self-evident to them previously. An “absorption” of these changes (Oliveros), and a thorough clarification of direction, ultimately annulled the need for tape.

It is perhaps the unexpected nature of these tape-assisted changes, which Oliveros could not have foreseen when recording at her window, that made so queer a work as *Time Perspectives* (1961) seem possible. Entailing the inspired abuse of recording equipment (not its straightforward use), this work found Oliveros circumventing tape’s precision rendering of time in her pursuit of intimate internal rhythms. Oliveros’s impression of agency upon the tape medium resounds throughout *Time Perspectives*; and yet the work is not without its tension. Foregoing those splice-driven methodologies of recording (for example, the practices of *musique concrète*) wherein the medium disappears behind a fireworks display of clever studio tricks, Oliveros’s debut tape work entrusts a great deal to the tape machine as *performer*, unspooling as faithful a record as possible of a real-time improvisation with the device. Oliveros’s risky choice of improvised “editing” is audible in *Time Perspectives*, which retains a sense of conflict between the obstinate forward motion of the tape reel and the speed-ups, slow-

downs, and ripples of distortion introduced through manual manipulation. Perhaps recognizing the power of this tension, or friction, that wells up in the dance of agency between woman and machine, Oliveros finally reversed the relation in *Sound Patterns* (1961–62), in which the stubborn sensuousness of human flesh periodically jams a straight-faced attempt at tape-studio karaoke.

None of these back-and-forth volleys of agency—these “lessons” learned and taught—are straightforward: each features an element of jam, glitch, or frictional collision. And if these deviations or deviances complicate our picture of a chain of direct exchanges, this linear model is further belied by their looping and cumulative logic. The KPFA improvisations, *Time Perspectives*, and *Sound Patterns* are not discrete and self-enclosed links on a chain, but rather moments in a continual cycle of recursive transformation passing from tape, to Oliveros, and back again. There is evidence that by late 1963, this play of “feedback,” whereby Oliveros repeatedly “absorbed” the influence of media and acted back upon it with a transformed perspective, had come to be much more than a mere abstraction or metaphor. Indeed, in the work that marks Oliveros’s return to tape following *Sound Patterns*, a soundtrack for dancer Elizabeth Harris’s work *Seven Passages* (premiered February 1964), one sees the first manifestations of Oliveros’s draw towards the “loops,” echoes, and reverberations that she had earlier heard in Terry Riley and Ramon Sender’s work. The preparatory notes associated with the *Seven Passages* music (an imperfect, but valuable roadmap to a work only partially available on record) reveal that Oliveros manipulated a collection of prerecorded sounds (bongos, maracas, and numerous noises derived from piano strings, and bowed brass rods) using spatial panning, “big echoes,” and artificial reverberation.²⁵⁰ These effects would have suited a dance

²⁵⁰ Notes and preparatory materials associated with *Seven Passages*, 1964, Box 3, Folder 6, Oliveros Papers. I cannot definitively confirm Oliveros’s use of artificial reverberation in this work, but the term “thunder,” which appears in her preparatory notes, quite possibly refers to a “thunder sheet”—an apparatus that applies echo to sounds via their propagation through a flexible metal sheet. Regarding Elizabeth Harris’s *Seven Passages*, see Alexander Fried, “A Promising New Dance Troupe,” *San Francisco Examiner*, February 20, 1964, 36. So obscure is Oliveros’s soundtrack within her broader oeuvre that her most detailed description of the work appears on the inner ring of its limited-edition vinyl release, issued in 2012. See Pauline Oliveros, *Two From Seven Passages*, Medusa Editions #100, vinyl, 7”.

whose final “passage” involved a “twirling” Harris growing entangled with a large metal mobile.²⁵¹

[Figure 20]

By 1965, Oliveros was experimenting with the more sophisticated mechanism of tape-delay (whereby, with the proper configuration, one can draw sounds into an ever-accumulating avalanche of delayed repetitions) to create works like her landmark *Bye Bye Butterfly* (1965), an improvised performance with two Hewlett-Packard oscillators and a vinyl recording of the aria from Giacomo Puccini’s (1858–1924) *Madame Butterfly* (1904). In this piece and the five tape works encompassing her *Mnemonics* series (also from 1965), Oliveros uses the continual forward feed of a two-recorder tape-delay system and the piercing tones of oscillators to conjure roiling sonic currents that ebb, flow, and multiply, returning at uneven intervals to compound and laminate one another in big, cresting waves of sound.²⁵² This logic of the self-amplifying, self-reinforcing loop, and of cyclical oscillations churning back and forth, gathering up deviations and bursts of noise in their wavelike repetitions—this is the movement that structured Oliveros’s early dealings with tape between 1958 and 1963. And in the following chapter, we will watch as cyclical relays of this looping mediality, having already marked Oliveros deeply, press her towards a point of rupture in her practice, leading her to fundamentally restructure her notions of the musical work. So, for now, we must insist that it is not tape → Oliveros → tape → Oliveros, but rather a ring—a reel—spooling forward in an endless loop, retaining every sound, and every change, upon its magnetized surface.

In the ever-expanding ecosystem of the Tape Center, the logic of the loop was contagious. On March 9, 1963, an elaborately wrought participatory performance (Happening?) titled *City-Scale*, spearheaded by Ramon Sender, Ken Dewey, and multimedia artist Tony Martin (1937–2021), who we will meet in the following chapter, functioned as the grand finale of the first and only Jones

²⁵¹ Fried, “Promising New Dance Troupe,” 36.

²⁵² Bernstein, liner notes, *Reverberations*.

Street season. Sender and his co-conspirators gathered audience members at Jones Street for a tape-recorded question-and-answer session before leading them outside and up the hill on Jones Street; there, they were treated to the sight of a “car ballet” in which vehicles with colored gels on their headlights gathered in the parking lot of the Telegraph Hill neighborhood’s Coit Tower and blinked their headlights on and off, all while trombonist Stuart Dempster (1936–), who will return at the Tape Center 2.0, sounded out the resonances of the nearby Broadway Tunnel.²⁵³ This sequence of events merely constituted the beginning of an evening-long performance scaled to the city of San Francisco: projections were cast upon the facade of a Wells Fargo building, a soprano in a bathrobe sang Debussy songs on the corner of Pacific Avenue, audience members were trucked to a movie-house in North Beach to watch a bull-fighting film, a “book-returning ceremony” was organized at favorite Beat-writer haunt City Lights Books, and weather balloons were released in Potrero Hill’s Vermont Street park.²⁵⁴ Just prior to the weather-balloon activity, the audience responses recorded to tape at Jones Street were played *back* on tape machines—and thus re-cycled within the fabric of the performance. While not quite a feedbacking tape loop, this gesture represented an exquisitely negotiated play of delay, casting the audience’s words across the streets of San Francisco like an echo.

Although Oliveros’s partner, Laurel Johnson took part in *City-Scale*, sitting on a toilet in the alcove of a Bank of America entrance, it is unclear if Oliveros herself participated. While her name, along with the word “accordion,” appears on a preliminary map of the event contained in Ken Dewey’s papers, it does not appear in the more polished version of the map drawn by Tony Martin, and contributed by Martin, Dewey, and Sender to the Winter 1965 issue of *TDR (Tulane Drama Review, now The Drama Review)*. [Figure 21] Perhaps feelings of estrangement or discomfort held her

²⁵³ Sender, interview by Updike and Van Cleve, 59–61.

²⁵⁴ Sender, interview by Updike and Van Cleve, 60..

back from this final Jones Street performance; perhaps she was simply busy. Soon after *City-Scale*, the Jones Street Tape Center met an unexpected end: Sender, who short-circuited Jones Street's faulty wiring by changing a fuse in the fuse-box, takes credit for the "three-alarm fire" that drew out "hundreds of spectators" to watch flames shoot from the Tape Center's roof.²⁵⁵ Perhaps the *real* finale of the Jones Street season, this May 1963 fire forced the Tape Center's immediate move to an ample new location at 321 Divisadero Street; here, Oliveros would find a haven in which to loop forward ecstatically and vibrantly, expanding her circuit of mediality to include elements of theater, multimedia, and roleplay.

If this fire quite literally cleared the way for the Tape Center's forward evolution into a more refined, community-integrated, and publicly visible institution, it also punctuated a wider shift in San Francisco's cultural climate, which was soon to shake off the last tattered remnants of the Beat era and welcome the countercultural revolution. Already by the early Sixties, Myron Stolaroff, who, we will recall, entered the ground-floor of Ampex as a young engineer called into assist Alexander Poniatoff, had left the tape titans to found the International Foundation for Advanced Study—a Menlo Park non-profit dedicated to the study of lysergic acid diethylamide (LSD-25) and its potential as a therapeutic tool.²⁵⁶ The tape recorder itself, a key evaluative device in these acid-laced therapy sessions, was soon to ride the psychedelic wave too: in the mid-Sixties, records like The Electric Prunes' "I Had Too Much to Dream Last Night" (1966) would deploy tape-delay, echo, and reverb to achieve precisely the quotient of "trippiness" associated with the era.²⁵⁷ It would turn out, then, that Oliveros's *Time Perspectives* and Terry Riley's *M . . . Mix* (1960–61) were opening salvos

²⁵⁵ Sender and Maginnis, interview by Bernstein and Payne, 62; "Hundreds Witness Nob Hill Flats Fire," *Oakland Tribune*, May 3, 1963, 46.

²⁵⁶ Matthew Oram, *The Trials of Psychedelic Therapy: LSD Psychotherapy in America* (Baltimore: Johns Hopkins University Press, 2018), 59–68.

²⁵⁷ Ann Johnson and Mike Stax, "From Psychotic to Psychedelic: The Garage Contribution to Psychedelia," *Popular Music and Society* 29, no. 4 (October 2006): 416–419, <https://doi.org/10.1080/03007760600787440>.

timed at a delay. Very soon, the revolution begun in the humble confines of Sender's attic studio would run off its reel and into the Haight.

Chapter 3: Live Electronics: David Tudor and Pauline Oliveros in Transition, 1963–1966

Introduction: “There was something understood”

Pauline Oliveros first met David Tudor in 1963 at the San Francisco home of Olive Cowell (1887–1984), aunt of American experimentalist Henry Cowell. The meeting had been arranged by Tudor, who had recently been introduced to Oliveros’s music, and was sufficiently interested to want to meet the composer responsible.¹ There is some disagreement as to exactly *which* music drew Tudor to San Francisco: You Nakai has suggested that Tudor had learned of Oliveros’s accordion music; since Tudor, at this time, was studiously carving out time between piano performances in order to master the bandoneon, a type of concertina central to tango music, it is plausible that Oliveros’s shared enthusiasm for the drone of bellows and reeds might have piqued his interest.² Oliveros, for her part, has been consistent in her recollections: Tudor sought her out after seeing the score for her choral work *Sound Patterns for Mixed Chorus* (1961–62), which had been passed on to him by conductor Thomas Nee (1920–1980), then based in Minneapolis.³

The remarkable ease with which these circumstances fit into our developing narrative suggests their veracity. Tudor, we will recall from Chapter 1, had spent ten-plus years following his debut of Pierre Boulez’s Second Sonata and John Cage’s *Music of Changes* (1951) honing his abilities as a pianist-turned optical scanner, and he had been catapulted to the height of renown in musical milieus as diverse as New York City, and Darmstadt, Germany, by his *techno-logical* execution of a

¹ Pauline Oliveros, interview by Libby Van Cleve, June 8, 1998, OHV f-k, transcribed tape recording, Major Figures in American Music, Oral History of American Music, Irving S. Gilmore Library, Yale University, New Haven, CT, 58, https://archives.yale.edu/repositories/7/archival_objects/3185019.

² You Nakai, *Reminded by the Instruments: David Tudor’s Music* (New York: Oxford University Press, 2020), 143.

³ David Tudor, interview by Jack Vees and Pauline Oliveros, December 6, 1995, OHV 241 a-l, transcribed tape recording, Major Figures in American Music, Oral History of American Music, Irving S. Gilmore Library, Yale University, New Haven, CT, 99–100 https://archives.yale.edu/repositories/7/archival_objects/3185379.

postwar piano repertory deeply inflected by electronics. Oliveros's *Sound Patterns*, which grew out of the churning feedback loop (or relays) of agency and affordance she had forged with magnetic tape, was a winking and critical work for singers cast in *techno-logical* roles: a sounding out of the inevitable slippages that occur when seamy flesh-and-blood bodies are made to pantomime media. While for years, techno-logical Tudor had brooked no such slippages in his own performance practice, which was premised on the meticulous preparation and precision execution of others' compositions (even the ambiguous and the indeterminate), his virtuoso reputation had turned oppressive by the turn of the Sixties, when he began to feel like an "actor playing the same role."⁴ In *Sound Patterns*, he might well have recognized an intuitive understanding of his plight: empathy for the automaton.

For the historian reconciling personal archives, it is often difficult to track the ripples cast off when two figures cross paths, and shade from strangers into friends; one encounters no such issues in reconstructing the Tudor-Oliveros connection, for the effects of their crossing were immediate. The first extant item in the Tudor-Oliveros correspondence is a letter from Oliveros to Tudor dated October 7, 1963; considering that the pair had likely only met months before, the informality with which Oliveros writes "Tudle," in appreciation for the gift of a yerba mate tea strainer, is remarkable.⁵ What is most revelatory, however, is that this early letter already finds Oliveros and Tudor hashing out the details of a jointly organized concert (to be held in San Francisco under the sponsorship of KPFA), and a collaborative performance coordinated for the occasion.

As we will see below, the concert in question—still, here, in its early stages of planning—ultimately took place across five nights in March and April of 1964, beneath the eaves of the San

⁴ John Holzaepfel, "David Tudor and the Performance of American Experimental Music, 1950–1959" (PhD diss., City University of New York, 1994), 321.

⁵ Pauline Oliveros to David Tudor, October 7, 1963, Box 27, Folder 27, Pauline Oliveros Papers (hereafter Oliveros Papers NYPL), JPB 94-5, Music Division, The New York Public Library, New York, NY.

Francisco Tape Music Center, and under the memorable name “Tudorfest.” Comprising a selection, curated by Tudor, of music by John Cage and a number of younger experimentalists, it was equally an attempt by Oliveros (to whom we can credit the name) to “honor David for all his support of composers with his outstanding interpretations of contemporary music.”⁶ As will be seen in this chapter, and Chapter 4, “Tudorfest” was merely the first major manifestation of a lifelong sympathetic resonance between Tudor and Oliveros that has largely escaped the attention of historians—perhaps because it defied words. Asked by John Holzaepfel to describe her relationship with Tudor just three years before her death, Oliveros remarked: “There was a deep understanding between us. . . . I don’t know what it was. I can’t tell you. It was more telepathic, I think, or merely that there was something understood.”⁷ What might have accounted for the rapid consolidation of this “telepathic” bond is the subject of this chapter, which begins by discussing Tudorfest, and follows with a parallel exploration of Oliveros and Tudor’s respective (and on occasion, collaborative) activities through to the end of 1966.

During the three-year period explored here, Tudor and Oliveros each underwent dramatic and lasting transformations as artists and performer-composers, codifying wholly new approaches to music-making that anticipated the next decade of their practices—and the mature work discussed in Chapter 4. It would be too simplistic to argue that Oliveros and Tudor’s mutual encounter *caused* the transformations discussed, which were overdetermined by a wide array of proximate influences and historical circumstances (all discussed in turn), and at any rate, in germinal development well before 1963. I do, however, want to demonstrate the great significance of Oliveros and Tudor’s acquaintance for their subsequent trajectories, and to argue that this encounter, in a bit of

⁶ Pauline Oliveros, “Memoir of a Community Enterprise,” in *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde*, ed. David W. Bernstein (Berkeley: University of California Press, 2008), 86.

⁷ John Holzaepfel, liner notes for *Music from the Tudorfest: San Francisco Tape Music Center 1964*, New World Music 80762-2, 2014, compact disc.

synchronicity or resonance, occurred at an auspicious moment in both subjects' careers. In 1964–66, Oliveros and Tudor were both in creative transition, and each musician was wrestling with the same questions: what does it mean to *perform* electronic music, and perform it *live*, with the presence and vitality that attends human performance? And for that matter, could electronics, or mediation, serve to cultivate entirely new forms of presence (or *immediacy*) unattainable without technological supports?

Oliveros and Tudor came to these questions from entirely different angles, their direction of approach dictated by the prehistories discussed in Chapters 1 + 2. When we last encountered Tudor at the end of Chapter 1 (and ca. 1960), he had reached a turning (or breaking) point in his technological performance practice, from which he was yielding diminishing creative returns. In our discussion of the music Tudor selected for performance at Tudorfest, which dates from the mid Fifties to early Sixties, and, appropriately, charts his development over these intervening years, we will get a sense of the qualitatively new performance opportunities afforded him by Cage and others, and the changes they awakened in him. Between 1958 and 1963, during which time Tudor first encountered electronics, and was negotiating a new musical “theatre” embraced by Cage and his younger followers, the once techno-logical pianist grew interested in the materiality, animacy, and theatrical presence of technologies outside of himself. As we will explore, these new interests first inspired Tudor, so long the archetypal interpreter, to assert himself as an original composer in 1964–66.

When we last encountered Oliveros at the end of Chapter 2, she had just completed a European travel junket (occasioned by the Fall 1962 premiere of *Sound Patterns* at Gaudeamus Muziekweek), and returned to San Francisco, touching down just months before the Spring 1963 conflagration at 1537 Jones Street. The San Francisco Tape Music Center was poised for major institutional change, and Oliveros, following years of engagement with magnetic tape, and her close

involvement in the “Sonics” series, was herself positioned for a change of tack. With its unusual regstral notation, and its smuggling of unpitched clicks, hisses, and pops into conventional choral form, *Sound Patterns* was a breakthrough, but one still wedded to the structure it sought to dissolve. Oliveros, in her own words, was “still thrashing with notated music.”⁸ Her work was “in transition between the known ground of transitional writing, the unknown ground of improvisation, and tempered by [her] work with tape music which was moving [her] towards a synthesis.”⁹ As we will see, Oliveros’s musical “synthesis” of the mid Sixties took the form of “theater pieces” (her term), which in their most developed form, used tape technology to accentuate the materiality and presence of the performer’s (human) body.

Precisely because Oliveros and Tudor found themselves at work on the same practical problems between 1964 and 1966 (those of “live electronics”), they were able to engage in a profitable exchange of ideas and influence. In the first section of this chapter, I turn to the origin of this exchange—Tudorfest—and simultaneously glance back across Tudor’s early-Sixties performance history. In the second section, I focus on the artistic ruptures that followed Tudorfest in 1964, tracking Tudor and Oliveros’s first steps towards very different interpretations of electronic “liveness.” In the third and final section, I retrace Oliveros and Tudor’s interwoven paths towards culminating works of 1966—Oliveros’s *A Theater Piece*, and Tudor’s *Bandoneon! (A Combine)*—charting their increased collaboration, and their parallel arrivals at major creative “syntheses.” Ultimately, I argue that the models of “liveness” manifest in *A Theater Piece* and *Bandoneon!* suggest a radical rewriting of the divisions between the composer, the performer, and the audience, thus destabilizing the regulating structure of what Lydia Goehr terms the “work-concept” (*Werktreue*). I further argue that they each model an approach to live-electronic performance premised on

⁸ “Theater Piece Book,” ca. 1968–1972, Box 10, Folder 8, Pauline Oliveros Papers (hereafter Oliveros Papers). MSS 102. Special Collections & Archives, UC San Diego.

⁹ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

embodiment, and thereby clear a path towards Oliveros and Tudor's mature work of the early Seventies.

1. Tudorfest

Just over a year before Tudorfest, in the spring of 1963, the San Francisco Tape Music Center was in literal, physical transition, moving from the cinders of Jones Street—felled by a testy fuse-box—to a new home at 321 Divisadero Street. With two large meeting halls (including a room large enough to accommodate 100–150 people), 321 Divisadero represented a substantial structural upgrade for the Tape Center, as well as an opportunity for closer contact with the Bay Area arts community.¹⁰ Recognizing a means of covering rent costs, but also, perhaps, a valuable chance to network-build, Ramon Sender and Morton Subotnick reached out to KPFA Music Director Will Ogdon soon after signing the new lease, and offered to share their main auditorium with the Berkeley radio station; Ogdon was excited by the prospect of a city venue for live-broadcast concerts, and promptly organized a KPFA volunteer day during which station listeners came in to line the walls with acoustic baffles, and extend the auditorium stage.¹¹

The main auditorium sat adjacent to a control room, used by KPFA for remote broadcasts, and on the other side of this control room was an L-shaped studio that Sender quickly offered to dancer Anna Halprin and her San Francisco Dancers' Workshop. Halprin was familiar to the Tape Center cohort from the “Sonics” concerts, which had featured Workshop dancers John Graham and Lynne Palmer, and she was especially close to Subotnick, who had composed the music for her *Five-Legged Stool* (1962)—it was a natural fit.¹² The growth of a vibrant artistic cosmos within the Tape

¹⁰ Oliveros, “Memoir of a Community Enterprise,” 84.

¹¹ Ramon Sender and William Maginnis, interview by David W. Bernstein and Maggi Payne, in *Tape Music Center*, ed. Bernstein, 67–68.

¹² Sender and Maginnis, interview by Bernstein and Payne, 67–68.

Center was mirrored by roiling cultural currents outside its walls. Already, at the turn of the Sixties, Berkeley (and specifically, the campus of University of California, Berkeley) appeared poised to act as a centrifuge of New Left politics, and several fast-consolidating social movements: the 1960 protests against the execution of Caryl Chessman at San Quentin Prison, and the hearings held by the House Un-American Activities Committee (HUAC) were merely soft rehearsals for a decade of wide-scale civil-rights campaigns, Students for a Democratic Society (SDS) demonstrations against Vietnam, and, of particular interest to Oliveros, Free Speech Movement (FSM) rallying cries.¹³

And if Berkeley was to be the epicenter of what “counter-culture” chronicler Theodore Roszak termed the “hard-headed political activism” of the New Left, San Francisco would act as the locus of the “mind-blown bohemianism of the beats and hippies.”¹⁴ Positioned just at the edge of the Haight in its new home on Divisadero Street, the Tape Center would begin to metabolize the counter-culture’s headier, lysergic side in the year leading up to its move to Oakland, CA’s Mills College in February 1966. Upon first arriving at their new location, however, the studio’s cohort was still working largely with the same musical and artistic vocabularies it had codified at Jones Street. Morton Subotnick and Ramon Sender were continuing to hone their work in tape and live (instrumental) improvisation, which mingled with electronic compositions by European avant-gardes (Luigi Nono, György Ligeti, 1923–2006, and Karlheinz Stockhausen) on weekly concert programs. There were several personnel changes afoot: for one thing, Oliveros, who had opted out of the activities at Jones Street, came fully on board in the renewed Tape Center. The composer welcomed 321 Divisadero as a “haven,” quickly entered into aggressive collaboration with Sender,

¹³ Anthony Ashbolt, *A Cultural History of the Radical Sixties in the San Francisco Bay Area* (New York: Routledge, Taylor & Francis Group, 2016), 26–46.

¹⁴ Theodore Roszak, *The Making of a Counter Culture* (Garden City, NY: Anchor Books, 1969), 56.

Subotnick, and others, and embarked on a period of major artistic renewal that she later regarded as “very important” in her development.¹⁵

Meanwhile, after the first (1963) season at Divisadero, in early 1964, the Tape Center cohort welcomed another familiar face: the young visual artist Anthony (Tony) Martin. Martin was not new to the group; having arrived in San Francisco in 1959 via the Art Institute of Chicago, he had contributed visual flourishes to the Sonics concert series, worked with Ann Halprin on a maze-like participatory installation at the San Francisco Museum of Art (*Theater for Watchers, Walkers, Touchers*, 1962), and collaborated with Ramon Sender and Ken Dewey on *City-Scale* (1963).¹⁶ Now, however, his developing experiments with dynamic projection, which entailed the use of mirrors and prisms, hand-painted glass slides and 16-mm film (blended and cross-faded manually), and the mixing and pooling of liquids on overhead projectors, became a hallmark of Tape Center concert presentations.¹⁷ Effectively replacing artist Elias Romero, who had previously contributed liquid light to the musical proceedings, he became the cohort’s premiere “visual composer.”¹⁸ Martin’s own practice, and his close involvement at the Divisadero Tape Center, was in part motivated by a realization common among postwar electronic musicians. He has recalled: “A lot of what was going on in the new music didn’t involve much to look at. There were tape recorders, and once in a while a performer to watch, but at any rate, it often lacked a visual component.”¹⁹

The problem was not just one of visual impoverishment, but also *presence* in the live concert environment, and it was becoming more pronounced with each forward step in electronic music’s rapid evolution. In a particularly histrionic (but not unrepresentative) 1968 article titled “The

¹⁵ Oliveros, “Memoir of a Community Enterprise,” 84.

¹⁶ Tony Martin, interviewed by David W. Bernstein and Maggi Payne, in *Tape Music Center*, ed. Bernstein, 146–152.

¹⁷ Tony Martin, “Composing With Light,” in *Tape Music Center*, ed. Bernstein, 136–143.

¹⁸ Sender and Maginnis, interview by Bernstein and Payne, 151–153.

¹⁹ Martin, interviewed by Bernstein and Payne, 147.

Humanization of Electronic Music,” the composer John Eaton (1935–2015) raised such concerns thus:

[I]t’s difficult to believe that future audiences will be satisfied as a prerecorded tape machine or programed [*sic*] computer spins away with solid-state gusto, ignoring the mood of the immediate moment and omitting interference in the performance from an “imprecise” and “temperamental” human performer. . . . Can that roomful of transistors ever become a truly sensitive and immediately responsive kind of ‘instrument’ for the new music, capable of being performed ‘live’?²⁰

Along with Subotnick, Sender, and the rest of her Tape Center colleagues, Oliveros was keenly interested in the problem posed by the live performance of electronic music circa 1963–64. Her experiments with magnetic recording and improvisation had disabused her of any prior faith in staff-bound notation and suggested potent new uses of time, space, and the body, on and off tape. Additionally, her experiences in Sonics and increasing encounters with dancers (including, as discussed in Chapter 2, Elizabeth Harris of *Seven Passages*) had directed her attention outward from the conventionally demarcated “sound field” to “visual, kinetic, and dramatic elements.”²¹ What she needed was a push towards synthesis, or what she would later term the “theater piece,” and there is every indication that she found a valuable spur in David Tudor and John Cage.

The David Tudor that Oliveros met at the home of Olive Cowell in 1963 was, it must be stressed, not the David Tudor of just five years prior. Perhaps Oliveros could not have told the difference, for indeed, we do not know exactly *how much* Oliveros knew of Tudor (and for that matter, Cage) prior to this initial meeting. While Oliveros has recalled that “[by 1964] very little of Cage’s music had been performed in the Bay Area,” she also notes that “controversy about his writings and music was very much in the air,” and she would have learned of both the composer and his stalwart interpreter from La Monte Young, one of the primary conduits of this controversy.²²

²⁰ John Eaton, “The Humanization of Electronic Music,” *Music Educators Journal* 55, no. 3 (November 1968): 102, <https://doi.org/10.2307/3392390>.

²¹ Pauline Oliveros, *Software for People: Collected Writings 1963–1980*, 2nd ed. (Kingston, NY: Pauline Oliveros Publications, [1984] 2015), 184–185.

²² “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

Young had met Tudor and Cage at the 1959 Darmstadt Summer Session, and subsequently returned to the Bay Area with a devious new sensibility, writing conceptual “word pieces” (discussed below), and, as we saw in Chapter 2, dragging benches across Anna Halprin’s studio with Terry Riley.²³ Certainly, we should be surprised to learn that the first Tudorfest selection discussed in correspondence between Oliveros and Tudor is not, say, an indeterminate piano work by Morton Feldman or Earle Brown, but rather a piece for accordion and bandoneon that Oliveros wrote for herself and Tudor (the latter cast as the bandoneonist). We should be equally surprised to learn that Oliveros, in a letter sent in Fall 1963, requested an “amplified piano piece” from Tudor. When (and how) did electronic amplification and the concertina enter Tudor’s musical cosmos?²⁴

Compellingly, the twelve works Tudor eventually “curated” for Oliveros’s Tudorfest concisely tell the story of how he evolved from a techno-logical pianist into an agent of theatrical and electronic exploration on a nearly parallel track with the Tape Center cohort. These works also explain how Tudor, by 1964, had come closer than ever to embracing original composition. Whether it was Tudor’s intention to curate such a self-portrait is unclear, for the relevant correspondence with Oliveros, despite its occasional revelations, is largely concerned with workaday concerns. Written in the gaps and interstices of a grueling tour with Karlheinz Stockhausen, Tudor’s missives to San Francisco circle around matters of scheduling, the shipping out of equipment and materials (toy pianos, electronics, and reams of sheet music), and revisions to program notes.²⁵ But they also find Tudor growing sincerely excited for what amounted to a mid-career retrospective and a prelude to artistic rebirth.

²³ Keith Potter, *Four Musical Minimalists: La Monte Young, Terry Riley, Steve Reich, Philip Glass*, Music in the Twentieth Century (Cambridge: Cambridge University Press, 2002), 41–52.

²⁴ Pauline Oliveros to David Tudor, c. October–November 1963, Box 27, Folder 27, Oliveros Papers NYPL.

²⁵ Holzaepfel, liner notes, *Music from the Tudorfest*.

Below, I discuss several of the most telling works Tudor selected for Tudorfest, thereby profiling where he was at the time, and indicating the precise evolutionary stage of the Cage-Tudor collaboration to which Oliveros, the wider Tape Center, and a variously charmed and bewildered Bay Area public bore witness. Later on, in sections two and three, we will learn how Oliveros and her peers responded to and metabolized this influential incursion of East Coast experimentalism into the West's artistic and musical landscape.

John Cage, *Concert for Piano and Orchestra*, 1957–58

Of the composers featured in Tudorfest, John Cage is the most amply represented on the concert program, and the only composer to whom an entire evening of the five-night concert series is dedicated. This is not surprising, given what we know of Cage and Tudor's relationship from 1950 onward. Recall that back in 1951, the practical exigencies of Cage's *Music of Changes* (1951), with its yawning holes in continuity, and fluctuating timescales—partial artifacts of Cage's work with tape—had encouraged Tudor's transformation into an optical “scanner.” As a scanner, Tudor had learned to circumvent the entrainment of rhythm and mime the effects of electronic media by experiencing music as *image*. It is no exaggeration to say that Tudor's work on *Changes* helped him codify the performance practice that carried him through the Fifties, and to great heights of renown in musical circles as disparate as Darmstadt and New York City. As discussed at the end of Chapter 1 (and rehearsed above), Tudor's enthusiasm for his scanning protocols was waning at the end of the Fifties; and yet, at this transitional moment, Cage—himself changing—was happy to lay new challenges at Tudor's feet. If before, Cage had helped to create a techno-logical Tudor, he would now help unmake him.

Tudor found fresh opportunities for growth, and for the rewiring of his anatomical “apparatus,” in Cage's doctrine of “indeterminacy.” Cage's indeterminacy, which he announced to

great controversy and bedlam in a 1958 Darmstadt lecture (accompanied by Tudor on piano), was premised on the composer's ceding of structural decisions to the performer, and thus on the re-conception of the composition as a fill-in-the-blanks exercise.²⁶ Cage's embrace of "composition which is indeterminate with respect to its performance," which had its prototypes in Morton Feldman and Earle Brown's ambiguous graphic scores of the early Fifties, represented a disavowal of exactly the sort of chance protocols that had animated *Music of Changes*.²⁷ The problem with *Music of Changes*, Cage explained, was that while chance operations may have brought it into being, it was essentially fixed as a compositional object, differing only incidentally from performance to performance, and affording its performer no freedom to perform from his or her "own center."²⁸

As Chapter 1 demonstrated, Tudor's response to Morton Feldman and Earle Brown's works of proto-indeterminacy, or "implicative graphics," per John Holzaepfel, had been an interpretive rigor that resulted in highly *determined* realization scores.²⁹ It was now several years since Tudor had first wrestled with these implications and emerged triumphant; if Cage was to write indeterminate compositions capable of chipping away at Tudor's techno-logical cladding, he was going to need to find new ways to challenge that great "solver of puzzles."³⁰ Cage's *Concert for Piano and Orchestra* (1957–58) represented a daunting challenge indeed: comprised of instrumental parts conceived wholly independent of one another, the *Concert* casts its performers as soloists playing *beside* one another, but not with one another, and allows for performer discretion as to specific musical parameters (duration and dynamics).³¹ The *Concert's* most celebrated component is its *Solo for Piano*: a

²⁶ James Pritchett, *The Music of John Cage* (Cambridge: Cambridge University Press, 1996), 107–108; Martin Iddon, *New Music at Darmstadt: Nono, Stockhausen, Cage, and Boulez*, Music since 1900 (Cambridge: Cambridge University Press, 2013), 196–228.

²⁷ John Cage, "Composition as Process" (1958), in *Silence: Lectures and Writings*, 50th anniversary ed. (Middletown, CT: Wesleyan University Press, 2011), 35–40. I borrow the phrase "chance protocol" from Eva Díaz. See Eva Díaz, *The Experimenters: Chance and Design at Black Mountain College* (Chicago: University of Chicago Press, 2015), 56–57.

²⁸ Cage, "Composition as Process," 36.

²⁹ Holzaepfel, "Performance of American Experimental Music," 48.

³⁰ Holzaepfel, vii.

³¹ Pritchett, *Music of John Cage*, 112–113.

veritable love-letter to Tudor and his abilities taking the form of eighty-four different score fragments, each prototyping a different approach to indeterminate composition.³²

The *Solo for Piano*'s highly graphic notational fragments, distinguished via alphabetical labels, each forced Tudor into new, and newly flexible, ways of working: notation BJ floats a single black point inside an otherwise empty rectangle, instructing the performer to determine the parameters of a note (pitch, duration, dynamics, timbre) by measuring the point's distance from the rectangle's four sides; notation BT presents something like a birds-eye view of a piano, with black points distributed in the vicinity of the notional keys functioning to denote individual sound events.³³

[Figure 1] For Tudor, just as important as the *Solo for Piano*'s notational flexibility was its structural flexibility: the *Solo* could be played in whole or in part, and in any conceivable order.³⁴ Cage's newly recombinant "scores"—per James Pritchett, "tools" for the *assembly* of scores more than scores themselves—gave Tudor the courage to loosen his obsessive precision and take on a pragmatic new interest in structural mobility.³⁵

Faced with Cage's open door to performer choice, and his new predilection for modular and order-free notation usable "in part" (or, keeping with Pritchett's "tool" metaphor, *as parts*), Tudor no longer regarded, as his interpretive task, machine-like penetration into a composition's immutable core. In preparing for the *Concert for Piano and Orchestra*'s May 1958 premiere at New York's Town Hall, where artists Robert Rauschenberg (1925–2008) and Jasper Johns (1930–) had organized a twenty-five-year retrospective of Cage's music, Tudor compiled a ring-bound collection of realizations to the notational puzzles in *Solo for Piano* which, in theory, could be shuffled and

³² Martin Iddon, *John Cage and David Tudor: Correspondence on Interpretation and Performance*, Music since 1900 (Cambridge: Cambridge University Press, 2013), 64–71.

³³ Pritchett, *Music of John Cage*, 119–121.

³⁴ Iddon, *Cage and Tudor: Correspondence*, 65.

³⁵ Pritchett, *Music of John Cage*, 126.

permutated endlessly in response to changing performance circumstances and rehearsal times.³⁶

While new for Tudor, who had formerly favored permanence in his (singular) realizations, this macro-level deck-of-cards treatment was expressly permitted by Cage. However, growing newly confident, Tudor also took ungranted liberties on the micro-level of Cage's new compositions, stripping away perceived redundancies, soldering together independent notational "parts" by overlaying them on single staves, and cleverly circumventing certain of Cage's stipulations where he saw fit.³⁷

Given the sheer scale of *Concert for Piano and Orchestra* and its myriad component parts, Tudor's choice to stage it at the Tape Center in 1964, and to coordinate its staging via long-distance communication, surely represented something of a gamble. This is all the more true considering the circumstances of the work's debut performance in 1958. During that premiere at New York's Town Hall, the *Concert* had aroused "mocking, disruptive applause" and sporadic laughter throughout the audience.³⁸ The once unflappable Tudor, who had, by the early Sixties, begun to strain under the weight of Cage's controversies, would have been acutely sensitive to the potential for uproar at what would be the second-ever West Coast performance of the *Concert*. We can thus regard Tudor's selection of the work as both an affirmation of its personal significance and a cross-coastal gesture of trust.

For the rendition of *Concert for Piano and Orchestra* organized for April 3, 1964, the final night of Tudorfest, Tudor played his *Solo for Piano* alongside Oliveros, who doubled on horn and tuba, Morton Subotnick, who played clarinet, Loren Rush, who played double bass, and six other

³⁶ Iddon, *Cage and Tudor: Correspondence*, 92.

³⁷ Iddon, 66–71.

³⁸ David Grubbs, *Records Ruin the Landscape: John Cage, the Sixties, and Sound Recording* (Durham, NC: Duke University Press, 2014), 69–70.

performers in the KPFA/Tape Center ecosystem.³⁹ Ramon Sender assumed the role of the conductor, which, Tudor warned in a March 12th letter to Oliveros, is “hard.”⁴⁰ In Cage’s topsy-turvy satire of orchestral grandeur, the conductor functions as a rather *dé*humanized “human stopwatch,” keeping and dictating time for the performers by articulating their arms like a second- and minute-hand.⁴¹ Fortunately for Tudor, no mocking interruptions are legible in the recording of Tudorfest. While there is no suggestion, in Tudor and Oliveros’s correspondence, that Cage initially planned to attend Tudorfest, he ultimately graced the Tape Center with his presence; perhaps boasting a slight bronze, he had flown to San Francisco from Honolulu, Hawaii, where he was evidently staying in advance of an art and music festival occurring later that month.⁴²

John Cage, *Music Walk*, 1958

If *Concert for Piano and Orchestra* (1957–58) served to represent indeterminacy on the Tudorfest concert program, Cage’s *Music Walk* (1958) bore the banner of another recent development in Cage and Tudor’s collaborative history: “theatre.” Essentially naming an interest in the visual dimension of musical performance, theatre crept into Cage’s thought slightly before indeterminacy, but required the flexibility of the latter development to properly take root in his work. Cage offered his first, germinal definition of theatre in an October 1954 lecture titled “45’ for a Speaker,” in which he states: “Music is a simplification of the situation we are actually in. ***An ear alone is not a being;*** music is one part of theatre. . . . Theatre is all the various things going on at the

³⁹ Liner notes, *Music from the Tudorfest*; “Tudorfest” performance notes, Box 15, Folder 24, David Tudor Papers (hereafter Tudor Papers), accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

⁴⁰ David Tudor to Pauline Oliveros, March 12, 1964, Box 27, Folder 27, Oliveros Papers NYPL.

⁴¹ Pritchett, *Music of John Cage*, 112–113.

⁴² “KPFA Announces the Cage-Tudor Festival,” press release, March 6, 1964, Box 13, Folder 27, Oliveros Papers.

same time. I have noticed that music is liveliest for me when listening for instance doesn't distract me from seeing.”⁴³

With theatre, Cage wanted to give audiences something to look at. And although, by 1965, he had seemingly made the creation of theatre the sole province of the spectator, deemed capable of transforming a “conventional symphony orchestra” into a theatrical activity through the act of conscious looking alone, this outsourcing to the audience followed structural changes in Cage’s own practice, which began tilting towards on-stage athletics and sensory spectacles beginning in 1958 with *Music Walk*.⁴⁴ Scored for piano and radio and allowing for the participation of multiple pianists sharing a single instrument, *Music Walk* leverages some of the same graphic elements included in the *Solo for Piano* (1957–58), instructing readers to interpret intersections between scattered points and five parallel lines as sound events. [Figure 2] The five lines are each assigned different categories of piano and radio sounds, among which are included “noises within the body of the piano; radio static,” and “noises on the exterior of the piano; radio speech.”⁴⁵

When involving multiple performers, *Music Walk* required its participants to prepare structurally independent realization scores to be played in parallel. Given its restricted instrumental arsenal, the work thus allowed for—even invited—human “traffic jams”: collisions of bodies scrambling around a lone piano.⁴⁶ Desiring an explosive diversity of visual and sonic events commensurate with this scramble, Cage mobilized a novel notational conceit, laying out *Music*

⁴³ As observed by numerous historical commentators, this vision of theatre was anticipated in August 1952, when Cage, working at Black Mountain College among a network of frequent collaborators, helped to organize a loosely structured group performance of simultaneous but discrete activities. Titled *Theatre Piece No. 1*—but also known as *Untitled Event*—the piece involved, variously: Cage delivering a lecture on a ladder (which poet Charles Olson and M.C. Richards periodically ascended to contribute spoken segments; Tudor performing Cage’s 1952 composition *Water Music* on piano; and slides project upon Robert Rauschenberg’s series of white monochrome paintings (1951), which were suspended upside-down. William Fetterman, *John Cage’s Theatre Pieces: Notations and Performances*, Contemporary Music Studies, vol. 11 (Amsterdam: Harwood Academic Publishers, 1996), 151–162. See also Díaz, *The Experimenters*, 78–83.

⁴⁴ John Cage, “An Interview with John Cage,” by Michael Kirby and Richard Schechner, *The Tulane Drama Review* 10, no. 2 (Winter 1965): 50, <https://doi.org/10.2307/1125231>.

⁴⁵ Iddon, *Cage and Tudor: Correspondence*, 140.

⁴⁶ Fetterman, *John Cage’s Theatre Pieces*, 52–53.

Walk's points and parallel lines on separate transparencies, or clear plastic sheets; it was thus left to performers to overlay their sheets, which could be flipped and rotated at will, and generate the intersections from which their sound events would derive. The brilliant conceit of the transparency had been developed for another work of 1958—*Variations I*, for “any sound producing means”—and Cage had introduced it to press Tudor towards true “multiplicity” in performance.⁴⁷

Cage's problem was this: Tudor's realization score for *Concert for Piano and Orchestra* had comprised parts that could be freely re-sequenced, but as Martin Iddon notes, each of these parts was determinate in its notation; what's more, once Tudor produced a satisfactory ordering of parts for a particular performance, he reused it. Cage's response to this residual fixity was to provide rudiments of a composition so open, and so elastic, as to encourage a wholesale remaking for each performance.⁴⁸ Adapted from notation BV of the *Concert's Solo for Piano* and dedicated to Tudor “on his birthday (tardily),” *Variations I* provided Tudor with the following: a transparency with twenty-seven points varying in size (size denoting number of sound events), and five transparencies traversed with cross-cutting lines denoting different event parameters (e.g., duration, amplitude, frequency).⁴⁹

While *Variations I* successfully drove Tudor towards a greater notional mobility in performance, encouraging his creation of three separate realization scores for its premiere (each “complete in and of itself” and free of re-iterated parts), *Music Walk* quite literally made him move.⁵⁰ Cage had always woven a winking theatricality throughout his work, which, from his use of hulking drum brakes, anvils, and gongs in his percussion days, to his invention of the prepared piano, played on and with the physicality of instruments. But *Music Walk*, with its demand for noises made on

⁴⁷ Iddon, *Cage and Tudor: Correspondence*, 82–84.

⁴⁸ Iddon, 84–85.

⁴⁹ Pritchett, *Music of John Cage*, 136; *Variations I* performance instructions and transparencies, 1958, Box 8, Folder 6, Tudor Papers.

⁵⁰ The quoted phrase is Martin Iddon's. Iddon, *Cage and Tudor: Correspondence*, 92.

every conceivable part of the piano, and for the manipulation of radio (or radios) potentially situated in far-flung regions of the performance space, engaged the *performer's* physicality in a manner unprecedented.⁵¹ Tudor has remarked that strenuous motion was not just a possibility inherent in *Music Walk*, but the proverbial point: “You try to put things far apart so you would have little problems of getting there on time. . . . You purposefully place things out of view of the audience such as going backstage.”⁵²

Recall that in preparing for his performance of Boulez’s Second Sonata (1947–48), Tudor had followed the dictates of Antonin Artaud’s “affective athleticism” and learned to surrender to a trance-like automatism characterized by reflexive response and the cancellation of consciousness. The province of the affective “athlete” was more metaphysical than strictly somatic—related to the “heart” and spirit—and in following Artaud’s training regimen, possibly refracted through the writing of Émile Jaques-Dalcroze and Jean-Louis Barrault, Tudor left behind his flesh and blood body for a techno-logical one. Cage’s “theatre,” with its literal athletic demands on performers, pried Tudor from the piano bench and gave him an opportunity to experience his body anew—not as a precision “instrument,” or a scanner floating in space, but as a collection of muscles, bones, and tendons rooted in *place*. Whereas for many years, Tudor had engaged with musical works as pure image, or as spatial manifolds stretching out before his eyes, compositions like *Music Walk* invited him to navigate actual, concrete space with his whole apparatus, now unhinged from its seat.

And Cage’s theatre did more than unhinge Tudor’s body. It managed to disrupt his scanning protocols and loosen his relationship with the musical score. Cage’s indeterminate works had forced Tudor to swap out his usual interpretive procedures for new techniques and treatments (e.g., the use of freely ordered part-books in *Concert for Piano and Orchestra*, or the wholesale creation of multiple,

⁵¹ The theatricality of Cage’s early work in ensemble percussion has been remarked on by William Fetterman. Fetterman, *John Cage’s Theatre Pieces*, 25–27.

⁵² Fetterman, 47.

distinct realizations of *Variations I*), but incredibly, they did not pull him away from the conventional notational building blocks of staves, bars, and notes. For *Music Walk*, Tudor adopted a new vocabulary entirely, listing out actions and sound events derived from Cage's transparencies in plain English.⁵³ Tudor's realization scores enumerate bits of textual shorthand referring to objects and activities (e.g., "speech," "static," and "quickly to radio") beside indications of seconds elapsed ("12," ".21," and etc.). [Figure 3] These scores exhibit Tudor's characteristic precision in their careful, second-to-second timing, but their ambiguously descriptive, (as opposed to rigidly denotative) cues were foreign to the musician's symbolic universe. And in response to the unusual practical exigencies of *Music Walk*—traffic jams and the like—Tudor flexibly rearranged his readings and saw fit, even, to omit actions "on the spot" if need be.⁵⁴

Tudor's notes for Tudorfest reveal that he adopted, as an adjunct to this new, theatre-optimized notation, the handy expedient of the floorplan. From what appears to be a map drawn up for the *Music Walk* performance, one can faintly reconstruct the spatial choreography in which the Tape Center cohort took part.⁵⁵ [Figure 4] Around the periphery of two demarcated rooms, Tudor has situated at least three different radios (shortwave, AM, and AM-FM), and several turntables (which Cage permitted, in *Music Walk*, as radio supplements). The cryptic notation "collage tape" raises the tantalizing possibility of a Tape Center Ampex having been hauled out for the performance, but neither the Tudorfest audio recording nor Tudor's preparatory notes provide confirmation either way. What we do hear in the recording is the wild dynamism not legible on paper: from clouds of static and the wails of an abused piano emerge snippets of news and talk radio

⁵³ Iddon, *Cage and Tudor: Correspondence*, 142–145; Peter Zaparinuk, "David Tudor's Performance Composition," *Musicworks*, Summer 1998, 48.

⁵⁴ Fetterman, *John Cage's Theatre Pieces*, 53.

⁵⁵ "Tudorfest" performance notes, 1964, Tudor Papers, Box 15, Folder 25, Tudor Papers.

(“Italian soldiers. . .,” “. . .almighty god”), the canned applause of a comedy record, and the sounds of performers gleefully careening across the floors of 321 Divisadero.

George Brecht, *Card-Piece for Voice*, 1959/Toshi Ichianagi, *Music for Piano #4*, 1960

Beginning around 1960, Tudor began receiving playful, poetic, and absurd text “scores”—most consisting of one or two lines instructing a performer to carry out an action or activity—from younger artists and musicians ascendant in the New York City scene.⁵⁶ Most of these figures would soon be affiliated with Fluxus, a loose affiliation of creators connected via the organizational efforts—festivals, manifestos, and circulated artists’ multiples—of designer-impresario George Maciunas (1931–1978). And many, including Dick Higgins (1938–1998), Toshi Ichianagi, George Brecht (1926–2008), and La Monte Young—attended either an influential “Experimental Composition” course that John Cage taught at the New York’s New School, or the class that succeeded it—taught by electronic musician Richard Maxfield.⁵⁷ Cage’s storied New School course, taught between Fall 1956 and Summer 1960, functioned largely as a forum for a mix of artists, musician, and poets to share their own work in an “anything goes” environment.⁵⁸ It was a key conduit by which developing Cagean concepts, including indeterminacy and theatre, reached emerging members of the New York avant-garde, who appropriated and transformed these ideas as they saw fit.

Of the text scores Tudor received circa 1960, the most notable, and prototypical, are those produced by La Monte Young following his encounter with Cage and Tudor at the 1959 Darmstadt

⁵⁶ Ron Kuivila, “Open Sources: Words, Circuits and the Notation-Realization Relation in the Music of David Tudor,” *Leonardo Music Journal* 14 (2004): 19–20, <https://doi.org/10.1162/0961121043067424>.

⁵⁷ Rebecca Y. Kim, “The Formalization of Indeterminacy in 1958: John Cage and Experimental Composition at the New York School,” in *John Cage*, ed. Julia Robinson, October Files 12 (Cambridge, MA: MIT Press, 2011), 141–143; Potter, *Four Musical Minimalists*, 49–50.

⁵⁸ Kim, “Formalization of Indeterminacy,” 161–163.

summer school, and his subsequent move from the Bay Area to New York. One of three dedicated to Tudor in 1960 (and titled *Piano Piece for David Tudor #2*), instructs:

Open the keyboard cover without making, from the operation, any sound that is audible to you. Try as many times as you like. The piece is over either when you succeed or when you decide to stop trying. It is not necessary to explain to the audience. Simply do what you do and, when the piece is over, indicate it in a customary way.

The more inscrutable *Piano Piece #3* reads, simply, “most of them/were very old grasshoppers.” A year before Young began issuing text pieces, George Brecht had started to codify a functionally similar but altogether unique art form that he termed the “event score”: per art historian Julia Robinson, Brecht’s event scores, which typically took the form of white cards with one or two fragmentary lines of text, were “linguistic proposition[s]. . .designed to mediate a moment of the spectator’s experience.”⁵⁹ Brecht’s *Three Lamp Events* (1961), one of many event scores passed on to Tudor in the early Sixties, reads, in stacked bullets, “off. on./on. off./ lamp,” its text hovering ambiguously between instruction and description. [Figure 5]

As analyzed by Julia Robinson and art historian Branden Joseph, Young and Brecht’s respective scores differently extend and complicate the language of Cagean indeterminacy and theatre: at their most cryptic (“very old grasshoppers”), the former’s pieces not only “remov[e] any explicit directive to the performer,” but also “confoun[d] any implicit one.”⁶⁰ Meanwhile, Brecht’s work takes the mediating form of the “score,” which by the most generalized definition, holds actions or activities in semiotic suspension, and divorces it from music entirely, bending it instead to the perceptual flotsam of everyday life.

What exactly such scores did for Tudor, who began performing them circa 1960–61, is a bit unclear. In view of his almost coincident adoption of text-based notation in realizations of Cage’s

⁵⁹ Julia Robinson, “From Abstraction to Model: George Brecht’s Events and the Conceptual Turn in Art of the 1960s,” *October* 127 (Winter 2009): 77, <https://doi.org/10.1162/octo.2009.127.1.77>.

⁶⁰ Branden W. Joseph, *Beyond the Dream Syndicate: Tony Conrad and the Arts after Cage* (New York: Zone Books, 2011), 93.

theatre works, I would propose, following musician Ron Kuivila, that they affirmed his new interpretive direction, which rested on the specification of concrete actions and objects.⁶¹ But I would also argue that the poetry and playfulness of this new work, which, one-generation removed from Cage, riffed on his oeuvre with a perceptive wryness and criticality, afforded Tudor a novel chance to view himself historically, and, as it were, through the looking glass of theater.

Kuivila points out that Young's *Piano Piece for David Tudor #2*, with its injunction to *silently* "open the keyboard cover," may well cast an irreverent glance at Cage's *4'33"* (1952), whose three movements were delineated by Tudor's opening and closing of the piano's keyboard cover.⁶² However, the rest of the piece's instructions, with their tone of relaxed acceptance, seem more a benevolent gesture to the pianist, who might take a moment to reflect on the demands of performance (and the frustrations of seeking "silence"). With their express dedications to Tudor, many of the "New School"-circle text scores seem to invite him to both reflect on his *role* in Cage's legacy, and to recognize that this *was* a role, not a fixed identity.

Tudor's choice to represent the younger New School generation at Tudorfest via not one but two works (a piece by George Brecht, and a piece by Toshi Ichianagi realized twice) signals both his personal appreciation for their liberating spirit of roleplay, and his increased willingness to align himself with work beyond the Cagean pale. Perhaps selected for its adaptability to larger groups, Brecht's uncharacteristically complex *Card-Piece for Voice* (1959), for one to fifty-four performers, turns experimental composition into a "game" in a manner Cage would have found irreverent or unserious. **[Figure 6]** In Brecht's piece, a presiding "chairman" figure (such hierarchy would also have irked Cage) shuffles and deals playing cards to participating players; players then turn over the cards in their "sub-decks" one-by-one, responding to a cueing system of suits,

⁶¹ Kuivila, "Open Sources," 19.

⁶² Kuivila, 19.

numbers, and faces, by annunciating phonemes or other “vocables” (for example, sounds produced with the lips, vocal cords, cheeks, or tongue).⁶³ Having grappled with vocables and phonemes in *Sound Patterns* (1961–62), Oliveros would certainly have appreciated Brecht’s fleshy and disintegrative use of speech.

Honored, at Tudorfest, with two separate realizations—an acoustic rendition, and an “electronic version” making use of microphonic amplification—Toshi Ichianagi’s *Music for Piano #4* (1960) counterbalances the playful conceptualism of Brecht’s *Card Piece* with simple but provocative demands on the performing body. The spare instructions for the work [**Figure 7**], which Tudor originally premiered January 1961 in the Chambers Street loft of musician Yoko Ono (1933–), read:

- No attack should be made
- Use sustaining sounds and silence(s) only
- The piece may be played with any number of players on any number of pianos

As generally defined in musical practice, the “attack” is the moment at which a sound first enters into audibility and rises to peak amplitude; the “attack” of piano performance is the moment at which the performer depresses a key, triggering the collision of a hammer and string. That the techno-logical Tudor of the Fifties was, per You Nakai, known for his preternatural command of attack might explain why Ichianagi chose to rob the musician of this performance fundamental.⁶⁴ And Tudor’s answer to the provocative challenge of the work, with its effective embargo on any conventional “playing” of the instrument, says a great deal about his changing self in the early Sixties. Tudor realized Ichianagi’s work with what he termed “constructional sounds,” or sounds produced through his steady, frictional rubbing of the piano’s exterior body—traced from one end to the other.⁶⁵ Premised on his highly sensual contact with the piano’s smooth carapace, Tudor’s

⁶³ George Brecht, *Card Piece for Voice* (1959), score, Box 5, Folder 23, Tudor Papers.

⁶⁴ Nakai, *Reminded by the Instruments*, 26–34.

⁶⁵ Ray Wilding-White, “David Tudor: 10 Selected Realizations of Graphic Scores and Related Performances,” 1973, Box 19, Folder 2, Tudor Papers.

solution to *Music for Piano #4* coronated his somatic reawakening under the sign of Cage's "theatre," and put to rest that part of himself associated with pointillist precision. At Tudorfest, the work was performed on two pianos, with Tudor rubbing one, and Oliveros rubbing the other.

John Cage, *Cartridge Music*, 1960/John Cage, *Variations II*, 1961

In a letter to Oliveros mailed less than a month before Tudorfest, Tudor reported that he arranged for C.F. Peters, Cage's music publisher, to mail her copies of relevant scores (e.g., for Cage's *Concert for Piano and Orchestra*, 1957–58, and the indeterminate orchestral work *Atlas Eclipticalis*, 1961–62). "*Atlas* and *The Concert* you could distribute already," he wrote, giving the green light for preparation in his absence. "[A]lso some could start preparing *Music Walk*."⁶⁶ One of Cage's works, however—a piece titled *Cartridge Music* (1960)—was evidently not so self-explanatory; Tudor remarked that it would have to "wait till [he got] there."⁶⁷ *Cartridge Music* is a curious and complex statement indeed, and of great relevance to the present narrative, it provided Tudor with an early opportunity to engage with electronics. An important stepping-stone in Tudor's evolution, which by 1960 had moved from indeterminacy and "theatre," to electrical amplification, it warrants a slightly longer prehistory.

The chronology is inexact, but we know that sometime circa 1959–1960, Tudor began combing through "lower Manhattan junk shops" and electronics retailers "searching for inexpensive components, mixers, phonograph cartridges and contact mics [microphones]."⁶⁸ The universe of electronics had changed since Cage and Tudor's experience producing *Williams Mix* (1952) nearly a decade earlier: for one thing, prewar advances in piezoelectricity, or the production of electrical

⁶⁶ David Tudor to Pauline Oliveros, March 12, 1964, Box 27, Folder 27, Oliveros Papers NYPL.

⁶⁷ Tudor to Oliveros, March 12, 1964, Oliveros Papers.

⁶⁸ Gordon Mumma, "David Tudor the Composer along the Path to Rainforest?" (2006/2013), in *Cyber sonic Arts: Adventures in American New Music*, ed. Michelle Fillion, *Music in American Life* (Urbana: University of Illinois Press, 2015), 151; Alvin Lucier, *Music 109: Notes on Experimental Music* (Middletown, CT: Wesleyan University Press, 2012), 5.

charges via the compression of solids (quartz, ceramic), and then the postwar boom in hi-fi audio, had left behind a glut of cheap “transducers.” “Transducer” is a generic term for any device that “converts mechanical, magnetic, or acoustic energy into electrical energy, or vice versa.”⁶⁹ What specifically interested Tudor and Cage were phonograph cartridges, which travel the grooves of phonograph records, and stethoscope-like contact microphones, which pick up surface vibrations (whether on musical instruments, industrial machinery, or human throats), and render them audible through electrical amplification. And what ultimately interested them *about* these transducers was not at all straightforward.

As You Nakai has discussed, Tudor (and by extension, Cage) first encountered contact-mic amplification via *Quantitäten* (1958), a work by the young Swedish composer Bo Nilsson (1937–2018) that Tudor premiered “acoustically” in 1958 and subsequently performed with electrical amplification, per the work’s instructions.⁷⁰ Around the same time, Nakai writes, while touring less-than-ideal venues on performance circuits, Tudor soon found amplification a handy remedy, or supplement, to sub-standard pianos and room acoustics.⁷¹ Perhaps inspired by Tudor, Cage made amplification (via contact microphones applied to instruments) an optional component of his sweeping *Atlas Eclipticalis*, which, at its largest, could involve a full, eighty-six-member orchestra. These early uses of amplification were either practically minded, or otherwise plausible—within the remit of microphonics. However, Cage and Tudor wasted no time in developing more impractical, or implausible ways to leverage electricity. In July 1960, Cage completed a work titled *Cartridge Music*. The composition was scored primarily for phonograph cartridges, of which Cage made creative

⁶⁹ Glenn D. White and Gary J. Louie, *The Audio Dictionary*, 3rd ed. (Seattle: University of Washington Press, 2005), 402–403.

⁷⁰ Nakai, *Reminded by the Instruments*, 102–104. Nilsson’s performance instructions specifically stipulate that the work “should in performance in a concert be fortified with the help of one or more loudspeakers whose level . . . is as high as possible.” Nilsson’s stipulation was in part a pragmatic consideration related to his work’s impossibly wide dynamic range. Nilsson demanded sounds so loud and so quiet as to represent, respectively, the upper and lower limits of human “audibility.” Bo Nilsson, *Quantitäten* (1958), translated performance instructions, Box 194, Folder 1, Tudor Papers.

⁷¹ Nakai, *Reminded by the Instruments*, 106.

instrumental use: cartridges of the time traced vinyl grooves with needles that could be easily removed, and Cage found he could replace these needles with such sundry items as “pipe-cleaners, wires, feathers, slinkies, [and] matches.”⁷² [Figure 8]

In performances of *Cartridge Music*, cartridges so modified, along with amplifiers, were distributed among participants, who manipulated their inserted objects to induce vibrations, and produce amplified scratches, scrapes, and clicks. Additional “auxiliary” sounds were derived from contact microphones attached to objects or pieces of furniture (“tables, ladders, moveable carts, chairs”).⁷³ The result was a symphony of what Cage liked to call “small sounds”—the microscopic murmurs of material artifacts made audible. Musician Alvin Lucier has described the effect thus: “Twang the toothpick and you get the sound of wood. . . . The cartridge *amplifies these objects* enormously.”⁷⁴

Cartridge Music marked Cage’s fullest engagement with his longtime interest in small sounds and amplified objects, of which he had made different, less developed use in his *Imaginary Landscape* works decades earlier.⁷⁵ But there was another salient dimension to *Cartridge Music*—one directly linked to the explorations in indeterminacy and “theatre” discussed above. In Tudor’s papers, there exists a brief summary of *Cartridge Music* and its practical specifics, written in Tudor’s hand. The summary ends thus:

Since each player prepares his own part, indications can easily arise which contradict or interfere with the actions of other players. This results in ~~hel helps~~ to make ‘CM’ one of the first ^successful theatrical pieces of ‘live-electronic music.’ /The composer has remarked about the work, “I had been concerned with composition which was indeterminate of its performance; but in this instance performance is made, so to say, indeterminate of itself.”⁷⁶

⁷² Undated description of Cage’s *Cartridge Music* (1960), Box 6, Folder 9, Tudor Papers.

⁷³ Undated description of Cage’s *Cartridge Music* (1960), Tudor Papers.

⁷⁴ Alvin Lucier, *Music 109*, 57 (my emphasis).

⁷⁵ Mumma, *Cyber sonic Arts*, 167–169

⁷⁶ Undated description of Cage’s *Cartridge Music* (1960), Tudor Papers.

Tudor's summary is undated, but were it written around the time of *Cartridge Music*'s composition, it would stand as one of the earliest uses of the *term* "live-electronic music," which appears nowhere in literature prior to the early Sixties. In any event, we can date two of the first recorded uses of "live-electronic music" (by name, or as a similar construction) roughly to this moment, and we can attribute them both to Cage. In the liner notes accompanying a 1963 vinyl recording of *Cartridge Music*, Cage cites, as one of the composition's chief motivators, the desire "to make electronic music live."⁷⁷ And in the concert program distributed at the New York Philharmonic's famously disastrous February 1964 performance of the composer's *Atlas Eclipticalis*, Cage—quoted by program annotator Edward Downes—describes his work thus:

[*Atlas Eclipticalis*] is also an example of what may be called 'live' electronic music. Most electronic music is dependent on magnetic tape for its performance and so becomes a recording. This music uses electronic circuits (microphones, amplifiers, loud-speakers) in connection with musical instruments.⁷⁸

The emergence of live-electronic music as an actor's category is crucial to both the cross-coastal history discussed in this chapter, and the longer history of electronic music. Thus, if Cage and Tudor acted as originating architects of the concept (and there is evidence enough to believe this is the case), it is important that we understand the *definition* of "liveness" that the pair thought to be operative in *Cartridge Music*, a work Cage deemed "indeterminate of itself."⁷⁹

Scored, like *Music Walk*, for "soloists" working together (physically) but apart (structurally), *Cartridge Music* invites collisions and conflicts as in the former work. Crudely, its compositional "tools" comprise overlaid transparencies dictating the manipulation of specific cartridges, auxiliary objects, or amplifier dials ("volume," for changes in amplitude, and "tone control," for changes in

⁷⁷ John Cage, liner notes for *John Cage • Christian Wolff*, Time Records S/8009, 1963, vinyl LP.

⁷⁸ Concert program, 6 Feb 1964, Program ID 3172, New York Philharmonic Shelby White & Leon Levy Digital Archives, <https://archives.nyphil.org/index.php/artifact/2fbec537-ec06-47ec-b99b-3296626ff5a2-0.1>. Downes's notes—and thus Cage's quoted description—concern not only *Atlas Eclipticalis*, but also Cage's *Winter Music (Electronic Version)*, which was performed simultaneously with the former work by David Tudor, acting as a soloist.

⁷⁹ Undated description of Cage's *Cartridge Music* (1960), Tudor Papers.

timbre), the execution of single or repeat actions, and timespans within which said events are to occur (not exact times).⁸⁰ [Figure 9] To these performance conditions, Cage added two significant wrinkles: first, he allowed for what David W. Bernstein terms “performer interactivity,” leaving open the possibility for “one of the performers to change the volume or tone control of another player’s amplifier”; second, he explicitly permitted unpredictable interactivity among technological devices: “feedback, humming, howling, etc.”⁸¹ This was a radical extension of Cage’s indeterminacy as it had operated in his music and theatre up to this point: whereas before, Cage had made it so composers could not predict how performers might interpret their pieces, here, he had made possible situations that not even performers could predict with certainty.

Substantial credit was due, for this hyper-indeterminacy, to electronics. *Cartridge Music* fulfilled the basic dictates of Cage’s theatre in that its unusual objects made for a strange visual spectacle; but it was also theatrical in its pitting of human performers against technological agents, whose misbehavior (amplifier feedback and loud-speaker hum) defied planning or anticipation. Cage had made prior use of technical media like radios and phonographs in live performance (see any of the *Imaginary Landscape* works, or indeed, *Music Walk*), but this sort of *emergent* contingency, dispersed between performers and technological devices, was something new, and it promised, quite precisely, to “make electronic music live.” Cage’s redefinition of “liveness” in the context of *Cartridge Music* introduced a cunning new distinction into electronic music and its associated performance practices—one that would resonate well beyond Cage’s immediate circle of collaborators.

At Tudorfest, *Cartridge Music* surely posed provocative questions—for example, had the multi-channel tape-recordings featured in the Sonics series qualified as “live-electronics”? By inviting Oliveros and her peers to participate in its making (the performance enlisted Oliveros, Sender, and

⁸⁰ David W. Bernstein, “John Cage’s *Cartridge Music* (1960): ‘A Galaxy Reconfigured,’” *Contemporary Music Review* 33, nos. 5–6 (2014): 557–560, <https://doi.org/10.1080/07494467.2014.998419>.

⁸¹ Bernstein, “Galaxy Reconfigured,” 562; John Cage, liner notes for *John Cage • Christian Wolff*.

Subotnick, among others), Tudor ensured the impact of its implications among Tape Center practitioners. In his performance of Cage's *Variations II* (1961), a solo piece for piano that brought a different manner of live electronics to 321 Divisadero, Tudor sharpened these implications still further. As You Nakai observes, Tudor's realization of *Variations II*, which employed Cage's most elastic and formless compositional tools to date (five transparencies bearing single points, and six transparencies bearing single lines, to be superimposed in any way for the measurement of sound-event parameters), has long been regarded as a career "threshold" that put an end to Tudor's time as a performer-interpreter, and set him on his path towards composition.⁸² Nakai is right to argue that this characterization rests on a false division (for Tudor never stopped performing the work of others), but there is still sufficient reason to regard *Variations II* as a breakthrough. Tudor responded to the work's impossibly broad criteria (which, as ever, allowed for "any sound-producing means") with a richly realized yet unexpected solution, thus prototyping, for the very first time, the technical and conceptual meshwork around which he later molded an authorial identity.

For his interpretation of *Variations II*, which represents a clear metabolization of his work on *Cartridge Music* and amplified piano pieces such as Nilsson's *Quantitäten*, Tudor upped the ante of "live-electronic" indeterminacy considerably by wiring the piano for unpredictability. Tudor's most involved performance realizations of the work entailed the following: the placing of microphones above and below the piano, the distribution of contact microphones around its interior and exterior (e.g., on spring coils jammed into the piano's strings), and the use of phonograph cartridges ("prepared" as in *Cartridge Music*), either manipulated by hand, or left to freely vibrate between piano strings.⁸³ [Figure 10] So wired (and amplified through loudspeakers), the piano responded to Tudor's "playing" (the scraping and striking of strings and the soundboard with various tools and

⁸² Nakai, *Reminded by the Instruments*, 141.

⁸³ Frank Hilberg, *David Tudors Konzept des "Elektrifizierten Klaviers" und seine Interpretation von John Cages Variations II (1961)* (Saarbrücken: Pfau, 1996), 20–22.

implements) with complex feedback situations that constantly threatened to escape his control. “The amplified piano is like a creature,” Tudor remarked in a late interview, gesturing towards a “liveness” understood as a volatile animacy.⁸⁴ Reflecting on the dramatic sonic mutations wrought by even the smallest changes or excitations, he described the transformations as “exponential.”⁸⁵

It is unknown just how much of the technological finery cited above was used in the Tudorfest performance of *Variations II*—for indeed, Tudor’s realizations of the work varied in this regard. What is clear from the concert recording, with its squeals, hums, and shuddering vibrations, is that *Variations II* announced Tudor’s changing direction more boldly than any other work on the program, tracing out a new, live-electronic realm into which he had newly entered.

Pauline Oliveros, *Duo for Accordion and Bandoneon with Possible Mynah Bird Obbligato*, 1963–64

Reporting on Tudorfest for the *San Francisco Examiner*’s March 28, 1964 edition, music critic Alexander Fried described a rehearsal for Pauline Oliveros’s original work *Duo for Accordion and Bandoneon with Possible Mynah Bird Obbligato* (1963–64). He painted an implausible scene:

Strange things happened yesterday at the San Francisco Tape Music Center’s theater, 321 Divisadero St., in preparation for what will surely be the strangest set of concerts this city has ever witnessed. Avant-garde composer Pauline Oliveros, wearing girlish full-length black cotton stockings under her informal dress and trussed into safety by a seat belt, sat perilously at one end of a seesaw, making modernist moan [*sic*] on an accordion. Perched at the other end was the world-noted avant-garde pianist David Tudor and in his grasp was—no, not a piano, but another instrument that he masters, the Argentine squeezebox known as a Bandoneon. As the two performers rose and sagged on their seesaw, Ahmed the Indian Mynah bird, in his cage nearby, pricked up eyes and ears, fluttered and occasionally uttered a Mynah bird cry.⁸⁶

The peculiar circumstances that placed David Tudor, Pauline Oliveros, and a squawking mynah bird atop a rotating seesaw, providing for Tudorfest’s single most indelible image [Figure

⁸⁴ Hilberg, 36.

⁸⁵ Hilberg, 35.

⁸⁶ Alexander Fried, “Music in a Mynah Key,” *San Francisco Examiner*, March 28, 1964, 18.

11], arose thus: in 1961, not long before meeting Oliveros, Tudor had begun practicing the bandoneon, a species of concertina well noted for its place in the Argentine tango ensemble. Tudor had been introduced to the bandoneon by composer Mauricio Kagel (1931–2008), whom he had first met at the 1958 Darmstadt Summer Courses (Kagel was present for the explosive lecture on indeterminacy).⁸⁷ Born and educated in Argentina, Kagel moved to Cologne from Buenos Aires in 1957 and subsequently began producing work that cast a satirical eye on the Darmstadt school of avant-garde composition (then dominated by Karlheinz Stockhausen and the pointillist palette of post-Webernism).⁸⁸ Kagel's itinerary had reversed the trajectory of the bandoneon itself; invented in Germany in the mid-nineteenth century, the instrument drifted to the port cities of Argentina and Uruguay several decades later, taking on a new life in the brothels and cabarets where tango thrived.⁸⁹

As Jonathan Goldman has observed, it is a testament to Tudor's avant-garde credentials and virtuoso reputation circa 1960 that Kagel, within just two years of meeting the techno-logical pianist, chose to dedicate to him a work for bandoneon—a notoriously difficult instrument with which Tudor had no working familiarity.⁹⁰ Tudor did not premiere the work in question, *Pandorasbox* (1960), until 1965 (original plans for a 1961 premiere were scrapped), but in the intervening years, he dedicated himself to the bandoneon with characteristic rigor, finding thrilling opportunities for puzzle-solving in the instrument's daunting practical requirements.⁹¹ A “bi-sonic” concertina, the bandoneon has two keyboards, with each set of buttons producing different sounds depending on

⁸⁷ Jonathan Goldman, “The Buttons on Pandora’s Box: David Tudor and the Bandoneon,” *American Music* 30, no. 1 (Spring 2012): 34–36, <https://doi.org/10.5406/americanmusic.30.1.0030>.

⁸⁸ Paul Griffiths, “Unnecessary Music: Kagel at 50,” *The Musical Times* 122, no. 1666 (December 1981): 811–812, <https://doi.org/10.2307/961246>.

⁸⁹ María Susana Azzi, “A Hellish Instrument? The Story of the Tango Bandoneón,” in *The Accordion in the Americas: Klezmer, Polka, Tango, Zydeco, and More!*, ed. Helena Simonett, Music in American Life (Urbana: University of Illinois Press, 2012), 236–238.

⁹⁰ Goldman, “Buttons on Pandora’s Box,” 36.

⁹¹ Goldman, 42–43.

the position of the bellows (open/closed). Thus, per Goldman, “no fewer than four separate key arrangements need to be mastered: left hand/right hand, opening bellows/closing bellows.”⁹² One of very few accordionists in the avant-garde orbit, Oliveros would have been thrilled to learn of Tudor’s work with the bandoneon at the pair’s 1963 meeting, and by this time, Tudor must have boasted a respectable level of technique; Oliveros’s confidence in him was sufficient that she set to work writing a bandoneon-accordion duo for them immediately.

Already by October 3, 1963, Oliveros had begun to mail Tudor parts of *Duo for Accordion and Bandoneon*’s as-yet unfinished score, which in its first of two iterations, took the form of a hybrid notation fusing textual directives and graphics to conventional staves.⁹³ (Recall that at this post-*Sound Patterns* moment, she was “still thrashing with notated music.”⁹⁴) And in her October 3rd communication, Oliveros informed Tudor that another performer would be joining them on stage: “Our duo will be a trio for accordion, Bandoneon, and Mynah Bird,” Oliveros wrote, “as Ahmed has made a definite bid to be a member of this performance.”⁹⁵ Ahmed the Mynah Bird belonged to Oliveros’s then-partner Laurel Johnson (a participant in the “Sonics” performances, as well as Sender, Martin, and Ken Dewey’s *City-Scale*, 1963), and evidently responded positively to Oliveros’s at-home practice sessions, “producing fantastic combination tones.” If Ahmed represented the first curveball thrown to Tudor in the lead-up to *Duo for Accordion and Bandoneon*’s Tudorfest premiere, the second took the form of a rotating see-saw equipped with two freely revolving seats.

The “handsome” and “absolutely silent” contraption was the handiwork of dancer Elizabeth Harris.⁹⁶ As discussed in Chapter 2, Oliveros had collaborated with Harris in late 1962, soundtracking the latter’s dance *Seven Passages* (1963) with tape music, mixed live. At some point

⁹² Goldman, 32–33.

⁹³ Nakai, *Reminded by the Instruments*, 143–144.

⁹⁴ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

⁹⁵ Pauline Oliveros to David Tudor, October 3, 1963, Box 57, Folder 8, Tudor Papers.

⁹⁶ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

during *Duo for Accordion and Bandoneon*'s development, Harris had asked Oliveros, "How would you like to play your piece on a see saw?"⁹⁷ Oliveros took readily to the idea, and apparently so did Tudor, who joined her in rehearsing on the wooden "instrument" according to Harris's direction. A caged Ahmed, not to be forgotten, was suspended over the see-saw's center as part of a makeshift mobile. Harris's original choreography, which guided Oliveros and Tudor through a delicate "setting [of] the mobile in motion," on to revolutions "to the left, [and] to the right," and to "patterns of revolving with up and down motions," worked marvelously, the myriad rotations throwing Oliveros and Tudor's sounds "in and out of phase," and conjuring "incredible stereophonic effects."⁹⁸ With little more than inspired carpentry, Harris had provided Oliveros and Tudor with a means of dynamically spatializing their instruments' dueling melodic phrases, and thus emulating surround-sound stereo. There was just one issue: how were Oliveros and Tudor to read their sheet music while whirling about in their chairs?

What began as a problem begging resolution—the foreclosure of the score as a viable adjunct to performance—ultimately inspired a creative rupture for Oliveros and Tudor both. Already at war with notation and thus unperturbed by the situation at hand, Oliveros "decided to throw out [her] score and instead [make] an improvisation mnemonic which was influenced by [Tudor's and her] rehearsals of the written score and cued by the motions of Elizabeth's choreography."⁹⁹ "It was good," Oliveros recalls, "to be free of the written material."¹⁰⁰ Finding no explicit need for cues bound to paper, Oliveros and Tudor thus availed themselves of corporeal and environmental triggers; if the sequenced revolutions of the pair's bodies functioned as one arm of their "improvisation mnemonic," Tape Center artist Tony Martin provided further cues via the

⁹⁷ "Theater Piece Book," ca. 1968–1972, Oliveros Papers.

⁹⁸ "Theater Piece Book," ca. 1968–1972, Oliveros Papers.

⁹⁹ "Theater Piece Book," ca. 1968–1972, Oliveros Papers.

¹⁰⁰ "Theater Piece Book," ca. 1968–1972, Oliveros Papers.

modulation of stage lighting. (The first performance of *Duo for Accordion and Bandoneon* featured a “dark section with flashes,” discontinued because of Ahmed’s fretful response.¹⁰¹)

Despite the fact that Ahmed, as reported an April 1, 1964 *Examiner* write-up, apparently didn’t “obligge” Oliveros and Tudor with his promised obbligato, Oliveros’s *Duo for Accordion and Bandoneon* was arguably the runaway success of Tudorfest—certainly in the eyes of critics, who readily lapped up the work’s inherent theatricality.¹⁰² And for Oliveros and Tudor, *Duo for Accordion and Bandoneon* represented personal changes of much wider significance: in the first place, the work inaugurated a lifelong friendship, and an ongoing collaborative exchange that would extend into 1965–66 and after, awakening in both figures depths and sensibilities that might otherwise have remained unsounded. Second, incorporating indeterminacy-*cum*-improvisation, shades of Cage’s “theatre,” and even—with its purely acoustic stereophony—the specters of the electronic, *Duo for Accordion and Bandoneon* honored Tudor with a précis of his development in 1960–63—a period during which he worked, with Cage, to unmake his techno-logical identity. Finally, in retrospect, Oliveros and Tudor’s ditching of their sheet music atop Harris’s see-saw would seem a significant passage-point for both figures, whose subsequent paths towards live-electronic music (formulated in two very different ways), severed their last remaining ties to conventional composition and notation.

In the immediate term, the San Francisco Tape Music Center felt the aftershocks of Tudorfest as keenly as *Duo for Accordion and Bandoneon*’s joint performers, for the work represented in the concert—and Cage’s work, most of all—threw down a clear gauntlet, clarifying, for Sender, Subotnick, Martin, and others, the creative direction in which they wanted to go next. On May 12, 1964, over one month out from the conclusion of Tudorfest, Oliveros wrote Tudor the following expression of gratitude, making clear the changes that were developing in his wake: “It was a joy to

¹⁰¹ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

¹⁰² Alexander Fried, “Zaniest Concert in Local History,” *San Francisco Examiner*, April 1, 1964, 24.

hear all the music and have the opportunity to perform with you. Everyone is much richer having had the benefit of your experience. . . . 321 Divisadero is having growing pains plus crises of all sorts. It will never be the same. Ha Ha Ha Ha Ha.”¹⁰³

2. “Liveness” two ways

Tudorfest ended on April 3, 1964. In the two years that followed, Tudor and Oliveros each took critical steps towards defining what “liveness,” or presence, might mean in the context of electronic musical performance. Although this chronology strongly suggests that Tudor and Oliveros were acutely affected by their contact and collaboration, such a suggestion has never been seriously pursued by the composers’ historical commentators, who have tended to deemphasize or otherwise ignore their demonstrable exchange of influence. In the two vignettes that follow, I remedy this silence by tracing the ripples of Tudorfest into a pair of major transitional works of 1964–1965: Tudor’s *Fluorescent Sound* (1964) and Oliveros’s *Pieces of Eight* (1965).

Depending on who you ask, *Fluorescent Sound* is either Tudor’s compositional debut, or a prelude to his debut proper: *Bandoneon! (A Combine)* of 1966 (see section 3). Tudor himself hesitated on the point, tending towards the latter interpretation, but nevertheless giving *Fluorescent Sound* a place of priority on resumés compiled much later in his life.¹⁰⁴ Tudor’s hesitation may have followed from his relative lack of technical knowledge in 1964, and the consequent simplicity of *Fluorescent Sound*. Produced for a live performance by artist Robert Rauschenberg, the work is in any case a telling reflection of a Tudor left to his own “devices” for the very first time. As I discuss, the work

¹⁰³ Pauline Oliveros to David Tudor, May 12, 1964, Box 57, Folder 8, Tudor Papers.

¹⁰⁴ For a representative account of *Fluorescent Sound* (1964) in which Tudor hedges regarding its status as a composition, see David Tudor, “I smile when the sound is singing through the space”: An interview by Teddy Hultberg in Düsseldorf, May 17, 18, 1988, last modified November 29, 2001,

<https://daviddtudor.org/Articles/hultberg.html#Untitled/Toneburst>. Tudor includes *Fluorescent Sound*, classed as a composition, on a resumé (c. 1969–1970) in Box 27, Folder 27, Oliveros Papers NYPL.

begins to draw out of the charged implications of Cage's *Cartridge Music* (1960), and Tudor's idiosyncratic realization of the former's *Variations II* (1961), searching after electronic liveness by emphasizing the agency and unpredictability of technology.

Oliveros regards her starkly different *Pieces of Eight*, an elaborate, prop-strewn musical satire inspired by Robert Louis Stevenson's (1850–1894) *Treasure Island* (1863), as having inaugurated her string of mid-Sixties "theater pieces": works that embed music in a larger aggregation of visual, choreographic, and narrative components. I first draw a connection between Oliveros's move to "theater pieces," and her experience organizing Tudorfest. I show that *Pieces of Eight* bears the inspiration of both Cagean "theatre," and, more conspicuously, the text scores of Fluxus artists such as George Brecht. I next raise the more provocative argument that *Pieces of Eight*, beneath its outward appearance, is a nascent product of Oliveros's extended work with tape, and her "absorption" of electronic influence. Created while Oliveros was still learning how to deploy tape-technology in the live-performance context, the work announces, but does not consummate, a very different negotiation of the body, electronics, and liveness. In the next section, moving into late 1965 and 1966, we will see Oliveros and Tudor properly codify their respective models of a live-electronic music, emboldened both by a greater familiarity with media, and their continued collaboration.

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In September 1964, an event series titled "Five New York Evenings" brought a string of concerts and happenings—and several of New York City's most noted artists and performers—to Stockholm, Sweden at the Moderna Museet. Organized jointly by museum director Pontus Hultén and the Swedish arts organization Fylkingen, the series featured performances by the Merce Cunningham Dance Company, dancer Yvonne Rainer (1934–) and artist Robert Morris (1931–2018), dancers Alex and Deborah Hay (1930–, 1941–), artist Öyvind Fahlstrom (1928–1976), and

artist Robert Rauschenberg.¹⁰⁵ John Cage and Tudor were in Stockholm with the Cunningham Company, then on a world tour, in their respective roles as the Company's music director and accompanist; however, they were also slated to contribute a duo-piano concert to the Moderna Museet production. Rauschenberg, too, was in Stockholm under the Cunningham umbrella: since 1954, when he contributed a vibrantly collaged and free-standing wooden structure to Cunningham's dance *Minutiae*, he had functioned as the Company's designer and stage manager, handling stage-dressing and set pieces, costumes, and lighting.¹⁰⁶

In his years spent juggling these many roles, Rauschenberg had grown reasonably close to Tudor. Indeed, in June 1961, Rauschenberg, and artists Jasper Johns, Jean Tinguely (1925–1991), and Niki de Saint-Phalle (1930–2002) staged a combined concert-performance in Tudor's honor (*Hommage to David Tudor*) in a theater at the American Embassy in Paris. The event was considerably less organized than Oliveros's Tudorfest: evidently, Tudor had arrived in France at the start of a concert tour, and Rauschenberg and Johns were so pleased by his presence that they promptly spearheaded the proceedings.¹⁰⁷ At the *Hommage*, variously, Tudor played an unamplified version of Cage's *Variations II* (1961) on piano, Rauschenberg executed a painting live on stage, turning the canvas away from the audience, but affixing it with contact microphones (no doubt borrowed from Tudor), and de Saint-Phalle hired “the world’s second-best sharpshooter” to fire at one of her sculptures, positioned perilously close to Rauschenberg.¹⁰⁸ **[Figure 12]**

Given his lively history with Tudor, and his fraying relationship with Cage and Cunningham at the time of the “Five New York Evenings,” one can understand why Rauschenberg might have

¹⁰⁵ Carolyn Brown, *Chance and Circumstance: Twenty Years with Cage and Cunningham* (Evanston, IL: Northwestern University Press, 2009), 406–407.

¹⁰⁶ Michelle Potter, “‘A License to Do Anything’: Robert Rauschenberg and the Merce Cunningham Dance Company,” *Dance Chronicle* 16, no. 1 (1993): 5–8, <https://doi.org/10.1080/01472529308569113>.

¹⁰⁷ Calvin Tomkins, *Off the Wall: A Portrait of Robert Rauschenberg* (New York: Picador, [1980] 2005), 175.

¹⁰⁸ Tomkins, *Off the Wall*, 175–176.

taken the unusual step of requesting, from the increasingly reluctant pianist, an original piece of music for his event contribution: a performance “duet” with a live cow titled *Elgin Tie* (1964).¹⁰⁹ What is more surprising is that Tudor accepted the assignment, for never had he created outside of the boundaries (however elastic) provided by composer-collaborators like Cage. As discussed earlier, historians have been quick to identify Tudor’s realization of *Variations II*, for which he constructed an amplified, feedback-drooling piano-turned-“creature,” as *the* transitional moment at which he lofted himself from the familiar territory of interpretation into the higher realm of composition. The identification is compelling, but then, why should three years have transpired between this supposed transition, and Tudor’s decisive choice to score *Elgin Tie* with sounds of his own design? And what suddenly changed in 1964?

Of course, Tudor changed; and there is ample evidence to suggest that what changed or catalyzed him was Tudorfest. At the Tape Center concerts, which unfolded in an environment far from both New York and Darmstadt, Tudor had the rare opportunity to work with younger admirers who regarded him on his own terms, and not as an extension of Cage or Stockhausen (Oliveros had called the series “Tudorfest,” after all). What is more, he was given the chance to look back upon his own recent performance history (and his developing breach with his techno-logical reputation), and to look forward and onward to a future of works like Oliveros’s *Duo for Accordion and Bandoneon* that might allow him to jettison the piano once and for all. In carving out a place for Tudor’s new love, the bandoneon, Oliveros had ensured that Tudorfest was not just a retrospective, but an announcement of an evolution yet to come. For this, no doubt, Tudor was grateful. “The festival was a great joy for me,” Tudor reported to Oliveros in late May 1964, adding, “some of the performances are the best ever.”¹¹⁰

¹⁰⁹ Brown, *Chance and Circumstance*, 406–407.

¹¹⁰ David Tudor to Pauline Oliveros, May 19th, 1964, Box 27, Folder 27, Oliveros Papers NYPL.

Tudor was thus primed to accept Rauschenberg's challenge at the Moderna Museet. The artist's *Elgin Tie* was to unfold as follows: Rauschenberg would lower himself from a museum skylight at the center of a large gallery space, inching down a rope "strung with a heterogenous collection of objects and clothing," and landing snugly in a barrel of water set atop a flatbed cart.¹¹¹

[Figure 13] After his soaking, Rauschenberg was to be joined by his *Elgin Tie* co-star: a live cow shepherded through the gallery by a "stalwart farmer," and assisting stagehands.¹¹² The visual prompt was richly evocative, of course, but Tudor was limited as to his creative options: Rauschenberg preferred that the music be quiet (he feared that the cow might defecate in response to noise), and additionally, as You Nakai points out, there is no evidence in performance photos that Tudor had access to a robust sound-system equipped for live processing.¹¹³ Contact sheets documenting *Elgin Tie* reveal only one horn loudspeaker standing lonely vigil in the corner of the gallery space. [Figure 14] While Tudor certainly could have opted for a subdued piano performance, recourse to his old instrument was evidently not to his taste.

As Tudor tells it in his few, spare accounts of *Fluorescent Sound*'s (1964) origins, an idea for a piece came to him as he walked around the museum in the days prior to *Elgin Tie*: "One day I was in the room when someone was turning on the fluorescent lights and they didn't know which to turn on and all of a sudden there was the most beautiful music."¹¹⁴ It is significant that Tudor specifically cites *hesitation* on the part of this anonymous "someone"—an unsure switching-on-and-off of multiple lights—for he heard "music" not in the steady-state buzz of fully lit fluorescent tubes, but in the aleatory pops and flickering noises that dwell in the two-to-three seconds of delayed ionization. Curious to see whether this "beautiful music" could be amplified, Tudor ascended a

¹¹¹ Nina Sundell, *Rauschenberg/Performance 1954–1984* (Cleveland, OH: Cleveland Center for Contemporary Art, 1984), 12–13.

¹¹² Brown, *Chance and Circumstance*, 409–410.

¹¹³ Tudor, interview by Hultberg; Nakai, *Reminded by the Instruments*, 207.

¹¹⁴ Tudor, interview by Hultberg.

ladder and fixed a contact microphone to a fluorescent tube; finding that his desired sound could be achieved, he spent three days distributing contact microphones among approximately 250 bulbs present in the large gallery space, which Cunningham Company dancer Carolyn Brown recalls was “three times as wide as the Metropolitan Opera House stage.”¹¹⁵ How was Tudor to “play” his work?

In speaking to a Swedish scenographer named Sören Brunes, whose help Tudor enlisted when preparing his *Elgin Tie* music, You Nakai has determined that these ~250 bulbs were controlled not by *switches* in a separate room, as previously reported, but by screw-in fuses, with each fuse controlling three lights. Tudor would have been pleased to find that the fuses and bulbs did not communicate on a one-to-one basis: this branching structure would have added a further layer of unpredictability to an operation already rendered imprecise by the fickle nature of fluorescent tubes. In *Fluorescent Sound*, these randomizing factors assumed the role played by “feedback, humming, howling, etc.” in *Cartridge Music* (1960) and *Variations II*. Still desiring some performance parameters, Tudor drew up a score, never located, by which the fifty-to-seventy-five fuses could be manipulated to the greatest (most lively) effect. Nakai speculates that in rehearsal, Tudor placed Brunes and his friend at the fuse-boxes (located, recall, outside of the gallery) so that he could see and hear his piece in action.¹¹⁶ And there is evidence that when *Elgin Tie*’s premiere came around, Tudor operated the fuses himself—which means this milestone in his career unfolded out of view and earshot.¹¹⁷ One must trust others’ recollections as to how *Fluorescent Sound* actually sounded: curator Nina Sundell, in a retrospective account of Rauschenberg’s performance activities, has characterized Tudor’s piece as a “‘bell’ sounding orchestra.”

¹¹⁵ Brown, *Chance and Circumstance*, 406–407.

¹¹⁶ Nakai, *Reminded by the Instruments*, 207.

¹¹⁷ Nakai, 207. This is Nakai’s supposition, based on available photographs of the *Elgin Tie* performance.

Fluorescent Sound has generally been regarded as a kind of *qualified* composition in two respects: in the first place, historical commentators have stressed the “readymade”-like character of the work, which, to be sure, Tudor has always tried to characterize as the product of last-minute resourcefulness. D’Arcy Philip Gray, for example, has remarked that the “piece made use of ‘existing technology’ in the most literal sense.”¹¹⁸ Second, Tudor long expressed ambivalence as to whether the work qualified as a composing debut. The following exchange, which occurs in Tudor’s 1988 interview with Teddy Hultberg, is representative in its slipperiness:

Hultberg: When did you first sign your name to a composition?

Tudor: I was working in electronics a great deal and at one point when I was working on an electronic set-up, the thought came into my head, ‘well, this is mine,’ you know, ‘this belongs to me.’ . . .

Hultberg: When was that?

Tudor: The first time was 1964 although the first one I actually signed my name to was *Bandoneon* in 1966. But the first piece was actually in 1964 which was done at the Moderna Museet in Stockholm and at that point I had not titled the piece. I titled it after that [*Fluorescent Sound*].¹¹⁹

Tudor is correct in his recollection that he titled *Fluorescent Sound* after the fact. You Nakai perceptively points out that on the program for “Five New York Evenings,” Tudor is credited, beneath the entry for *Elgin Tie*, with the following line: “Fluorescent sound: David Tudor.”¹²⁰ As a point of comparison, an identically formatted credit beneath another work reads: “Arm make up: Öyvind Fahlström.” This dryly enumerated (and unitalicized) credit, which accords Tudor’s “composition” the same status that one would stage-lighting, appends an unassailable asterisk to *Fluorescent Sound*. And even if Tudor, around the time of the work’s execution, *had* thought to regard it differently—as something more than stage-setting—he evidently kept his feelings to himself:

¹¹⁸ D’Arcy Philip Gray, “The Art of the Impossible,” last modified January 28, 1999, https://daviddtudor.org/Articles/dpg_impos.html.

¹¹⁹ Tudor, interview by Hultberg.

¹²⁰ Nakai, *Reminded by the Instruments*, 207–208.

according to D'Arcy Philip Gray, Tudor "neglected to tell anyone that it was his first fully realized composition."¹²¹ Despite all this, however, Tudor's continued desire to speak about *Fluorescent Sound* over the years, and his efforts, however cryptic, to give it a retroactive buffing, gesture towards a real and stubborn significance. Clearly, this significance occurred to Tudor as early as 1969–1970, when he chose to list *Fluorescent Sound* (this time underlined, and, significantly, with "sound" capitalized) as the first entry in an undated resumé's "works" section.¹²²

For us, the significance is clear: *Fluorescent Sound* may say something ambiguous about Tudor's status as an original author in 1964, but it is nevertheless a focused expression of his design for a "live" electronic music, and one that reveals precisely what he took from his work on *Cartridge Music* and *Variations II*. In this case, the absence of more refined technological means, and the fact of Tudor's still-developing technical knowledge function as assets. It is the sonic and conceptual purity of *Fluorescent Sound*, which is premised only on the caprice of gas and electrons, and the labyrinthine complexity of a wiring system used but not understood, that allows us to identify what Tudor first *heard* in his electronic explorations with Cage, and what, after Tudorfest, he followed into the great unknown of solo creation.

In a biography loosely dateable to 1969–70, Tudor wrote that "in the early 1960's, he [Tudor] and Cage initiated the continuing trend of 'live,' as distinct from taped, electronic music," both taking ownership of live-electronic music as a practice and positing it as a product of his collaboration with Cage. But clearly, even if Tudor and Cage saw eye-to-eye regarding the nature and stakes of electronic "liveness" at the beginning of their electronic explorations, they quickly began to diverge in their thinking. For Cage, the beauty of *Cartridge Music*, with its potentially chaotic "performer interactivity," and built-in technological hiccups, lay in its creation of completely

¹²¹ Gray, "The Art of the Impossible."

¹²² Undated biography and resumé (c. 1969–1970), Box 27, Folder 27, Oliveros Papers NYPL.

contingent situations for its human interpreters, who knew not whether their sounds would be rendered inaudible by a collaborator's hand on their amplifier dial, or by whorls of feedback. Allowing for performance "indeterminate of itself," *Cartridge Music* thus coronated a decade-long search for the annihilation of habit and intention begun with *Music of Changes* (1951) and continued with the *Concert for Piano and Orchestra* (1957–58), *Variations I + II* (1958, 1961), and the like.

We know this because *Cartridge Music* inaugurated a decade during which Cage committed intensely to electronics, exchanging former philosophical touchstone—e.g., South and East Asian thought—for the techno-optimism of media theorist Marshall McLuhan, and architect-polymath Buckminster Fuller.¹²³ Refracted through the thought of McLuhan, who held that electronic networks had rewired our perception, and exploded the privacy of sense and subjectivity, to feel one's actions *amplified*, electrified, was to feel one with the vast, encompassing central nervous system that media had woven together from the "brains and nerves of man around the globe."¹²⁴ Just as felt, rubber, and knives had once helped Cage prepare his piano and thus jam the smooth function of intention and ego, electronic amplification promised a preparation of the *self*: a wiring for ego-death.

Cage most explicitly articulated this implication of electronics in a work titled *0'00" (4'33") No. 2* (1962), whose original score reads, "In a situation provided with maximum amplification (no feedback), perform a disciplined action."¹²⁵ The premiere of the work, which took place in Tokyo in October 1962, consisted of him *writing its very score*. [Figure 15] This gesture suggested that with amplification, performance and composition could be collapsed into a "live-electronic" dance between a human performer and a technological "sound-system" (a new Cagean coinage).¹²⁶ Tudor,

¹²³ Pritchett, *Music of John Cage*, 150–152.

¹²⁴ Bernstein, "Galaxy Reconfigured," 563–566.

¹²⁵ Fetterman, *John Cage's Theatre Pieces*, 83–84.

¹²⁶ Pritchett, *Music of John Cage*, 152–154.

who would be increasingly called upon to build and maintain Cage's "sound-systems" over the course of the Sixties, also found this dance to be a moving component of *Cartridge Music*; but he was clearly more interested in his technological partners than in his own performance. We know this because Tudor followed his work on *Cartridge Music* with his highly idiosyncratic realization of *Variations II*, which worked within Cage's usual "parameters" (measured with the help of transparencies), but subordinated Cage's remaining hold on the composition to the agency of a complex feedback system. His notes read:

my realization of *VII* evolved from a decision to employ the amp. pno. [amplified piano], conceived as an electronic inst. [instrument], whose charitics. [characteristics] *orient the interpretation* of the 6 parameters to be read from the ~~score~~ materials provided by the composer. . . . in performance the parameters can interact in unforeseen ways, & the performance becomes a process of constant invention & reinvention of the sound events.¹²⁷

Regrettably, we have no such clarifying notes related to *Fluorescent Sound*; but then, perhaps we don't need them. Interpreted most simply, the work takes "existing technology"—a network of fluorescent bulbs—and exploiting little more than built-in delay time, and the fuse-box's opaque logic, makes it behave in "unforeseen ways." The locus of "orientation" and, indeed, "invention," lies in the technology, and thus out of the hands of the composer and performer both. For Tudor, *Cartridge Music*, *Variations II*, and *Fluorescent Sound* must have seemed a steady passing of a torch: if the flexibility of Cage's indeterminacy had tempered his obsession with fixity, and "theatre" had given him back his body, these works promised to release him, once and for all, from his duties as a human *medium* by remediating the musical life, or "liveness," that formerly spoke through his technologal body.

From his work on Boulez's Second Sonata and Cage's *Music of Changes* onwards, Tudor had thought it his duty to re-invent his own body and mind in order that he might, following his spiritual mentor Ferruccio Busoni, restore the "primitive emotion" that the "composer's inspiration necessarily

¹²⁷ Undated description of *Variations II* (1961) realization, Box 8, Folder 7, Tudor Papers (my emphasis).

loses through notation.”¹²⁸ While Busoni was convinced of the power of the human interpreter, and of the necessity of “transcribing” music’s animate, abstract essence, he had, at the end of his *Sketch of a New Esthetic of Music* (1907), detected a “vista of fair hopes” in so strange a savior as Thaddeus Cahill’s Telharmonium (Dynamophone), a hulking, two-hundred-ton apparatus that sounded the currents of electrical dynamos, or generators.¹²⁹ Clearly, by the end of 1964, Tudor had heard the murmur of a lively “primitive emotion” in the electricity coursing between fluorescent tubes, and he had discovered a music that could engage in “invention & reinvention” so that he himself did not need to. While we must be careful, here, not to ignore Tudor’s own ambiguous perspective on *Fluorescent Sound*, and the fact that he only recuperated it as a composition in retrospect, it is patent that it illuminated his way forward: towards *Bandoneon! (A Combine)* (1966), his debut proper, and towards a live-electronic music of his own definition.

One last reflection at this stage: given the close correlation of Tudor’s notational practices to his personal development, it is unfortunate that *Fluorescent Sound*’s “score” has been lost, and that the work exists only in the memories of the attendees at “Five New York Evenings” (and the wiring of Stockholm’s Moderna Museet).¹³⁰ The athletic demands of *Music Walk* (1958), we will recall, had forced Tudor to circumvent his scanning protocols and adopt a form of textual shorthand fusing cryptic abbreviations and mnemonics to clocked time, measured in seconds. *Cartridge Music* and *Variations II* encouraged further simplifications. For the former work, Tudor developed a glyph-like language of single letters and geometric flourishes: in the most refined iteration of his *Cartridge Music* realization scores, for example, “C’s” bounded in squares prompt a change of cartridge (or inserted object), and capital “V’s,” accompanied by upward or downward diagonals, denote upward and

¹²⁸ Ferruccio Busoni, *Sketch of A New Esthetic of Music*, trans. Theodore Baker (New York: G. Schirmer, [1907] 1911), 17.

¹²⁹ Busoni, *New Esthetic of Music*, 33.

¹³⁰ Nakai, *Reminded by the Instruments*, 205.

downward shifts in volume.¹³¹ [Figure 16] For his dance with the amplified piano in *Variations II*, Tudor simply prepared strips of “graphic figures” he termed “nomographs,” which, free of *any* textual and numerical information (including time-markers), made “all conditions [parameters] for each event readable at a single glance.”¹³² [Figure 17]

As regards the necessity of the “glance” in *Variations II*, it is suggestive that Tudor could depart from scanning, but not the forwardly visual experience of encountering scores. And yet, there is a clear change in the notation being encountered: an increase of graphical ambiguity, or obscurity, proportional to an increasing complexity in Tudor’s technological arsenal. In this sense, there is a certain poetry to *Fluorescent Sound*’s score being lost: this work can thus mark a moment when Tudor achieved a technological liveness wholly resistant to representation (and least for now) and recovered a different kind of life within himself.

♦ O ♦

In 1964 and early 1965, Oliveros found herself at a moment of transition not unlike Tudor’s own; and there is every indication that this moment was mediated by her encounter with Tudor and the work of his composer-collaborators at Tudorfest. This was a period during which Oliveros moved from electronic music to the construction of elaborately staged productions she termed “theater pieces.” In these theater pieces, which made use of script-like prose notation, humorously called attention to concert-hall conventions, and toppled the “fourth wall,” Oliveros achieved a new kind of musical “liveness” or stage presence premised on new relationships among performers and audience members. At first, these theater pieces made only subtle use of electronic media; yet their original conception owed considerably to Oliveros’s experiences with tape. It is thus that at this unusual time, during which Tudor’s work with electronics moved him to discover a liveness in

¹³¹ Iddon, *Cage and Tudor: Correspondence*, 168–173.

¹³² Undated description of *Variations II* realization (1961–62), Tudor Papers.

technology, Oliveros's "relays" moved her to construct lively new connections among embodied human performers. In what follows, I will reconstruct her little-understood transition from electronic music to the "theater piece" in 1964–65, locating this transition within a larger move, among the Tape Center cohort, towards multimedia integration, and addressing the role played by Cage and Tudor's influence in these developments. My discussion will culminate with a closer look at *Pieces of Eight* (1965), Oliveros's first fully realized theater piece.

First, we should back up for a moment: recall that between 1958 and 1963, Oliveros engaged intensely with the medium of tape, participating in a feedback loop of exchange and influence that saw her both drawing on tape's affordances ("absorbing" them, to use her precise term), and, in turn, impressing herself upon the technology. At the end of Chapter 2, *Sound Patterns* (1961–62) was discussed as a consequence of these "relays," and more specifically, as a work that adapted the electronic sound-world of *Time Perspectives* (1961) to the flesh-and-blood body in the unlikely context of choral form. *Sound Patterns* was discussed largely in terms of its negative, techno-critical logic—the way it brought its tape-inspired "vocables" into collision with the stubborn materiality of the body. But the work was anything but a turn away from electronics. In a 1981 interview, Oliveros reflected that *Sound Patterns* was one of several early Sixties works that "represent the dissolution of notation" in her practice.¹³³ This dissolution was a positive development, affording Oliveros the "freedom that comes when you're not nailed to a page," and she had tape to thank for her newfound freedom:

Beginning to make music on tape—there was not any way for me to deal with the notation and the kinds of sounds I was interested in, because of our conventional notational system is centered around pitch and time. . . . The conventional way of notating was no good for me, and so I began to work in the oral tradition because. . . I had a handy-dandy device which is called a tape-recorder which remember everything. [Y]ou can play [sounds] back and hear them and listen to them and get them reorganized in your mind.¹³⁴

¹³³ Pauline Oliveros, "Interview with Pauline Oliveros," by Beth Anderson, *Ear Magazine*, March 1981, 13.

¹³⁴ Oliveros, interview by Anderson.

This is the clearest articulation of what Oliveros had “absorbed” by 1964: not only had tape exposed her to a new sound-world that could be conjured and manipulated *off* as well as *on* tape, but it had also taken on the role of a new prosthetic mind or memory capable of reorganizing thought, and promoting a new, freer manner of listening and working. If tape had provoked these changes in Oliveros as early as *Sound Patterns*, it was not until after Tudorfest that she recognized the stakes and implications of the “oral tradition” she now found herself in. At this time, as she writes, “[She] wanted to include visual, kinetic, and dramatic elements in [her] music,” and “[her] grand composition became a grand theater piece.”¹³⁵ “I charged myself,” Oliveros explains, “to be aware of everything all the time: sound, sight, movement, all that the range of the sensory system can tune to.”¹³⁶ Just as her windowsill recording session in the late Fifties had inspired her to expand the scope of her listening, Oliveros’s further dealings with tape had yielded a new kind of embodiment rooted in a rich interplay of the senses. Before Tudorfest, Oliveros did not have a name for this embodied interplay—what she termed a “synthesis.”¹³⁷ After Tudorfest, she called it “theater.”

Oliveros has always stated that the entry of theater into her musical practice, and thus the development of what she termed her “theater pieces,” was prompted by her work with tape. At some point at the tail-end of the Sixties, by which time she had taken a position in University of California, San Diego’s Department of Music, she set about writing a long document which in her papers bears the title “Theater Piece Book.” Seemingly written at first for internal UCSD purposes (but later reworked for an abandoned publication), the text does not look forward, but rather, back, reflecting on Oliveros’s biography, and attending most closely to her work with “theater.”¹³⁸ Even in

¹³⁵ Oliveros, *Software for People*, 184–85.

¹³⁶ Oliveros, 184–185.

¹³⁷ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

¹³⁸ Included in Oliveros’s “Theater Piece Book” is an undated memo, signed by UCSD’s Music Department Chairman Will Ogdon, prevailing on faculty for descriptions of research they might undertake as part of a “Center of New Music Research”; Ogdon, who had been looking to found (and fund) a center for experimental music research since his arrival at UCSD in the mid Sixties, was to provide these descriptions to the school Chancellor. What seems clear is that Oliveros began compiling her “Theater Piece Book” in fulfillment of Ogdon’s request; what is less clear is when exactly

its unpublished, patched-together form, the “Theater Piece Book,” which collates handwritten notes, newspaper clippings, doodles, and a typed manuscript, is a highly revealing document. And on one of its first pages, in a stack of bullet-like subject lines, we find the following: “Relation of theater to electronic music.”¹³⁹ What was the nature of this “relation”? Asked by one interviewer how she “[got] from tape music to theater music,” Oliveros had the following to say:

It seemed to come out of a need to have something happen. When you’re presenting tapes, there’s nothing to look at, so theater suggested itself quite readily in connection with tape. Also, because of the improvisations that we did. We were sharing the space at Di Visadero Street [*sic*] with Ann Halprin and her dancers’ workshop, so there were people around who were quite interesting to work with. A collaboration naturally developed.¹⁴⁰

Oliveros’s second assertion—that her proximity to and working relationship with dancers helped press her towards theater—is manifestly true, and it will be addressed in turn. But her first comment, which, echoing a remark by Tony Martin cited earlier, links the visual impoverishment of the electronic music concert to the development of theater, seems a facile reduction of more complex thinking on Oliveros’s part. Indeed, while this perspective holds that theater came about to supplement a *lack* at the heart of electronic musical performance, Oliveros’s other remarks cited above—regarding her assimilation into an “oral tradition,” and the expansion of her awareness to include the “visual, kinetic, and dramatic” as well as the sonic—suggest that tape awakened in her a new sensorial fullness and interconnectivity. In 1958, in KPFA’s studios, the unblinking ear of the Ampex machine had given Oliveros and her collaborators the courage to improvise free of pre-

she began work on the document. As we will see in Chapter 4, Ogdon’s dreams of a UCSD research center were finally realized in 1972, when funding from the Rockefeller Foundation and Ford Foundation supported the establishment of the Center for Music Experiment, or CME (initially Project for Music Experiment, or PME); and Oliveros has suggested that plans for the CME extended back at least five years from the date of the center’s founding. See Pauline Oliveros, “On the Need for Research Facilities for New Music and the Related Arts” (1979) in *Software for People*, 198. As the “Theater Piece Book” is dated 1968 in the Oliveros Papers records, it seems probable to me that Oliveros began compiling it around this time; however, a curriculum vitae dated January 1974 reveals that Oliveros used a faculty fellowship to continue work on the “book” (and presumably expand it for publication) in Summer 1971. “Career Narrative,” 1972–77, Box 29, Folder 8, Oliveros Papers. The fate of Oliveros’s plans for her “Theater Piece Book” is, regrettably, unclear.

¹³⁹ “Theater Piece Book,” ca. 1968–1970, Oliveros Papers.

¹⁴⁰ William Duckworth, “Pauline Oliveros,” in *Talking Music: Conversations with John Cage, Philip Glass, Laurie Anderson, and Five Generations of American Experimental Composers*, 1st Da Capo Press ed. (New York: Da Capo Press, 1999), 170.

planning and scores, content in the knowledge that all their musical gestures, even those unmoored from conventional vocabularies, would be captured on tape. By 1964, tape had already inspired the entry of fleshy, unpitched noises into Oliveros's musical practice (e.g., the clicks and pops of *Sound Patterns*); and she seems to have understood, as the logical implication, that *anything* could be introduced into her music—even extramusical elements.

That Oliveros could have derived a new “orality” and somatic, sensorial fullness from her work with tape seems, at first, implausible—or at least, difficult to understand. But what Oliveros appears to have been experiencing was, in the early Sixties, being actively theorized as a consequence of a dawning electronic age. In a 1986 study of oral and literary cultures, and their corresponding structures of consciousness, classicist Eric A. Havelock observed that 1963 was a “watershed date” when the subject of oral communication and oral traditions entered intellectual discourse like a “flood.”¹⁴¹ One of the factors stoking this new interest was the omnipresence of new media (e.g., television, radio—now transistorized—and, indeed, tape), and no one was arguing more vigorously for a link between electronics and orality than Marshall McLuhan.

In his article “The Agenbite of Outwit” (1963), which Cage quoted voraciously in the wake of *Cartridge Music* (1960), McLuhan argued that electronic media had already begun to undo the “fragmentation and specialization” of the human sensorium cultivated, since the Renaissance, by “print culture.”¹⁴² “Literacy stresses linearity, a one-thing-at-a-time awareness,” McLuhan explained, summarizing the thrust of his longer 1963 study, *The Gutenberg Galaxy*.¹⁴³ In contrast, the media theorist continued, “[E]lectronic media. . . . deal in auditory space, by which I mean that sphere of

¹⁴¹ Eric Alfred Havelock, *The Muse Learns to Write: Reflections on Orality and Literacy from Antiquity to the Present* (New Haven, CT: Yale University Press, 1986).

¹⁴² Marshall McLuhan, “The Agenbite of Outwit,” in *Media Research: Technology, Art, Communication*, by Marshall McLuhan, ed. Michael A. Moos (New York: Routledge, Taylor and Francis Group, 1997), 123–124.

¹⁴³ McLuhan, “Agenbite of Outwit,” 123.

simultaneous relations created by the act of hearing.”¹⁴⁴ McLuhan held that this “auditory space” marked a return to the “unified fields of the old oral cultures.”¹⁴⁵ Whether McLuhan’s thought bore on Oliveros’s later characterizations of her “theater pieces” is unknown; notably, *Understanding Media* did begin filtering through Tape Center circles in the early Sixties.¹⁴⁶ But the collapsed sensorium of “auditory space” describes Oliveros’s emerging theatrical consciousness (with its associated “oral tradition”) quite well, and helps to clarify Oliveros’s transition from tape to theater.

Oliveros did not consummate this transition, or find a framework suitable to her new sense of “orality” and sensory “synthesis,” until late 1964 or early 1965, when she set about writing her debut theater piece: *Pieces of Eight*.¹⁴⁷ Why, one is compelled to ask, did she write *Pieces of Eight* when she did? There is an appealingly simple answer to this question: at around this time, Oliveros was contacted by her friend Barney Childs, who wanted to commission a piece for his New Art Wind Ensemble at the University of Arizona (Tucson, AZ). However, just as Tudor’s *Fluorescent Sound* cannot be adequately explained by Robert Rauschenberg’s request for musical accompaniment, *Pieces of Eight*, by no means a conventional work for wind instruments, must be understood relative to a wide confluence of motivations.

¹⁴⁴ McLuhan, 123.

¹⁴⁵ McLuhan, 124.

¹⁴⁶ Morton Subotnick, interview by David W. Bernstein and Maggi Payne in *Tape Music Center*, ed. Bernstein, 120.

¹⁴⁷ In numerous places, Oliveros has dated *Pieces of Eight* to 1964, and indeed, the work’s published score is marked “April 1964.” I believe this dating, which is pervasive in available histories, to be in error. Oliveros’s work was premiered by the New Art Wind Ensemble on April 25, 1965, and three weeks earlier, on April 4th of that year, the musician wrote to Tudor, exclaiming, “Pieces of 8, Pieces of eight! It’s all finished!” *Pieces of Eight* meanwhile saw its Tape Center premiere the following month, on May 3rd and 5th. Even setting aside such evidence, Oliveros could not have produced so involved a work as *Pieces of Eight* in early April 1964, because she had her hands full with Tudorfest! There is another point of confusion: much like Tudor with his *Fluorescent Sound*, Oliveros has vacillated slightly as to the place of *Pieces of Eight* in her oeuvre; while in some places she cites it as her first theater piece, she elsewhere gives *Duo for Accordion*... (1963–64) this honor. As *Pieces of Eight* fulfills more of the criteria Oliveros later developed for her theater pieces, I will regard it as the first entry in this series of works. For confirmation as to dating, see program for Tucson New Art Wind Ensemble “Musical Evening,” April 25, 1968, Box 13, Folder 28, Oliveros Papers; and Pauline Oliveros to David Tudor, April 4, 1965, Box 57, Folder 8, Tudor Papers. For vacillation as to the priority of *Pieces of Eight* as a theater piece, see Pauline Oliveros, “An Interview with Pauline Oliveros,” by Moira Roth, *New Performance* 1, no. 2 (1977): 47; and Pauline Oliveros, “The Magic Garden of Pauline Oliveros,” interview by Craig Palmer, *Coast FM & Fine Arts*, July 1970, 41.

Here are the influences at play: first, since the earliest “Sonics” concerts (1961–62), which featured the interpretive choreography of Anna Halprin’s dancers A.A. Leath, Lynne Palmer, and John Graham, Oliveros had been performing with dancers, learning to improvise in step with the movements of the human body. The Tape Center’s move to 321 Divisadero in Spring 1963 had placed her in even closer company with Halprin and her Dancers’ Workshop; circa 1964–65, however, her more proximate dancer-muse was Elizabeth Harris, whose *Seven Passages* (1963) she had scored, and who had fashioned the “handsome” revolving see-saw used in *Duo for Accordion and Bandoneon* (1963–1964). Dance’s centrality as an inspiration for Oliveros’s theater pieces is made clear in the “Theater Piece Book,” which flags “dance-sound integration” as a creative milestone, and features Harris’s name throughout.¹⁴⁸ (Interestingly, the very first item in the “Theater Piece Book” is a newspaper clipping concerning Harris.)

Secondly, and just as significant, the 1964–65 Tape Center season at 321 Divisadero was characterized by a marked embrace of theatrical elements and multimedia in the context of electronic musical performance. This change had begun as early as Winter-Spring 1964, when Ramon Sender and Morton Subotnick each began incorporating the lush and evocative projections of artist Tony Martin into their work. In February 1964, for example, Sender premiered a work titled *Desert Ambulance* (1964) that featured Oliveros as an accordion soloist playing along with a prerecorded tape collage; the piece was performed in the dark, with Martin projecting slides of swirled, colorful liquids directly onto Oliveros (donning a white surgical gown for maximum reflectivity).¹⁴⁹ Oliveros herself found the work highly effective, remarking on the “aural interplay between the taped and the live sounds,” and the “liveliness” and “presence” of Martin’s projections.¹⁵⁰ At this time, then, Sender, Subotnick, and, indeed, Oliveros, were already drawing

¹⁴⁸ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

¹⁴⁹ Oliveros, “Memoir of a Community Enterprise,” 85.

¹⁵⁰ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

electronic music into more complex artistic webs. As Sender remarked to the *Oakland Tribune* in an article covering Tudorfest, “We’re interested. . .in the theatrical element, lighting, visual projections, and so on. And we’d like to establish a healthy relationship between the composer and audience.”¹⁵¹

Here, however, the chain of causality becomes complicated, because while the Tape Center was drifting towards theater prior to Tudorfest, the cohort’s exposure to (and participation in) the work of Cage and others (George Brecht, Toshi Ichianagi) was clearly transformative. Beginning in the Fall of 1964, Subotnick commenced a series titled *Play!* premised on interactivity in performance. While *Play! no. 1* (1964) found a woodwind quintet play alongside (and in active response to) an accompanying tape and film (the latter provided by Martin), Subotnick recalls that *Play no. 4* (1965) called on members of the audience to “play a game that requires movement and voices and things.”¹⁵² Sender’s *In the Garden* (1965) involved a clarinet and viola player duetting with a prerecorded tape while standing behind a projection screen, and then emerging, facing away from the audience, with masks on the back of their heads.¹⁵³

Whether Subotnick and Sender would concede the influence of Cage and his “New School” acolytes on their 1964–65 theatrical productions—what music critic Peter Yates, who came to lecture at the Tape Center, termed “theatrical-performance music”—is unclear; to Yates, who placed this work directly in the Cage’s lineage, the influence was patent.¹⁵⁴ However, I would argue that *Music Walk* (1958), *Cartridge Music*, and even Tudor’s realization of *Variations II* (1961), with their blend of Cagean “theatre,” and “live-electronic music” (which Cage defined in opposition to presentations on tape), encouraged Sender and Subotnick to graft a heightened interactivity and

¹⁵¹ M.K.T., “Ahmed the Mynah and a Bandoneon,” *Oakland Tribune*, March 31, 1964, 9.

¹⁵² Subotnick, interview by Bernstein and Payne, 129–130.

¹⁵³ Ramon Sender, interview by Tessa Updike and Mary Clare Bryzwa, April 14, 16, 21, 2014, Oral History Project, Library & Archives, San Francisco Conservatory of Music, San Francisco, CA, 106.

¹⁵⁴ Peter Yates, *Twentieth Century Music: Its Evolution from the End of the Harmonic Era to the Present Era of Sound* (London: Minerva Press, 1967), 327–328. Yates delivered a “lecture-concert” at the Tape Center on December 2 and 4, 1964: see Thomas M. Welsh, “Chronology,” in *Tape Music Center*, ed. Bernstein, 276.

multimedia presence onto their live productions. While the Tape Center musicians had for years been considering how electronic music could or should be presented in the live concert format, Tudorfest appears to have greeted them as an inspiration and a challenge: a spur towards new solutions. I would similarly argue that Oliveros's experience organizing Tudorfest potentiated an already present desire to tease out the implications of her tape work, and to sound out a new "orality," in a more robust performance context. *Pieces of Eight*, which premiered in Tucson on April 25, 1965, and at the Tape Center on May 3rd and 5th, marked her decisive first move from tape to the theater piece.

Pieces of Eight (sometimes written as *Pieces of Eight for Wind Octet, Props, and Tape*) is designed for eight wind players participating in a dramatic scenario.¹⁵⁵ Partitioned into eight "acts" separated by cues and involving carefully choreographed entrances and exits, the work demands theatrical activity (roleplay) as much as straightforwardly musical performance. The staging of the *Pieces of Eight*, which Oliveros diagrams [Figure 18] in her published score, involves many props, nearly all of which are interacted with (and not merely aesthetic): there is, variously, a cuckoo clock, a tea-table, a cash-register, a packing crate, and a papier-mâche bust of Ludwig van Beethoven (1770–1827) with red eyes set atop a grand piano.¹⁵⁶ [Figure 19] Oliveros also specifies a costume for each member of her octet; the conductor, for example, is to wear tails, a "colorful striped tee shirt," and "faded dungarees and sneakers," whereas the horn player is to wear "elegant 18th-century formal attire with [a] powdered wig."¹⁵⁷ The work begins when the conductor gives a downbeat with a crowbar, whereupon all players reach beneath their seats, pick up alarm clocks pre-set to ring at eight-o'-clock (AM or PM), and wind the clocks back to twelve minutes before eight. Along with

¹⁵⁵ I rely, here, on Heidi von Gundens lengthy discussion of *Pieces of Eight*, which represents the sole analysis of the work in available literature. Heidi Von Gundens, *The Music of Pauline Oliveros* (Metuchen, NJ: Scarecrow Press, 1983), 71–76.

¹⁵⁶ *Pieces of Eight* (1965) manuscript score (1973 revision), Box 5, Folder 1, Oliveros Papers.

¹⁵⁷ *Pieces of Eight* (1965) manuscript score (1973 revision), Oliveros Papers.

aural cues played back on a concealed tape machine, responsibility for which Oliveros leaves to a “tape operator,” these clocks perform a structuring role in the unfolding of the scenario.

After setting their clocks, the wind players begin making sounds, “as short and soft as possible,” synchronized to the ticking; simultaneously, the conductor sets to work opening the packing crate with a crowbar, prying off its nails in as “squeaky” a manner as possible.¹⁵⁸ Following a dramatic entrance from the oboist (clad in a fur-hat, fur-coat and ear-muffs), the flutist and the trumpet stand and traipse about the stage in a figure-eight formation; then, upon the inevitable ringing of the alarm clocks, the musicians slide into a rendition of “organ-grinder music,” the cash register is opened with a resounding *ka-ching*, and an offertory procession is begun in which collectors walk into the audience bearing collection plates and the Beethoven bust, soliciting money.¹⁵⁹ Beethoven is subsequently packed away in the crate, nailed shut, and the gathered money is brought to the piano as a projected image of a skull-and-crossbones emerges in the background. Represented here is only a fraction of what occurs in *Pieces of Eight*, and this summary scarcely broaches the work’s narrative and allegorical dimension. Nods to Stevenson’s *Treasure Island* are distributed throughout the proceedings, and, of course, there is a politics to be extracted from such gestures as the packing away of Beethoven.

However, beneath the fantastical imagery of *Pieces of Eight*, at its very structural core, lies the logic of electronic “orality” stoked in Oliveros by magnetic tape. One finds the clearest evidence of this newly developed attitude in her score for *Pieces of Eight*, which, save for a handful of staves dictating short melodic sequences (e.g., the “organ grinder” music), communicates to its individual musicians with straightforward prose instructions [**Figure 20**], for example: “Continue tones as short and soft as possible, and imitate the sounds of the squeaking packing case.”¹⁶⁰ In one of the

¹⁵⁸ *Pieces of Eight* (1965) manuscript score (1973 revision), Oliveros Papers.

¹⁵⁹ *Pieces of Eight* (1965) manuscript score (1973 revision), Oliveros Papers.

¹⁶⁰ *Pieces of Eight* (1965) manuscript score (1973 revision), Oliveros Papers.

interviews cited above, Oliveros directly attributes this aspect of *Pieces of Eight* to her work with tape, reflecting, “I began to realize that I could get the results I wanted by giving a verbal instruction and that I got more of the flavor of improvisation and freedom that comes when you’re not nailed to a page. . . . You don’t have to deal with the visual notation, and you have more attention for the sound.”¹⁶¹ However, one is also tempted to connect Oliveros’s move to prose to her encounter with the proto-Fluxus (“New School”) work represented at Tudorfest; George Brecht’s flatly explanatory instructions for his *Card Piece for Voice* (1959), which, like *Pieces of Eight*, incorporates a system of cues, would have been particularly influential in this regard.

Electronic “orality” plays on other aspects of *Pieces of Eight* as well. In Oliveros’s *Sound Patterns*, which marked a conscious response to her encounter with a new, abstract sound-world in the earlier *Time Perspectives*, she had introduced phonetic sounds from the very periphery of speech (and well beyond the pale of the twelve-tone scale) into the fabric of choral form. In *Pieces of Eight*, this subversive centering of the supposedly “extraneous” is accomplished on a grander scale. States Oliveros: “*Pieces of Eight* begins with what became central material in many subsequent theater pieces: activities normally considered peripheral in the performance of music or relegated to the background by certain convention in dress and presentation are brought into the foreground.”¹⁶²

Representing the logical conclusion of the “anything goes” attitude towards musical “content” that tape inspired in Oliveros, this “treatment of peripheral unarticulated elements” brings *Pieces of Eight* beyond the narrowly defined “sound field,” and into a space (McLuhan’s “auditory space”?) in which the “visual, kinetic, and dramatic” mix and mingle with the sonic. This embrace of the “peripheral” also calls Cage’s “theatre” strongly to mind, although Oliveros’s aestheticized and

¹⁶¹ Oliveros, interview by Anderson, 13.

¹⁶² “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

rigidly managed treatment of her diverse performance elements (e.g., her highly specific costuming, and her precision placement of props) extend beyond the scope of what Cage might have allowed.

The impress of Tudorfest on *Pieces of Eight* is patent, but what sharply distinguishes Oliveros's art form of the theater piece, of which this work is the breakthrough prototype, is the articulation of a new kind of presence, or liveness, within the loosely defined bounds of the ensemble concert format. Even though, as I have argued, Oliveros arrived at *Pieces of Eight* with the help of tape, this work achieves this person-to-person presence almost entirely through “unplugged” means. This dimension of the work operates through a collapsing of separations, or hierarchical divides, at every level: Oliveros does not communicate anonymously with her performers via the cold syntax of conventional notation, but rather speaks straightforwardly through prose, and cultivates further intimacy using personal pronouns in her performer-specific instructions (“stand, facing the packing case, with *your* profile to the audience”).¹⁶³

The divide between performer and audience is unsettled via multiple tactics: there is, for example, the joking, ceremonial “participation” of the offertory, and the aggressive “making strange” of the concert format, which is designed to play with audience expectations, and keep them on their toes. However, Oliveros’s most moving gesture in this direction is the recasting of the performer as a *listener* with whom the audience can empathize. Oliveros accomplishes this last feat in *Pieces of Eight* through her cueing system, which repeatedly asks the performers to closely listen for aural signposts. Explains Oliveros,

If the performer concentrates in this way, there is a focus for those particular kinds of sounds, which comes only from the attitude of listening. This is quite opposite from the kind of performing which focuses on projecting sounds outward towards the receiving audience. In this way the performers assume the role of audience as well, and thus provide a model of ‘the listener.’¹⁶⁴

¹⁶³ *Pieces of Eight* (1965) manuscript score (1973 revision), Oliveros Papers (my emphasis).

¹⁶⁴ “Theater Piece Book,” ca. 1968–1972, Oliveros Papers.

Oliveros first learned this manner of listening from the tape-recorder she placed at the window of one of her first San Francisco apartments; but at Tudorfest, she was treated to a refresher course. Later in life, Oliveros reflected glowingly on the “attention to detail” and “extraordinary” concentration that Tudor brought to the event, and to their collaboration. “David was a master musician,” Oliveros recalled. “He taught patience, perseverance, and listening by his actions and preparations for the performances, and mostly without words.”¹⁶⁵

Complexly situated relative to electronic media and their influence, *Pieces of Eight* conjured its theater of effects and affect almost entirely without tape, which the work used merely to play back intermittent cues via a concealed sound-system. Yet the medium that inspired Oliveros’s theater pieces was in no way structurally incompatible with them. In the next section, which engages with Tudor and Oliveros’s first proper formulations of live-electronic music in 1965–66, I will show that Oliveros followed *Pieces of Eight* with theater pieces of increasing technological complexity. In early 1965, Oliveros had not yet learned how to master the techniques of looping and tape delay that she first witnessed in the work of Ramon Sender and Terry Riley, and her still-limited grasp on tape’s live-performance potential may well have influenced the approach taken in *Pieces of Eight*. As will be seen, however, a growing familiarity with these procedures would soon encourage Oliveros to creatively apply tape to her continued quest for embodied presence, audience-performer interaction, and a human liveness paradoxically unattainable in the absence of electronics.

3. Unscripted/Unscannable

With *Fluorescent Sound* (1964) and *Pieces of Eight* (1965), respectively, David Tudor and Pauline Oliveros took important steps in their practices, working through the implications of electronics,

¹⁶⁵ Oliveros, “Memoir of a Community Enterprise,” 87.

and their encounter at Tudorfest, with special reference to issues of liveness and presence. Tudor's work, despite its ambiguous status in his oeuvre, provided a clear articulation of his growing interest in the agency or unpredictability of technological systems. While he had first begun cultivating this interest in the context of his work with amplified piano, in his collaboration with John Cage on *Cartridge Music* (1960), and in his realization of the latter's *Variations II* (1961), *Fluorescent Sound* afforded him an opportunity to explore electronic liveness beyond the bounds of a composer-collaborator's parameters. As I have suggested, the conception of liveness embedded in *Fluorescent Sound* owed considerably to Tudor's past experiences: the musician's longtime role as a technological performer, and his growing dissatisfaction with this identity, left him primed to cede the responsibility of "interpretation" to technologies outside himself. As I have further proposed, it is perhaps Oliveros's Tudorfest, which celebrated Tudor as an original authorial voice, that instilled in him the courage necessary to begin surrendering his techno-logical agency.

Pieces of Eight is a landmark production because it marked Olivero's first, decisive move to the format of the "theater piece," and thus inaugurated one of the most original series in her body of work. As I have also argued, however, it represented a sophisticated negotiation of an electronic influence that had been percolating within Oliveros since her earliest work with tape. A vision of music erected on the ashes of (conventional) notation, and powerfully shaped by the freedom and fluidity of a new "oral tradition," *Pieces of Eight* extracted from electronics the preconditions of a stage presence and person-to-person liveness that were anything but straightforwardly technological. Improbably, Oliveros's experiences with tape had thus prepared her to boldly reconfigure composer-performer and performer-audience relationships and introduce a new directness of communication with only minimal aid from actual electronics. What further prepared Oliveros for this breakthrough, critically mediating her efforts to process a new electronic "orality," was her experiences at Tudorfest, which exposed her both to the poly-sensorial flux of Cage's "theatre"

pieces, and the embrace of textual instruction among a younger generation of musicians and artists (most notably, George Brecht).

And yet, viewed with reference to Tudor and Oliveros's longer development in the mid-Sixties, these works appear to be stepping-stones or waystations. The broader argument of this chapter holds that the pair's most critical artistic ruptures of the mid-Sixties came about as they each pursued models of a live-electronic music whereby they could meaningfully deploy electronic media in the context of live performance. In *Fluorescent Sound* and *Pieces of Eight*, Tudor and Oliveros were able to derive powerful new experiences of liveness and presence from their prior work with amplification and tape, respectively; but in 1964 and early 1965, they had not yet gathered the technical fluency necessary to realize their fullest ambitions for a "live electronics." In later 1965, and 1966, the circumstances were right for Oliveros and Tudor to consummate newly complex ideas. During this time, both figures honed their practical skill with electronics, with Tudor learning to wire a greater degree of animacy and indeterminacy into technological systems, and Oliveros learning ways to heighten or accentuate the social and communicative dimensions of her theater pieces with a new fluency in the mechanism of tape delay.

Meanwhile, both figures soon found themselves involved in large-scale festivals that were premised on creative fusions of art and technology and entangled in a charged national politics. These events served as perfect contexts in which to articulate bold and highly critical statements via the language of live-electronic music. This final section follows Tudor and Oliveros's respective paths towards the festival "9 Evenings: Theatre and Engineering" in New York City, and the Trips Festival in San Francisco, tracking their rapid personal development, and their continued collaboration with one another. I end with a discussion of Tudor's debut proper *Bandoneon! (A Combine)* (1966), staged at "9 Evenings," and Oliveros's *A Theater Piece* (1966), staged at the "Trips Festival." With these works, Tudor and Oliveros posed incisive questions regarding technological

and political agency, and, more importantly, built prescient prototypes of the embodied practices they would arrive at in the early Seventies.

◆ O ◆

In the months following the Spring 1965 premiere of *Pieces of Eight* (1965), politics weighed heavily on Oliveros's mind. To be sure, nearly all Oliveros's major works of the early Sixties had carried some sort of political edge: for example, *Time Perspectives* (1961) found the composer committing the bends and folds of her queer subjectivity to tape, and *Sound Patterns* (1961–62) staged a human pantomime of electronics in a canny critique of technological or scientific abstraction. Meanwhile, *Pieces of Eight*, which was far from the absurd, Dadaist romp seemingly experienced by San Francisco's local music critics, boasted a highly motivated vocabulary of images and symbols, which, to the keen observer (and *Treasure Island* reader), mounted a concerted critique of concert-hall tradition. As Oliveros's frequent Sixties collaborator (and original *Pieces of Eight* performer) Stuart Dempster has perceptively reflected, "There really was this kind of great god Beethoven [in popular culture and musical education]. I think that [the Beethoven bust] was Pauline's way of asking, 'OK, well where are the goddesses?'"

These works, however, had dealt either with the politics of identity, or the prejudices of musical performance as a historical institution. In 1965–66, Oliveros's music turned, for the first time, towards the broader political climate of the United States, and the issues called newly to light by an emerging social consciousness. This social consciousness was unfolding right beyond the walls of the Tape Center's Divisadero Street location, in San Francisco's Haight, and across the bay, in Berkeley. In 1964, as the civil-rights movement was sweeping across the country, activists at University of California, Berkeley representing several local organizations (the campus group SLATE, and the W.E.B. Du Bois club) became embroiled in large-scale protests against

discriminatory hiring practices and the striking down of a fair-housing ordinance in San Francisco.¹⁶⁶ Civil-rights protests, with their mass picketing, and increasingly creative displays of civil disobedience, took root on Berkeley's campus, and the administration's hostility to such political campaigning—which took the form of arrests and disciplinary hearings—helped sow the seeds of the Free Speech Movement (FSM).¹⁶⁷

Oliveros would have been exposed to the activities of the FSM, one of the movements she has directly cited as an inspiration to her work of this time, through the presence of Berkeley's radio station KPFA at 321 Divisadero, where they had set up a new satellite station. But she found a more direct conduit to the FSM's roiling currents in the San Francisco Mime Troupe (originally the R.G. Davis Mime Troupe), an entity with which she began collaborating in Spring 1965.¹⁶⁸ R.G. Davis, we will recall from Chapter 2, had been known to the Tape Center cohort (though perhaps not Oliveros) since the Jones Street days. Davis had formed his Mime Troupe in 1959, shortly after traveling to San Francisco to join the prestigious San Francisco Actor's Workshop, and in 1962, the Tape Center played host to his group's spare, experimental performances, which early on joined pronounced physical expression with improvised dialogue.¹⁶⁹

By the time Oliveros teamed up with the Mime Troupe to provide music for their staging of Bertolt Brecht's (1898–1956) *Exception and the Rule* (1930, premiered by Mime Troupe in April 1965), and Michel de Ghelderode's (1898–1962) *Chronicles of Hell* (1929, premiered by Mime Troupe in November 1965), Davis and his Troupe had moved on to more fully realized productions, which, often broaching allegedly “indecent” subject matter, and staged frequently in public parks, had begun to draw the ire of the Park Commission.¹⁷⁰ In August 1965, Davis was arrested for an outdoor

¹⁶⁶ Ashbolt, *A Cultural History of the Radical Sixties*, 49–53.

¹⁶⁷ Ashbolt, 54–61.

¹⁶⁸ Pauline Oliveros, interview by David W. Bernstein and Maggi Payne, in *Tape Center*, ed. Bernstein, 107–108.

¹⁶⁹ Susan Vaneta Mason, ed., *The San Francisco Mime Troupe Reader* (Ann Arbor: University of Michigan Press, 2005), 9–13.

¹⁷⁰ Mason, ed., *Mime Troupe Reader*, 11–13.

performance of Giordano Bruno's (1548–1600) *Il Candelao* (1582), and this experience helped to inform his later formulation of a “guerrilla theater” designed to “carry the weight of ‘effective’ protest or social confrontation.”¹⁷¹

There is a whiff of Davis’s guerrilla spirit in Oliveros’s theater pieces *George Washington Slept Here* and *George Washington Slept Here Too* (1965/1965, premiered November 8th and 10th, 1965), which followed closely on the heels of *Pieces of Eight*. This pair of works, the first of which Oliveros has described as a “patriotism-buster,” were unambiguous in their symbolism.¹⁷² *George Washington Slept Here Too* calls for one performer to fire a blank from a pistol (or shoot a “toy sonic blaster by Mattel”) at another performer standing at a piano; the firing of the shot is followed by a blacking out of the stage-lights, and the projection of a slide which, in Oliveros’s recollection, depicted a finger pointing to the words “Uncle Sam wants you.”¹⁷³

As Oliveros’s social consciousness was expanding, so too was her technical knowledge. Already by 1963, when she soundtracked Elizabeth Harris’s *Seren Passages* (1963) via the live manipulation of pre-recorded source-tapes on a multi-channel mixer, Oliveros boasted an impressive command of the tape medium. Her work producing film soundtracks for spare change had taught her how to splice tapes and sync them up to footage, and *Time Perspectives* had demonstrated her ability to manipulate tape speed in *real-time* by tweaking her reel-to-reel machine’s take-up arm during the recoding process. However, only in 1965 did Oliveros begin experimenting with tape-delay and looping, which, during Sonics, Ramon Sender and Terry Riley had both proven to be a potent means of achieving delirious repetition effects. At 321 Divisadero, Oliveros began experimenting with several previously discussed approaches to delay on the available Ampex

¹⁷¹ R.G. Davis, “Guerrilla Theatre,” *The Tulane Drama Review* 10, no. 4 (Summer 1966): 132, <https://doi.org/10.2307/1125214>.

¹⁷² Oliveros, interview by Bernstein and Payne, 105.

¹⁷³ *George Washington Slept Here Too* (1965), score, Box 4, Folder 3, Oliveros Papers; Oliveros, interview by Bernstein and Payne, 106.

recorders, exploiting the lag time between the tape heads of a single recorder, and running tape between two recorders for extended delays.¹⁷⁴ However, Oliveros also began to play with more adventurous procedures, making clever use of “patch bays,” or hubs that allow for the rapid routing of signals between the inputs and outputs of different devices.¹⁷⁵ As David W. Bernstein explains, the Tape Center’s two-channel (stereophonic) recorders, which were designed to record two tracks of sound to a single reel of tape, featured separate inputs and outputs for each of their channels, and thus provided for experiments premised on cross-channel connection:

Using two-channel stereo tape recorders and a patch bay, [Oliveros] routed the signals in a variety of configurations. For example, the output from channel one could be routed to the input of channel two; and the output from channel two could, in turn, be sent to channel one. This ‘cross-coupling’ or ‘double feed back loop’ creates interesting delay effects. The feedback produced by this system can sometimes get out of control when the signal and delay volumes are too high; but adjusting the gain controls slowly produces interesting musical results.¹⁷⁶

The sounds of these delay procedures, which Oliveros used in tandem with oscillator whines in her *Mnemonics* tape pieces of 1965 (briefly discussed at the end of Chapter 2), affected Oliveros deeply. As Bernstein observes, Oliveros was particularly interested in the “sense of a multidimensional musical time” that one can achieve via delay, which, through its braiding of signals and layering effects, indeed creates a porous new relationship between the musical past, present, and future.¹⁷⁷ Tape delay appealed to Oliveros in two other respects as well: first, as Heidi von Gundten observes in her biography of the musician, the mobile and continuously building timbres produced by tape delay, which melt and shift about like glacial ice sheets, foster exactly the sort of textural interest and “transient activity of acoustical sound” that critics often found to be lacking in the first electronic music of the postwar.¹⁷⁸

¹⁷⁴ David W. Bernstein, liner notes for Pauline Oliveros, *Reverberations: Tape & Electronic Music 1961–1970*, Important Records IMPREC352, 2012, compact disc.

¹⁷⁵ Bernstein, liner notes for *Reverberations*.

¹⁷⁶ Bernstein, liner notes for *Reverberations*.

¹⁷⁷ Bernstein, liner notes for *Reverberations*.

¹⁷⁸ Von Gundten, *Music of Oliveros*, 54–55.

Additionally, and most importantly for the work soon discussed, tape-delay enabled the real-time manipulation of sound sources, and thus offered itself perfectly to the live-concert format. Input-output configurations joining different recorders and devices could be set up in advance of performances and then activated live; and while aspects of the tape-delay process (e.g., the delay time) could be predicted and planned with reasonable accuracy, the threat of snowballing “gain” or volume (what Bernstein describes as the system “get[ting] out of control”) introduced an unavoidably “indeterminate” component into the proceedings.¹⁷⁹ Delay offered tape musicians an alternative to comparatively static live-presentation methods (e.g., the spatialized playback of pre-recorded tapes, seen in the “Sonics” concerts, and the synchronizing of live instrumentals to pre-recorded tapes, seen in Ramon Sender’s *Desert Ambulance* of 1964). Indeed, while Cage, we will recall, cast tape as the foil of the properly “live” mechanics represented in his *Cartridge Music* (1960), delay seemed to fulfill his ambiguous criteria for “live-electronic music” inasmuch as it enabled performances “indeterminate of [themselves].”

A new world of possibility lay before Oliveros, who also had at her disposal the presentational format of the “theater piece,” with its capacity for multimedia integration, and its opening lines of communication between the composer, performer, and audience member. *Pieces of Eight* had made use of tape, but in this work, the recorder had functioned only as a cueing instrument overseen by a “tape operator.” How might tape, manipulated in real-time via delay configurations, be profitably brought to bear upon the theater piece? Could tape, operating *on*, and not *in* theater pieces, be used to dramatically heighten the directness and fluidity of communication—the sense of “orality”—achieved in *Pieces of Eight*? And could it be used to amplify the embodied presence of human performers? That Oliveros was asking such questions as early as the Fall of 1965 is demonstrated by the nature of a new collaborative work she produced around this

¹⁷⁹ Bernstein, liner notes, *Reverberations*.

time: *Light Piece for David Tudor*. Premiered at the Tape Center on November 8th and 10th, 1965, and subsequently performed at Cleveland, Ohio's Case Institute of Technology in May 1966, *Light Piece* is the second piece Oliveros wrote specifically for Tudor (*Duo for Accordion and Bandoneon*, 1963–64 being the first), and among her earliest works to deploy tape-delay in live performance.

Light Piece was written during a period when Tudor seems to have been visiting San Francisco quite often. Tudor's trips to California began soon after Tudorfest and continued well into the Seventies, even after Oliveros relocated to San Diego. In a late interview, he reflected that San Francisco was his “second home,” and when asked if the “West Coast [was a] better place to get away from doing just piano stuff,” Tudor replied, “Oh yes. I had to get away from any contact with [Pierre] Boulez and [Karlheinz] Stockhausen. Didn’t even want to hear their names.”¹⁸⁰ Ironically, given this exchange, *Light Piece* is, technically, a piano work; but its requirements on Tudor fell more along the lines of what Toshi Ichianagi had demanded in his *Music for Piano #4* (1960), and it allowed Tudor to reprise some of the tricks he had used in his *Variations II* (1961) realization. The work’s components, crudely described, were as follows: the piano key D-flat, played by Tudor *ad infinitum* in a variety of different ways; two stereo tapes, played back live, that layered recordings of the piano key D-flat, and mixed them with sine tones designed to reinforce the harmonics of the note; and a prism that Tony Martin had extracted from a World War II bombsight, suspended on a string (wound tightly, then released) and struck with a beam of light.¹⁸¹

Tudor and Oliveros each found ways to make their respective components more “lively.” For example, Oliveros’s two tapes had in fact been mixed down from ten different tapes of the pitch D-flat (and sine tones), which Oliveros had played simultaneously on ten Viking loop decks. These loop decks, among the devices that the Tape Center had acquired from a burned-down hi-fi store,

¹⁸⁰ Tudor, interview by Vees and Oliveros, 93.

¹⁸¹ Ray Wilding-White, “David Tudor: 10 Selected Realizations of Graphic Scores and Related Performances,” 1973, Box 19, Folder 2, Tudor Papers.

did not employ loops or delay in the manner discussed above: often called “cart machines” and used by radio broadcasters, they were designed to play recordings (e.g., of background music) on continuous, circular loop, and without alteration. While Oliveros had at first sought perfect synchronization between the ten machines (and thus a smooth, unchanging drone), the vagaries of the technology had resulted in a D-flat wash characterized by delicate shifts in harmonic structure and “microtonal deviations.”¹⁸² Against this backdrop, Tudor played the three piano *strings* that make up the piano D-flat below middle C using electric motors. The resulting vibrations were picked up by contact microphones attached to the soundboard, magnetic transducers, a contact microphone, and a phonograph cartridge positioned loosely within the piano, and “wire loops,” connected to cartridges, and hooked under the piano strings.¹⁸³

The sounds Tudor produced were fed to a two-channel sound-system, and separately to a speaker placed directly under the piano soundboard and designed to reinforce the resonances picked up by the microphones. It is unclear which precise technical configurations were used in the Tape Center and Case Institute performances of *Light Piece*, respectively; but at one or both concerts, Oliveros appears to have processed Tudor’s sounds using a delay system “cross-coupled” across a pair of two-channel recorders. [Figure 21] This may have marked her earliest live use of so complex a system. The configuration in question is illustrated in Oliveros’s 1969 text “Tape Delay Techniques for Electronic Music Composers,” a technical article written for *The Composer*.¹⁸⁴ In Oliveros’s set-up, delay effects achieved on one recorder via the cross-channel coupling described earlier are fed through a mixer to a second recorder, where they are compounded by another such delay, and a cross-channel feedback loop.¹⁸⁵

¹⁸² “10 Selected Realizations,” 1973, Tudor Papers.

¹⁸³ “10 Selected Realizations,” 1973, Tudor Papers.

¹⁸⁴ Oliveros, “Tape Delay Techniques for Electronic Music Composers” (1969), in *Software for People*, 42.

¹⁸⁵ In granular terms: the output of channel one on recorder A is fed to both a mixer, and the input of recorder A’s second channel, whose output is also fed to the mixer at a delay; the combined inputs of recorder A are then fed by the

Unfortunately, we do not know exactly what *Light Piece* sounded like; but an article published in Cleveland's *Plain Dealer* offers us a reasonably clear (if biased) idea. "The greatly amplified distortion was nerve-shattering" Ethel Boros writes in her review of the Case Institute concert, "but the audience of 400, with a few exceptions, sat silently and stolidly through the whole sickening business. Only a few dared or cared to hiss and boo."¹⁸⁶ That Oliveros's memories are even stormier—she recalls a near-riot and needing to drowning out a shouting man by cranking up the volume—suggests that *Light Piece*, with its churning, "nerve-shattering," drones, may have been as much an act of guerrilla theater as an aural meditation on D-flat.¹⁸⁷ Whether the work intended to induce shock or awe, it offered Oliveros a critical opportunity to refine her mechanics of delay, which she would soon put to more complex use on a much larger scale.

♦ T ♦

In the half-decade that followed his work with amplified piano circa 1958, Tudor became sufficiently knowledgeable about the inner workings of amplifiers, oscillators, and hacked-together circuits that he could, beginning in the mid Sixties, construct a new authorial identity premised on the use and abuse of do-it-yourself electronics. Unfortunately, there is no precise chronology mapping this arc of his development. Tudor's mastery of piano in the Forties can be quite easily tracked through examination of his exercises, worksheets, and recital programs, but electronics, and electronics of the sort Tudor was interested in (e.g., the handmade and the unique), are another matter entirely. Tudor learned much of this knowledge firsthand, in the field of practice, where he worked with equipment given to him by collaborators, acquired skills through simply doing, and allowed his materials to teach him what they wanted, and what they *could* do.

mixer to recorder B, which employs the same cross-channel delay, but creates a feedback loop between its channels, sending the output of channel two back to the input of channel one.

¹⁸⁶ Ethel Boros, "Experimental Music One Big Headache," *The Plain Dealer*, May 7, 1966, 33.

¹⁸⁷ Oliveros, interview by Bernstein and Payne, 107.

The work that Tudor engaged in, whether on his own, or with composer-collaborators, provides the most precise index of his evolution in this regard. Tudor's trajectory from *Cartridge Music* (1960), to his *Variations II* (1961) interpretation, to *Fluorescent Sound* (1964), to, indeed, Oliveros's *Light Piece for David Tudor* (1965), reveals a musician departing from a working familiarity with contact-microphone amplification, growing comfortable with a wider array of "transducers" (e.g., phonograph cartridges) and their creative modification, and, eventually, learning to use microphones and cartridges in tandem with sound-producing means (e.g., the piano) and amplifying sound-systems in order to construct potentially volatile feedback systems. This, however, brings us only to 1964–65, and thus one is shocked to learn *Bandoneon! (Combine)* (1966), a work which will be discussed in due course, incorporates "programmed audio circuits, moving loudspeakers, tv images and lighting, instrumentally excited."¹⁸⁸ What happened over the course of the intervening two years?

During this time, Tudor had the good fortune to forge strong relationships with highly skilled engineers, and hybrid engineer-musicians with appealingly idiosyncratic approaches to electronic music. Perhaps just as important, in 1965–66, Tudor fell into a newly established role as an all-purpose technician charged with the maintenance of the increasingly complex "sound-systems" used in Cage's electronic music of the Sixties. These experiences and contacts bore considerably on Tudor's path to *Bandoneon! (A Combine)*, and on the maturation of his creative voice. The Michigan-based electronic musician Gordon Mumma, whose mailed-in music, we will recall, was featured in one of Sender and Oliveros's Sonics concerts, was one of Tudor's first and most important fellow travelers in the uncharted realm of electronics. Tudor first met Mumma back in May 1960, when he and Cage traveled to Ann Arbor to give two concerts at the invitation of local

¹⁸⁸ Summary of *Bandoneon! (A Combine)* (1966) for "9 Evenings" program, 1966, Box 3, Folder 2, Tudor Papers.

composer Roger Reynolds (1934–).¹⁸⁹ Mumma had been in town for nearly a decade by this time, and since 1958, he and friend Robert Ashley had been running an electronic studio largely out of their homes.¹⁹⁰

Ashley had come to Ann Arbor via New York City to pursue doctoral work in composition at University of Michigan, and Mumma had arrived via Framingham, Massachusetts to earn an undergraduate degree in composition at the University of Michigan. Both musicians, for different reasons, would abandon their academics, and both would help to spearhead an ambitious Ann Arbor festival called ONCE, which between 1961 and 1966, evolved from a modest, four-concert presentation of avant-garde music to a radically cross-disciplinary event series incorporating Happenings, a film festival, and daring theatrical productions on par with contemporary work at the Tape Center.¹⁹¹ Around the time that they met Tudor and Cage, however, they were using their Cooperative Studio for Electronic Music to produce electronic scores for local artist Milton Cohen's (1924–1995) Space Theatre—an elaborate lightshow choreographed with films, slides, prisms, and mirrors under a custom-built dome.¹⁹² Sometime during their May 1960 trip, Tudor and Cage paid a visit to the Cooperative Studio, where Mumma showed the pair the sort of music he and Ashley had been producing for Cohen's productions.¹⁹³

We do not know exactly what they heard, but Mumma would write in 1961 that the music he was making for Cohen's *Manifestations: Light and Sound* event series made use of "electronically amplified and modified 'small sounds' from conventional instruments and other natural sources or

¹⁸⁹ Leta E. Miller, liner notes for *Music from the ONCE Festival, 1961–1966*, New World Records 80567, 2003, compact disc.

¹⁹⁰ Miller, liner notes for *Music from the ONCE Festival*.

¹⁹¹ Miller, liner notes for *Music from the ONCE Festival*. See also Richard S. James, "ONCE: Microcosm of the 1960s Musical and Multimedia Avant-Garde," *American Music* 5, no. 4 (Winter 1987): 359–390, <https://doi.org/10.2307/3051447>.

¹⁹² Mumma, "Manifestations: Light and Sound: Milton Cohen's Space Theatre" (1961), in *Cyber sonic Arts*, 8–13.

¹⁹³ Bernstein, "A Galaxy Reconfigured," 567.

electronic sound generators and other specially constructed apparatus.”¹⁹⁴ While Mumma notes that such sounds were stored on strips or short loops of tape that were played live, across multiple channels, with on-the-spot mixing, filtering, and reverberation, he issues the following qualification: “The most important characteristic of our music. . . is that it is developed as a *live-performance* medium using tape only as a means of storage and retrieval of sound.”¹⁹⁵ “The performances of 1957 and 1958,” he further states, “were often entirely ‘live.’”¹⁹⁶ No doubt, this early meeting with Mumma, who, around 1960, was already formulating a distinction between electronic music, and electronic music as a “live-performance medium,” deeply influenced Cage and Tudor’s thinking regarding live-electronic music. It is indeed highly suggestive that Cage wrote *Cartridge Music* in the summer of 1960, only three months after his visit to the Space Theatre.¹⁹⁷

Tudor would have drawn further inspiration from Mumma’s disposition towards the practice and culture of electronic music. Self-taught and aggressively independent in his approach to the medium, Mumma found the in-fighting among electronic music’s institutional juggernauts (the European studios, but also the Columbia-Princeton Electronic Music Center) to be tedious. It is no wonder he found sympathetic listeners in the “Sonics” cohort. Having designed his and Ashley’s Cooperative Studio in precise accordance with his unconventional musical needs [**Figure 22**], Mumma wanted other electronic tinkerers in the United States to follow his lead, and in 1964, he wrote an article praising the benefits of the studio for the “independent composer” for the *Journal of the Audio Engineering Society*. “There are too few studios to accommodate all those interested in making electronic music,” Mumma writes in the article, encouraging interested musicians to take

¹⁹⁴ Mumma, “Manifestations,” 11.

¹⁹⁵ Mumma, 11.

¹⁹⁶ Mumma, 11.

¹⁹⁷ Bernstein, “A Galaxy Reconfigured,” 557.

advantage of the “wide selection of high-fidelity components” available in the United States, and to set up their own operations.¹⁹⁸

It is clear that Mumma’s stance of “independence” was partly informed by the legacy of American experimental music, which, since the days of Henry Cowell and Charles Ives, had centered on a rugged “maverick” attitude. As early as 1770, Boston tanner and musical eccentric William Billings (1746–1800) wrote, “I think it is best for every Composer to be his own Carver,” and these words could have easily come from Mumma.¹⁹⁹ But Mumma’s insistence upon total creative freedom was also pragmatic—necessitated by the type of music he wanted to make. Beginning in 1962–63, Mumma began writing compositions which relied as much for their identity on specific configurations of electronic equipment as on notated abstractions. “My electronic music equipment,” Mumma wrote in 1967, “is designed to be part of my process of composing music.”²⁰⁰ He continues: “I am like any composer who builds his own instruments, though *most of my instruments’ are inseparable from the compositions themselves.*”²⁰¹ Mumma is not exaggerating here: one of his first fully realized electronic works, a 1963 piece for piano and circuitry titled *Medium Size Mograph*, exists as both sheet music and an accompanying circuit diagram.²⁰²

One cannot overstate how important Mumma’s recasting of composition as *building* must have been to Tudor. Nor can one overestimate what Tudor drew from Mumma’s unconventional use of his instruments. Keenly interested in “systems concepts,” Mumma dedicated himself, from 1963 onwards, to the production of what he termed “cyber sonic” music, or music premised on the

¹⁹⁸ Mumma, “An Electronic Music Studio for the Independent Composer” (1964), 15.

¹⁹⁹ Kyle Gann, *American Music in the Twentieth Century* (New York: Schirmer Books, 1997), 5.

²⁰⁰ Mumma, “Creative Aspects of Live-Performance Electronic Music Technology” (1967), 43.

²⁰¹ Mumma, “Creative Aspects,” 43 (my emphasis).

²⁰² Gordon Mumma, interview by Vincent Plush, May 17, 1983, OHV 125 a-f, transcribed tape recording, Major Figures in American Music, Oral History of American Music, Irving S. Gilmore Library, Yale University, New Haven, CT, 89, https://archives.yale.edu/repositories/7/archival_objects/3184995.

electronic modification or processing of sound sources in real-time.²⁰³ The provenance of Mumma's "cyber-" prefix reveals a great deal about his grounding intentions for this practice:

C-Y-B-E-R-S-O-N-I-C, one word. . . . Cyber-, from *kuber*, the Greek for steersman, -*sonic*, having to do with sound. Cybernetic—a *cybernetic* process is something in which some aspect of the process is fed back into the process as a control mechanism, just as the steersman controls the boat. . . [In cybersonic works] I establish the procedure by which the sound is modified, but the actual modification of the sound is done by the sound itself. And that's hardly a new principle in electronics, but applying the principle in a musical composition—a live performance. . . composition—that may well have been one of the first times that that specifically happened that way.²⁰⁴

What Mumma had arrived at in his cybersonic work was, if not by name (at least at first), a reformulation of Cage's live-electronic music quite in line with Tudor's own interpretation of electronic liveness. In his work on *Variations II* and *Fluorescent Sound*, Tudor demonstrated an interest in "unforeseen" activity on the part of electronics, and in the technological system as the locus of a work's "orientation." Drawing on the conceptual vocabulary of cybernetics, and a considerably wider knowledge of electronic media, Mumma had, simultaneous to Tudor's early-Sixties activities, advanced an even more sophisticated understanding of live-electronics premised on "control mechanisms," or pre-programmed processes of modification.

Via his continued contact with Mumma over the course of the early-to-mid Sixties, Tudor was able to draw on his expertise, as well as his custom-built equipment. Tudor and Cage cultivated a relationship with the ONCE Festival following their first visit to Ann Arbor, participating in the 1963 iteration of the event (where Tudor played Cage's *Variations II*), and collaborating directly with Mumma at the 1965 Festival.²⁰⁵ At the latter iteration, a multiply amplified Cage delivered an improvised talk ("Talk I"), while Tudor and Mumma, operating a six-channel sound-system, modified his speech in real-time.²⁰⁶ At one point during the piece, Robert Rauschenberg strode in

²⁰³ Mumma, "Creative Aspects," 44.

²⁰⁴ Mumma, interview by Plush, 91.

²⁰⁵ Miller, liner notes, *Music from the ONCE Festival*.

²⁰⁶ John Cage, "Talk 1" (1965) in *A Year from Monday: New Lectures and Writings* (Middletown, CT: Wesleyan University Press, 1967), 141.

and talked with Cage, although “very little of anything that was said. . .was comprehensible to the audience.”²⁰⁷ Also in 1965, Tudor placed his first order for one of Mumma’s handmade devices, securing a copy of his “Cyber sonic Spectrum Transfer.” According to You Nakai, the “ST,” which Tudor continued to use for decades, was essentially a ring modulator, or a device which, given two frequencies as inputs, generates the sum and difference of these signals.²⁰⁸

As Nakai explains, Mumma’s devices garnered Tudor’s interest and use even as mass-produced and more straightforwardly operated “voltage-controlled synthesizers” (Robert Moog’s [1934–2005] Moog Synthesizer, and Donald Buchla’s [1937–2016] Buchla Music Box) reached the market in 1964–65.²⁰⁹ These highly streamlined instruments, which automated and simplified the production and modification of electronic sound, took the form of connectable “modules” (filters, oscillators, and white-noise generators) that each performed predictable functions, and could be used in any combination with reliable results. The early synthesizer was, per electronic musician Joel Chadabe (1938–2021), a kind of “musical erector set” whose neatly packaged nature made for a shallow learning curve.²¹⁰ As his preference for Mumma’s devices suggests, this was never to Tudor’s taste. From an early stage in his exploration of electronics, he *preferred* volatility and unpredictability, embracing misaligned voltages and precarious connections, overloading amplifiers with power, and achieving a distributed complexity simply through multiplied components and maze-like wiring configurations.²¹¹

If Tudor’s developing fluency in electronics (colored by a taste for the “unforeseen”) drew him closer to Mumma, it also appealed strongly to Cage. In the mid Sixties, Cage, still drunk on the

²⁰⁷ Cage, “Talk 1,” 141.

²⁰⁸ Nakai, *Reminded by the Instruments*, 188–190.

²⁰⁹ Nakai, 221–225.

²¹⁰ Joel Chadabe, “The Voltage-controlled Synthesizer,” in *The Development and Practice of Electronic Music*, ed. Jon H. Appleton and Ronald C. Perera (Englewood Cliffs, NJ: Prentice-Hall, 1975), 139.

²¹¹ Nakai, *Reminded by the Instruments*, 222–224.

lofty technophilic rhetoric of Marshall McLuhan and Buckminster Fuller, sought to render the live-electronic indeterminacy of *Cartridge Music* on a much vaster scale, and just as he had once called on Tudor to animate the techno-logical sound-world of chance composition, he now enlisted his help with complex tangles of technology. A major opportunity arose for Cage and Tudor both when the New York Philharmonic's French-American Festival, directed by composer Lukas Foss (1922–2009) and scheduled for Spring–Summer 1965 at New York's Lincoln Center, commissioned a new collaborative work from Cage and Merce Cunningham.²¹² While the title of the resulting spectacle, *Variations V* (1965), familiarly referenced Cage's *Variations* works, which had hitherto explored performer indeterminacy via the use of transparencies, this new production bore little resemblance to anything that had come before it.

With *Variations V*, Cage wanted to create an electronic accompaniment to Cunningham's choreography that was influenced (but not *determined*) by dancers' movements. The technological configuration that ultimately helped achieve this was daunting in its complexity. Twelve antennae designed by none other than Robert Moog (of the Moog Synthesizer) were situated around the perimeter of the Lincoln Center stage, and photoelectric (light-sensitive) cells were placed at their bases. Live during the performance of *Variations V*, several pairs of helping hands operated tape-recorders and radios whose sounds were fed into a fifty-channel mixer (operated by Cage and Tudor); the proximity of Cunningham's dancers to the antennae and photocells onstage triggered which sounds were sent to which of the six loudspeakers that Tudor had distributed throughout the performance hall.²¹³ Contact microphones attached to each of the dancers and to a bicycle piloted by Cunningham fed additional sounds to the loudspeakers. To compound the acoustical fireworks,

²¹² Leta E. Miller, "Cage, Cunningham, and Collaborators: The Odyssey of 'Variations V,'" *The Musical Quarterly* 85, no. 3 (Autumn 2011): 544–545, <https://doi.org/10.1093/musqtl/85.3.545>; Merce Cunningham Dance Company 1968 program booklet, Box 23, Folder 40, Oliveros Papers.

²¹³ Miller, "The Odyssey of 'Variations V,'" 545–546

projections and modulated television imagery by artists Stan VanDerBeek (1927–1984) and Nam June Paik (1932–2006) flickered about the stage.²¹⁴

The extant “notation” associated with *Variations V* reveals a striking change in Cage and Tudor’s relationship—one motivated by a widening disparity in their respective knowledge of electronics. One of the most remarkable consequences of *Variations V*, as recalled by its participants, is that it seems to have finally forced Cage into a performance dynamic of “improvisation”; as Leta E. Miller writes, no score governed Cage and Tudor’s activities at the fifty-channel mixer, nor were the tape-recorders and radios manipulated in accordance with any preconceived plan.²¹⁵ While Cage eventually published what he termed an “*a posteriori* score” for the work, this document is merely a list of thirty-seven descriptive remarks that offer little sense of the technical mechanics of *Variations V* and could scarcely be used to reconstruct it.²¹⁶ **[Figure 23a]** From Tudor, on the other hand, we have an *a posteriori* block diagram (produced sometime between 1965 and 1973) laying out the work’s technological components and signal paths.²¹⁷ **[Figure 23b]** The startling ambiguity of Cage’s “score” as compared to Tudor’s, and the fact that Cage waited until after the *Variations V* premiere to produce it, reveals more than a change of attitude; it suggests that this work so challenged Cage’s ability to understand it that he could not *but* improvise, entrusting to Tudor, the real man behind the boards, with its success.

It is thus that Cage’s electronic music of the mid Sixties, which, on programs, increasingly featured the credit “Sound system by David Tudor,” provided Tudor with a valuable training ground for his own creative practice.²¹⁸ Just as Cage had gradually ceded responsibility to Tudor in his indeterminate compositions of the late Fifties and early Sixties, affording the techno-logical pianist

²¹⁴ “10 Selected Realizations of Graphic Scores,” 1973, Tudor Papers.

²¹⁵ Miller, “The Odyssey of ‘Variations V,’” 553.

²¹⁶ “10 Selected Realizations of Graphic Scores,” 1973, Tudor Papers.

²¹⁷ “10 Selected Realizations of Graphic Scores,” 1973, Tudor Papers.

²¹⁸ Nakai, *Reminded by the Instruments*, 166.

new chances to remake himself, he was now laying technological puzzles at Tudor's feet and firing his imagination once again. *Variations V* marked merely the beginning of a relationship that would continue for years to come, and only a year after the Lincoln Center spectacle, Cage and Tudor found themselves entangled in another complexly wired venture.

While building *Variations V*'s technological understructure, Cage and Cunningham had sought out the help of outside engineers (at the time, Tudor's knowledge only went so far), and one of these figures was an employee of New Jersey's Bell Laboratories named Wilhelm (Billy) Klüver (1927–2004).²¹⁹ By day, Klüver, an expert in microwave radiation, worked alongside other Bell engineers dealing variously with microelectronics, television, video, and synthesized speech; by night, at least since the early Sixties, he circulated giddily through the New York art scene, seeking out opportunities to make Bell's technology and know-how available to interested artists.²²⁰ By 1965, Klüver had already worked with sculptor Jean Tinguely, whom he helped build a mechanical assemblage (*Hommage to New York*, 1960) that self-destructed in the courtyard of New York's Museum of Modern Art; and he had collaborated with Robert Rauschenberg, whom he helped realize a five-part sculptural installation (*Oracle*, 1962–65) incorporating concealed radios.²²¹ Now, following the premiere of *Variations V*, and his work with Cage and Tudor, Klüver was hungry for further collaboration, and wanted badly to unite Bell engineers with leading avant-garde figures in a larger and more organized effort.

An opportunity arose in November 1965, when Klüver, a native Swede, received word of an art-and-technology festival being developed in his home country. Slated to take place in September 1966, the event was the brainchild of Fylkingen (the arts organization behind "Five New York

²¹⁹ Miller, "The Odyssey of 'Variations V,'" 552.

²²⁰ W. Patrick McCray, *Making Art Work: How Cold War Engineers and Artists Forged a New Creative Culture* (Cambridge, MA: MIT Press, 2020), 84–97.

²²¹ McCray, *Making Art Work*, 87–96.

Evenings” at the Moderna Museet), whose members encouraged Klüver to secure the involvement of American artists.²²² Drawing on all the artistic talent in his New York-area network, Klüver promptly assembled a group at Bell Labs that included Cage and Tudor, Rauschenberg, and dancer-choreographers Yvonne Rainer, Deborah Hay, and Lucinda Childs (1940–), among others.²²³ It was Klüver’s intention to pair these figures with suitable engineers at Bell, whom he hoped would help the artists realize masterful new fusions of dance, music, and technology for the Fylkingen festival. Tudor, for his part, would realize the first major work of his solo career, taking all the knowledge he was gathering and wiring it all for maximum feedback.

♦ O ♦

As 1965 shaded into 1966, “vibes were building” in San Francisco. This, at least, is Ramon Sender’s recollection. Since his first experience with peyote during the Tape Center’s 1965 season, Sender had been wandering down a path of psychedelic self-exploration that some of his colleagues found unsavory.²²⁴ In months previous, Morton Subotnick, ever the entrepreneur, had been hard at work securing funding for the Tape Center, and his efforts had yielded a \$15,000 grant from the Rockefeller Foundation. Hoping to nurture a relationship with the organization and obtain further funding, Subotnick wanted the Tape Center to maintain veneer of respectability, and he was growing concerned about certain of Sender’s extracurricular activities.²²⁵ To wit: it was around this time that Sender linked up with a young Stanford graduate named Stewart Brand (1938–), who, after a stint in the army, had begun his own journey of self-exploration, living in upstate New York with psychedelic arts collective USCO (Company of Us), visiting American Indian reservations, and at last finding himself in the Bay Area, where, in 1962, he connected with the International Federation

²²² McCray, 104–105.

²²³ McCray, 104–105.

²²⁴ Sender and Maginnis, interview by Bernstein and Payne, 74.

²²⁵ Sender and Maginnis, interview by Bernstein and Payne, 75.

for Advanced Study (IFAS), the psychedelic therapy initiative spearheaded by Ampex's own Myron Stolaroff.²²⁶ In time, Brand would become known for publishing the *Whole Earth Catalog*, a righteously countercultural magazine designed to connect readers with a variety of artists, craftsmen, and makers. For now, he was busy tracing out the edges of an expanding consciousness with writer Ken Kesey (1935–2001), whose band of associates (the Merry Pranksters) and their LSD-fueled gatherings (“acid tests”) inspired Tom Wolfe’s (1900–1938) novel *The Electric Kool-Aid Acid Test* (1968).²²⁷

In late 1965, Brand asked Sender, with whom he had been enjoying numerous misadventures along the California Coast, if he would be interested in organizing a large-scale event harnessing the growing psychedelic energies in San Francisco. Sender, enthusiastic, joined Brand in planning a “Trips Festival” that in January 1966 would take over the city’s Longshoreman’s Hall with three nights of music, multimedia performances, and dancing. Oliveros has on numerous occasions expressed her discomfort with drug culture, and recalling this turning point in the Tape Center’s cultural cosmos, she has remarked that she “resisted as the psychedelic movement revved up.”²²⁸ Nevertheless, she was enticed to participate in the “Trips Festival,” and of the Tape Center’s core cohort, only Subotnick opted out of involvement.²²⁹ If Oliveros’s recollections are correct, her participation was not exactly self-motivated: she states that she was invited to work on a collaborative production with dancer Elizabeth Harris and filmmaker Ronald Chase (1934–). After *Duo for Accordion and Bandoneon* (1963–64), Oliveros had continued to work with Harris, and in 1965, she contributed a discordant prepared-piano score to Chase’s film *The Covenant* (1965), in which

²²⁶ Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2008), 45–61.

²²⁷ Turner, *Counterculture to Cyberculture*, 59–91.

²²⁸ Oliveros, “Memoir of a Community Enterprise,” 90.

²²⁹ Sender and Maginnis, interview by Bernstein and Payne, 75.

Harris, captured in stark black-and-white, whirls about a vast, empty space while manipulating a long wooden plank.²³⁰

For the “Trips Festival,” Oliveros, Harris, and Chase set about producing something considerably less austere. The Festival’s main events at the Longshoreman’s Hall were slated to unfold between January 21st and 23rd, and Oliveros, Harris and Chase prepared what Oliveros termed a “side trip” at San Francisco’s Encore Theater; their production, a joint multimedia performance, would take place on Sunday, the 23rd, in the bleary-eyed aftermath of Saturday night’s performances by rock bands Big Brother & the Holding Company and The Grateful Dead (both fresh on the local scene), and what promised to be the Merry Pranksters’ most ambitious “acid test” yet. Oliveros and her collaborators stood up to competing “Trips Festival” fare by drawing in a vast web of collaborators: while Harris contributed choreography and props, and Chase handled “visuals and lighting,” Tony Martin brought slide projections, and R.G. Davis—still a lightning rod among San Francisco’s public officials—participated as a performer alongside other Mime Troupe members.²³¹

While deeply collaborative, the production that resulted from this creative fray was shaped powerfully by Oliveros, whose degree of creative direction is indexed by its name alone: *A Theater Piece* (1966, sometimes rendered *A Theatre Piece*). Regrettably lacking in documentation—neither photographs nor film of the event exists, and the recollections that Oliveros has offered are limited in detail—*A Theater Piece* exists primarily as a single lined notebook (held in Oliveros’s papers) containing handwritten budgets, drafted letters, wiring configurations, and piecemeal descriptions of planned performance elements. [Figure 24] From these pages, we can reconstruct some of the activities in which Harris, the Mime Troupe, and the remaining throngs of performers had a hand:

²³⁰ Oliveros, interview by Bernstein and Payne, in *Tape Center*, ed. Bernstein, 108.

²³¹ “Theater Piece notebook,” 1966, Box 6, Folder 24, Oliveros Papers; Trips Festival program, 1966, Box 13, Folder 29, Oliveros Papers.

for example, there are fragmented mentions of Anna Halprin's dancer Norma Leistiko jumping rope, the appearance of a prop hourglass and the wielding of a "light instrument," and a sequence in which performers tear newspapers to shreds as a "screeching" builds and decays in the background. It also seems that R.G. Davis, not to be upstaged, made an appropriately provocative cameo appearance, arriving to play violin in the nude.²³²

Even if Oliveros was, by her own admission, uncomfortable with aspects of the psychedelic revolution, her musical contributions to *A Theater Piece* suggest that she saw in the "Trips Festival" a wider cultural significance: a call to "freedom" with stakes beyond the psychotropic. Perhaps it was the enthusiastic collaboration of the Mime Troupe in *A Theater Piece* that encouraged Oliveros to consider the production in light of the Free Speech Movement and the right to public campaigning; Oliveros would have been keenly familiar with R.G. Davis's continued muzzling by the San Francisco Park Commission, and she may also have been aware that the Longshoreman's Hall, the Trips Festival's main venue, hosted benefits to defray the Mime Troupe's legal costs in 1965.²³³ It is at any rate that she was inspired to sketch out the following scenario in her *Theater Piece* notebook: "Open with huge procession including everyone going all over campus. Noise makers, pig bladders, distribution of food to needy students, FSM, sexual freedom, etc."

There is no evidence that anything like this pilgrimage to a college campus (presumably that of UC Berkeley) occurred in the context of *A Theater Piece*; and because portions of the work's associated notebook suggest its use as a daily scratchpad and planner, it is possible the "procession" was devised as an entirely separate venture. However, the conceptual rubric of "free speech" did, ultimately, ground Oliveros's music at her "side trip," and pressed her towards a bold new model of live-electronic music. One major component of her accompaniment for *A Theater Piece*, which was

²³² "Theater Piece notebook," ca. 1968–1972, Oliveros Papers.

²³³ Ashbolt, *A Cultural History of the Radical Sixties*, 88–89.

introduced during the last of the production's four acts, was a tape collage titled *Rock Symphony* (1966), which, in an anticipation of contemporary musical "mash-ups," strung together several chart-topping hits from 1965–66, including The Animals' "It's My Life," Bobby Fuller's "I Fought the Law," and The Four Seasons' "Let's Hang on!"²³⁴ Not all Oliveros's inclusions were popular radio fare, however: into this innocuous succession of songs, Oliveros inserted FSM leader Mario Savio's "Bodies Upon the Gears" speech, which had been delivered to immediate infamy at UC Berkeley's Sproul Hall on December 2, 1964.²³⁵ [Figure 25]

Savio's speech, which protested Berkeley's university "autocracy," and likened the school to one great "machine" into whose maw students flowed like "raw materials," issued the following injunction: "[Y]ou've got to put your bodies upon the gears and upon the wheels, upon the levers, upon all the apparatus and you've got to make it stop."²³⁶ Oliveros's sampling of Savio's speech was itself a strong statement, and the recording's use in *Rock Symphony* surely jarred those audience members bobbing along to The Animals and Bobby Fuller. Yet there is a more complex politics at work in *Rock Symphony*, which, Oliveros's notes reveal, was fed through the same kind of two-recorder delay system used in *Light Piece for David Tudor* (1965). Savio had used the figure of the

²³⁴ In numerous places, on both curriculum vitae, and in written accounts, Oliveros has not only dated *A Theater Piece* and *Rock Symphony* to 1965, but also suggested that these works were premiered at San Francisco's Encore Theater in January of that year. See Oliveros, "Memoir of a Community Enterprise," 90; and "Career Narrative," 1972–77, Box 29, Folder 8, Oliveros Papers. (On just one list of compositions filed with Oliveros's "academic biographies"—see Box 29, Folder 6, Oliveros Papers—the date of January 1966 is given for *A Theater Piece*.) As I discuss here, Oliveros presented these works at the Encore as part of her "Trips Festival" "side trip" in January 1966; thus, Oliveros's Janauary 1965 dating would, logic dictates, seem a simple misremembrance. Unfortunately, this misdating has proliferated through secondary literature, leaving behind a muddled picture of the relevant chronology. See David W. Bernstein, "The San Francisco Tape Music Center: Emerging Art Forms and the American Counterculture, 1961–1966," in *Tape Music Center*, ed. Bernstein, 33; and Von Gundten, *Music of Pauline Oliveros*, 163, 166. That *A Theater Piece* and *Rock Symphony* do not appear on any of the programs dated 1965 in Oliveros's comprehensive program files—see Box 13, Folder 28, Oliveros Papers—is suggestion enough that these works were not premiered until January 1966; there is, however, harder evidence that this is the case. Indeed, several of the rock songs "sampled" in Oliveros's *Rock Symphony* were not even released until late 1965: for example, Columbia Records first issued The Animals' "It's My Life" as a 7" single (catalogue no. DB 7741) on October 22, 1965; Tamla Records first issued The Marvelettes' "Don't Mess With Bill" as a 7" single (catalogue no. T-54126) on November 26, 1965; and Mustang Records first issued the Bobby Fuller Four's "I Fought the Law" as a 7" single (catalogue no. 3014) in October 1965.

²³⁵ *Rock Symphony* track listings and preparatory materials, 1965–66, Box 5, Folder 14, Oliveros Papers.

²³⁶ Ashbolt, *A Cultural History of the Radical Sixties*, 57.

“machine”—what Fred Turner calls the “computational metaphor” of the Cold War—to impugn Berkeley’s *suppression* of speech; and yet with *Rock Symphony*, Oliveros used the real-time manipulation of tape, the very same medium that spooled through IBM mainframes of the postwar, to draw Savio’s words, and the keening sounds of electric guitars into ecstatic, delirious repetition.²³⁷ This more nuanced gesture was altogether appropriate to the Trips Festival, which, beneath some of its bohemian trappings, leveraged some of the most sophisticated multimedia tools of the day—synthesizers, spatialized audio, and bespoke projection systems—in a utopian expression of hope. In the hands of Brand, Sender, and indeed, Oliveros, hard-edged *machines* became, per Fred Turner, liberating “technologies of consciousness.”²³⁸

With *Rock Symphony*, Oliveros *said* something about free speech; but with another segment of her music for *A Theater Piece*, she *did* something. Her notes reveal that in the middle of the production, she directed “sound assistant” Charles MacDermed to carry an Electro-Voice Model 636 omnidirectional microphone into the Encore Theater’s crowd and record the audience: “Charles will carry EVE636 around pick up noise make interviews,” her notes read.²³⁹ Elsewhere: “audience participation” and “audience applause recorded and continued.”²⁴⁰ The voices and sounds recorded were subsequently played back through the venue sound-system, and presumably drawn into the time-delayed churn of Oliveros’s looping configuration. With this gesture, simple in a nature but devastating in its implications, the musician united her newly honed knowledge of loops with her ambitious intentions for *Pieces of Eight* (1965), which had used prose instructions (scripts), performer-audience interaction, and the staging of listening as a creative act to forge a new musical theater in

²³⁷ Turner, *Counterculture to Cyberculture*, 11–12.

²³⁸ Turner, 234.

²³⁹ “Theater piece notebook,” 1966, Oliveros Papers.

²⁴⁰ “Theater piece notebook,” 1966, Oliveros Papers. David W. Bernstein has described this portion of *A Theater Piece* thus: “*A Theater Piece* also involved the audience: a member of the cast walked among the audience with a tape recorder, asking for responses to the action onstage. The remarks—which in one performance ranged from complete bewilderment to an astute realization that the work attempted to bridge the gap between art and life—were subsequently played back during the performance.” Bernstein, “The San Francisco Tape Music Center,” in *Tape Music Center*, 33.

the mold of electronic orality. By reflecting the voices of audience members back to them from the stage, and from the booming sound-system of the Encore Theatre, Oliveros did more than make listening a part of performance: she made listeners *performers*, and accorded them a structural role in the unfolding of *A Theater Piece*. With tape and an omnidirectional microphone, Oliveros achieved a live-electronic music whose liveness consisted in the unscripted voices of listener-performers, drawn into the “multidimensional” fabric of recorded time and amplified tenfold.

It might seem illogical, or implausible, to suggest that a new kind of performative presence was conjured in *A Theater Piece*, for such presence would then owe to the logic of re-presentation. To locate an embodied liveness in Oliveros’s work would be to locate *immediacy* in media. But then, what Oliveros demonstrates with this work is that one need not regard electronics, and specifically tape, as an embalming medium or sworn enemy of liveness. In the right hands, she would seem to say, an Ampex machine can free speech—not fix it.

♦ T ♦

In the Spring of 1966, several months after the “Trips Festival” left San Francisco awash in an excited afterglow, movements were being made by Billy Klüver’s East Coast artists and engineers, who remained committed to working together on projects for Fylkingen’s art-and-technology festival in Stockholm. Inevitably, tensions had surfaced during some of the first meetings between Bell staff-members and the New York avant-garde. Artists, for example, expressed desires for the unequivocally unrealistic (Klüver recalls that Robert Rauschenberg and artist Öyvind Fahlstrom “wanted to fly”), no doubt wearying the pragmatically minded Bell personnel.²⁴¹ Eventually, however, expectations were appropriately calibrated, and individual artists began to “pair off” with engineers well-suited to their interests.²⁴² The teams set to work within the parameters of available

²⁴¹ “9 Evenings” Ms. copy, “2. Origins,” Box 1, Folder 24, Experiments in Art and Technology Records (hereafter E.A.T. Records), accession no. 940003, Special Collections, The Getty Research Institute, Los Angeles, CA.

²⁴² “9 Evenings” Ms. copy, “2. Origins,” E.A.T. Records.

equipment (and the constraints of real-world physics), formulating more grounded plans of action. At this still-early stage, the real problems that were arising were coming not from the home-front, but from Sweden: Klüver's contacts in Fylkingen were made uneasy by the “open-ended” approach taken by the Americans, and further, had little interest in foregrounding Bell's engineers in their festival. Tensions flared, and in July, just months before the festival's projected start-date, the Stockholm plans collapsed.²⁴³

Were it not for Klüver's superhuman fundraising abilities, and Rauschenberg's enthusiastic assistance in this corner, the break with Fylkingen could well have spelled the end of the plans drawn up thus far. Fortunately, funds were secured from individual donors, and Klüver located a new venue much closer to home: New York City's 69th Regiment Armory. Here, the Bell engineers and their collaborating artists would stage their own festival on their own terms—and they would do it under a new name. Previously, their venture had borne the ambiguous title “Art and Technology.” They now decided upon a celebration of “Theatre and Engineering,” staggered across nine evenings in October 1966. Hence: “9 Evenings Theatre and Engineering.”

The degree to which Tudor had been involved in “9 Evenings” up to this point is not entirely clear, but as You Nakai observes, Tudor and Cage had missed a preliminary meeting about individual projects back in January, and Tudor was subsequently absent from meetings in March and May.²⁴⁴ What is known is that Tudor did not, at first, intend to produce an *original* work for Klüver's festival; indeed, his initial plan was to realize a composition by Mauricio Kagel, his conduit to the bandoneon, titled *Alle Rechte vorbehalten* (1965). The score for Kagel's work was a wide strip of paper bearing only tempo indications and dynamic markings, and glued end-to-end into a möbius-strip formation. As analyzed by You Nakai, Tudor's worksheets dating roughly to Spring 1966 (which,

²⁴³ McCray, *Making Art Work*, 108–109.

²⁴⁴ Nakai, *Reminded by the Instruments*, 234–235.

significantly, represent some of his first renderings of block diagrams) reveal that he intended to realize Kagel's work by processing the sounds of "white noise" (a *shhhhhh*-like signal with a "flat" spectrum, or evenly distributed frequencies) via several electronic components, some of which had been given to him (e.g., Mumma's Cybersonic Spectrum Transfer), and some of which he built himself.²⁴⁵

As Spring transitioned into Summer, however, and Klüver's assembled team regrouped following their fallout with Fylkingen, Tudor changed course almost entirely: according to his own program notes, his original idea "abandoned itself thru the process of my projecting my thoughts into the about-to-become available technology, & its potential for the creation of 'white noise' from scratch."²⁴⁶ Into what "about-to-become available technology" did Tudor wish to "project[t] [his] thoughts," in his evocative turn of phrase? And how was he to set about producing white noise "from scratch"? Two experiences motivated Tudor's change of heart in the summer of 1966. First, he began collaborating with his assigned partner Fred Waldhauer, a young engineer who specialized in feedback systems, and had been researching the digital multiplexing of telephone calls while at Bell.²⁴⁷ Second, he witnessed (and apparently consulted on) an inspired effort on the part of Bell's engineers to technologically "centralize" the execution of all the festival's projects.²⁴⁸

The artists involved in Klüver's undertaking had all planned strikingly different productions: for example, for his work *Grass Field*, dancer Alex Hay planned to equip himself with sensors and transduce his brainwaves and cardiac activity into sound; for his *Open Score*, meanwhile, Robert Rauschenberg, perhaps drawing influence from the flickering fluorescent symphony that had accompanied his *Elgin Tie*, decided to stage a tennis match wherein the rackets were fitted with

²⁴⁵ Nakai, 234–235.

²⁴⁶ Handwritten *Bandoneon! (A Combine)* (1966) note for "9 Evenings" program, 1966, Box 3, Folder 2, Tudor Papers; Nakai, 247.

²⁴⁷ McCray, *Making Art Work*, 115–117.

²⁴⁸ Nakai, *Reminded by the Instruments*, 247–250.

microphones and transmitters, and wired to dial down the lights of the Armory with each *thwack* of a tennis ball.²⁴⁹ Despite their obvious differences, however, all works had been made to function within the parameters of a wireless system employing FM receivers and transmitters that sent signals between devices (whether lights, sound-producing instruments, or other electronic components). Late in the summer leading up to “9 Evenings,” this shared wireless system grew into an elaborate central control apparatus known as the TEEM (Theatre Electronic Environmental Modulator), which spoke to nearly 300 separate components, and could achieve the “simultaneous remote control of multiple sounds, lights, and movement of objects.”²⁵⁰

The TEEM’s purpose was eminently practical: boasting a patch-board system with which artists’ works could be “preprogrammed” via the wiring of jacks and plugs, it allowed for thorough standardization.²⁵¹ Indeed, the TEEM enabled Bell engineer Herb Schneider to produce block-diagrams outlining the hardware connections involved in each artist’s performance.²⁵² After Gordon Mumma, we might say that these diagrams functioned—at least in the engineers’ eyes—as executable scores. Tudor’s interest in the TEEM was less straightforward. Noting that all the artists and dancers involved in “9 Evenings” were using only specific components of the TEEM, Tudor wondered whether it might be possible to “put everything [in the system] to use.”²⁵³ Faced with the dense interconnections of Bell’s centralized system, Tudor ignored the linear communication between select components. He focused instead on a vast web out of whose in-built complexity he could derive a makeshift “white noise.” As ever, he was in pursuit of the “unforeseen.”

A handwritten note Tudor contributed the original “9 Evenings” program suggests what the broad outlines of his thought might have looked like as the festival drew closer: “Live signals ->

²⁴⁹ McCray, *Making Art Work*, 112–115.

²⁵⁰ McCray, 121–122.

²⁵¹ McCray, 124.

²⁵² McCray, 122–124.

²⁵³ *David Tudor: Bandoneon! (A Combine)*, dir. Julie Martin and Barbro S. Lundestam (E.A.T. and ArtPix, 2010), DVD.

becoming electronic -> programmed transmission to physical materials,” the text reads in part.

Kagel, strangely, is still mentioned in this note, which also describes the “actuation” of “physical materials” using *Alle Rechte Vorbehalten*, “in a self-multiplying audio-visual application (towards ‘rebirth of white noise’).”²⁵⁴ The first quoted portion suggest, simply, that Tudor wished to use “live” acoustical signals as a sound source for electronic processing, and subsequent transmission to “physical” objects of some sort; however, Tudor provides no clues, here, as to the *source* of the live signals, the *means* of electronic processing, or the *identity* of the “physical materials” placed at the end of his transmission chain. We are thus left wondering as to what instrument Tudor was planning to use, and what components—electronic, “physical,” or otherwise—he hoped to chain to one another, and to the TEEM’s centralizing web.

The constituent bits and pieces of Tudor’s “9 Evenings” took concrete form in the months leading up to the festival’s October launch. During this time, Tudor was exposed to several ideas by friends and collaborators that manifestly shaped his plans for his piece. First, in May 1966, Tudor traveled to Toronto, where he premiered a work titled *Musica Instrumentalis* (1966) by a young electronic musician named Lowell Cross (1938–).²⁵⁵ For two years, Cross had been developing works under the generic title *Video* in which he converted electronic sound, produced through a variety of means, into visual patterns on a seventeen-inch monochrome television.²⁵⁶ [Figure 26] The visualizations Cross first achieved were simple (they took the form of bright white loops and curves writhing against a black background), but Tudor found their real-time alchemy compelling.²⁵⁷ Cross’s *Musica Instrumentalis* required Tudor to generate visualization patterns via his bandoneon, whose

²⁵⁴ Handwritten *Bandoneon! (A Combine)* (1966) note for “9 Evenings” program, 1966, Tudor Papers.

²⁵⁵ Lowell Cross, “Remembering David Tudor: A 75th Anniversary Memoir,” *European Journal of Musicology* 4 (2001): 8–11, <https://doi.org/10.5450/ejm.2001.4.6118>.

²⁵⁶ Crudely, Cross’s configuration rendered sound visually and spatially by turning the television screen into an X-Y plot that could assign X- and Y-values to different parameters of sonic input (e.g., amplitude or harmonic structure).

²⁵⁷ Nakai, *Reminded by the Instruments*, 232–234.

sounds were electronically processed, but it also demanded that he *respond* to the resulting patterns as if they were an ever-changing score; it thus established a cunning feedback loop between performer and television.²⁵⁸ Several months later, in August 1966, Tudor once again pressed his bandoneon into service, performing Gordon Mumma's *Mesa* (1966) in the premiere of a new Merce Cunningham dance titled *Place*. *Mesa* marked Mumma's first Cunningham commission and the beginning of a long relationship with the choreographer's company.²⁵⁹ Written especially with Tudor in mind—Tudor had played his bandoneon for Mumma during his 1965 trip to Ann Arbor—*Mesa* involved the “cybersonic” processing of bandoneon sounds.²⁶⁰

It is evident that *Mesa* and *Musica Instrumentalis* both encouraged Tudor to deploy his bandoneon as a sound source in “9 Evenings,” for at some point before October 1966, his contribution solidified as *Bandoneon! (A Combine)*. In its final, exceedingly complex form, the work found Tudor marshalling the bandoneon as the single “live” sound source for a diverse aggregation of processing devices. In notable tribute to Rauschenberg, whose *Elgin Tie* (1964) had occasioned *Fluorescent Sound* (1964), Tudor likened his chimeric creation to Rauschenberg’s “combines,” those hybrid pictorial forms grafting together elements of painting, sculpture, and found objects—hence the parenthetical of his work’s title. Contact microphones hooked to Tudor’s instrument picked up its sounds and routed them across multiple channels to a variety of components and peripheral devices: equipment custom-built by Bell engineers allowed Tudor to modulate the Armory’s overhead lighting and pan his sound spatially around the venue’s fleet of loudspeakers; Lowell Cross processed Tudor’s sounds using adapted *Video* equipment, projecting the results; and amplifiers

²⁵⁸ Nakai, 232–234.

²⁵⁹ Mumma, “From Where the Circus Went” (1975), in *Cybersonic Arts*, 117–119.

²⁶⁰ Mumma, “From Where the Circus Went,” 117–119; Goldman, “Buttons on Pandora’s Box,” 46–48.

designed to generate volatile, self-sustaining feedback (Tudor termed them “saturated amplifiers”) accepted Tudor’s audio signals and then sent them snowballing out of control.²⁶¹ [Figure 27]

Perhaps the most unusual components featured in *Bandoneon! (A Combine)*, a veritable sea of strange devices, were tall, totemic sculptures—what Tudor termed “instrumental loud-speakers” or “moving loudspeakers”—set on carts and piloted about the vast floor of the Armory via remote controls.²⁶² [Figure 28] These constructions were the “physical materials” mentioned in Tudor’s handwritten note, and for the most part, they were not conventional speakers, but rather metal assemblages to which Tudor had attached “tactile transducers.”²⁶³ These transducers received Tudor’s sound signals, converted them to vibrations, and sent them coursing through his metal assemblages, which murmured and rattled in step with every squeeze of Tudor’s bellows.

As we will see in the following chapter, the principle underlying these “instrumental loud-speakers”—the transmission of sound through solids via transduction—sits at the very root of Tudor’s *Rainforest* works, begun in 1968 and developed into full-fledged installations in the Seventies. The provenance of the principle is thus important. Matt Rogalsky, who has authored an extensive history of *Rainforest*, has suggested that Tudor’s inspiration for his loudspeaker-objects—and, in turn, *Rainforest*—came from build-it-yourself articles in hobbyist magazines, and, potentially, the musician Alvin Lucier, who had begun working with percussive resonance in the mid Sixties.²⁶⁴ Gordon Mumma, however, has posited an equally likely inspiration: Pauline Oliveros.²⁶⁵

²⁶¹ Nakai has keenly reconstructed the nature and derivation of Tudor’s “saturated amplifiers.” See *Reminded by the Instruments*, 264–271.

²⁶² The phrase “instrumental loud-speakers” (so hyphenated) appears in Tudor’s short, handwritten note for the “9 Evenings” program, whereas “moving loudspeakers” appears in his slightly longer program description. Handwritten *Bandoneon! (A Combine)* (1966) note for “9 Evenings” program, 1966, Tudor Papers; Summary of *Bandoneon! (A Combine)* (1966) for “9 Evenings” program, 1966, Tudor Papers.

²⁶³ Handwritten *Bandoneon! (A Combine)* (1966) note for “9 Evenings” program, 1966, Tudor Papers; Matthew R. Rogalsky, “Idea and Community: The Growth of David Tudor’s Rainforest, 1965–2006” (PhD diss., City University of London, 2006), 77–80.

²⁶⁴ Rogalsky, “Idea and Community,” 71–73.

²⁶⁵ Gordon Mumma, e-mail communication with the author, April 17, 2021.

In March of 1966, Oliveros and Tudor both appeared at that year's "reduced" iteration of Ann Arbor's ONCE Festival and performed a proper "duo" with one another for the first time since *Duo for Accordion and Bandoneon* (1963–64).²⁶⁶ At least since her making of *Time Perspectives* (1961), Oliveros had been fascinated by the physical resonances and percussive textures of wooden apple boxes (or crates). By 1966, Oliveros had discovered that she could equip apple boxes with contact microphones (foundational components of Tudor's electronic toolkit) and put them to effective use as amplified percussion instruments in live performance; she thus invited Tudor to perform an improvised duo for amplified apple boxes, and Tudor happily obliged. For their *Applebox Double* (1965), Tudor and Oliveros scraped, banged, and bowed their boxes with metal springs, "curb scrapers," and other sundry implements, unleashing a universe of resonances and textures from the barest of physical vessels; as in *Duo for Accordion and Bandoneon*, they followed no score, improvising with one another in real time.²⁶⁷ It is appealing to think that Oliveros may have been present, by physical proxy, at the October 1966 premiere of Tudor's *Bandoneon! (A Combine)*, her sonic sensibility rattling from the "instrumental loud-speakers" whirling about on Tudor's carts. For indeed, Tudor, having offered himself as a performer in Oliveros's *Light Piece for David Tudor* (1965), had surely helped Oliveros along her looping path to *A Theater Piece* (1966).

Bandoneon! (A Combine) was, in any case, a threshold work for Tudor—every bit the breakthrough that Oliveros's "Trips Festival" contribution was for her. Gathering a vast network of feedbacking components whose signals shape-shifted from light, to sound, to kinetic movement, Tudor's work rendered the stochastic disorder of white noise on an architectural scale, dragging the whole of the TEEM and New York's 69th Regiment Armory into seething, unpredictable oscillation. In the context of "9 Evenings," which, despite its utopian dream of a seamless art-and-technology

²⁶⁶ Miller, liner notes, *Music from the ONCE Festival*.

²⁶⁷ Miller, liner notes, *Music from the ONCE Festival*.

marriage, ultimately forced artists to abide by the limiting parameters of Bell's "central control" system, *Bandoneon! (A Combine)* was a clear, if subtle, statement of subversion: an attempt to bring thousands of dollars' worth of technology to the brink of collapse (or, at the very least, to the space of the unpredictable). As Tudor reflected in 1973, in still-cryptic terms, "The audio processing and programming, as well as all the software, had to contribute to the oscillating (and unknowable) tendency—including the multiplication of circuits."²⁶⁸

However, in successfully modeling an "unknowable tendency" (just as *Variations II*, 1961, had pointed to "unforeseen ways"), *Bandoneon! (A Combine)* accomplished something more important: it fulfilled Tudor's criteria for a live-electronic music, and demonstrated to him what true technological agency, exerted with maximum force, could look like. As we have discussed, Tudor always had complicated feelings about *Fluorescent Sound*, which allowed him to continue his exploration of the technologically unforeseen, but was nevertheless limited in its capacity to surprise—partially as a result of its "readymade" character. In a late interview, Tudor attempted to explain what type of liveness he sought in his electronic practice, and what kind of "life" qualified his works as original compositions:

I discovered that if you work very seriously in electronics there is a point where a certain sound-world or a certain color conception can appear, an electronic set up that's hooked together with a certain idea. And all of a sudden you realize that it has a life of its own. And that's when it occurs to me, 'it's I who have done that. . . . I have given life to this configuration.' So then I decided that I have to sign my name to that.²⁶⁹

Unknowable, unpredictable, and rife with surprise, *Bandoneon! (A Combine)* at last brought techno-logical Tudor face-to-face with a technological double that escaped the precise mechanics of his understanding. It spoke decisively to him as a live entity and a live-electronic music, clearing a path forward for a new kind of composition premised on physical construction, animation, and

²⁶⁸ David Tudor, descriptive note regarding *Bandoneon! (A Combine)*, 1973, Box 1, Folder 7, E.A.T. Papers.

²⁶⁹ Tudor, interview by Hultberg.

unpredictable liveness. “*Bandoneon!* uses no composing means,” reads the final, remarkable line of Tudor’s statement in the “9 Evenings” program. “When activated it *composes itself* out of its own composite instrumental nature.”²⁷⁰ In one of Tudor’s most obscure remarks regarding *Bandoneon! (A Combine)*, one which has never been directly discussed by historical commentators, the musician described the work as instigating an “unscannable environment.”²⁷¹ Viewed from the laser-like perspective of Tudor the optical scanner, this comment reads as an expression of defeat; viewed from the perspective of Tudor the composer, reborn in the heat of white noise, it carries the ring of strange victory.

Conclusion: Bodybuilding

Above, we have charted a long, winding path—or perhaps, a braiding of paths—departing from Oliveros and Tudor’s transformative collaboration at Tudorfest (1964), and tracking the pair’s later steps towards very different interpretations of “live-electronic music.” In 1964–66, Tudor found himself emboldened by his increasingly idiosyncratic interpretations of Cage’s indeterminate scores, and his work with electrical amplification. He leveraged a growing facility with electronics, and a new artistic confidence—no doubt bolstered by Oliveros—in the creation of his *Fluorescent Sound* (1964), and *Bandoneon! (A Combine)* (1966), two works which mark his decisive move to original creation, and articulate a highly individual definition of live-electronic music premised on the unforeseen, the unpredictable, and the “unscannable” as manifest in technological systems. During this same time period, Oliveros, drawing influence from Tudor and the work of his composer-collaborators, progressed from electronic music to the construction of “theater pieces” (most notably, *Pieces of Eight*, 1965) premised on an “oral” structure of communication and a sense of stage

²⁷⁰ “9 Evenings: Theatre and Engineering,” program, 1966, Box 13, Folder 29, Oliveros Papers (my emphasis).

²⁷¹ Frances Dyson, “And then it was now: 9 Evenings,” Fondation Daniel Langlois, accessed December 6, 2021, <https://www.fondation-langlois.org/html/e/page.php?NumPage=2152>.

presence deeply influenced by tape (but not, at first, integrated with electronic media). In *A Theater Piece* (1966), we saw Oliveros unite her ambitions for the theater piece with the affordances of complex tape-delay systems and achieve a startling new activation of the embodied listener.

This chapter mounts the broader historical argument that prevailing narratives of live-electronic music in the postwar period suffer from an impoverished understanding of the diverse motivations underlying this practice, and frequently ascribe endeavors towards electronic “liveness” to concerns over a dearth of presence in electronic musical performance. As we have seen, Tudor and Oliveros sought liveness in their practices not *in spite* of electronics, but *through* them. And in their respective searches for liveness, each artist arrived at a startling revision of enshrined relationships between the composer, the performer, and the audience, decentering key principles behind what Lydia Goehr has termed the “work-concept.” Tudor’s “self-composing” *Bandoneon!* annulled the need for “composing means” and, indeed, the composer *as such*, binding Tudor and his unruly assemblage in a dynamic, unresolved dance of agency; meanwhile, Oliveros’s bid for “free speech” in *A Theater Piece* worked to collapse any remaining divisions between the on-stage performance and the off-stage audience.

Just as important, Tudor and Oliveros’s respective explorations of electronic liveness in the mid Sixties provided them with critical opportunities to prototype new experiences of embodiment that assume a critical role in their work of the Seventies. In the following chapter, we will see Tudor and Oliveros sound out the full range of implications raised by the work examined above: while Tudor will further pursue the elusive life and unpredictability of technological systems and instruments, understood as bodies, Oliveros will further pursue the activation of the listening body, understood as a technology or instrument. When pressed into resonance, these bodies will shake the foundation of musical “composition” as conventionally defined, beckoning a younger generation of practitioners invested in the unmaking of music, and the construction of a new “sound art.”

Chapter 4: Pauline Oliveros and David Tudor's Resonant Bodies, 1966–1980

Introduction: Schoolwork/Music made flesh

The two 1966 festivals that coronated Pauline Oliveros and David Tudor's transformative live-electronic explorations in the mid Sixties—the “Trips Festival,” and “9 Evenings,” respectively—were deafening, dazzling points of culmination for the musicians. Wholly distinct in their approaches to the problematic of electronic “liveness,” but united by their ecstatic embrace of high-technological means, Oliveros's *A Theater Piece* (1966) and Tudor's *Bandoneon! (A Combine)* (1966) showcased the pair's rapidly accrued fluency in the arcana of electronics (the cross-wired “ins” and “outs” of tape-delay systems, and the fickle oscillations of “saturated amplifiers”) just as they provocatively troubled the hierarchized roles of composer, performer, and listener enshrined in Lydia Goehr's musical “work” and its “imaginary museum.” And like the massive patch-bays whose wires conveyed the looping sounds of Oliveros's delay configurations, these works suggested nearly endless points of creative departure.

In the late Sixties and early Seventies, both Oliveros and Tudor engaged extensively with the implications of their live-electronic experiments, arriving at still another new stage in their respective practice. However, these *creative* developments, to be charted at length in this chapter, were preceded, and in some cases galvanized, by changes in Oliveros and Tudor's personal and professional lives; here, we should address the relevant developments briefly, looking first at Tudor. As I argued in Chapter 3, the mid Sixties represented a period of intense self-actualization for Tudor: afforded a long view of his own career and influence at Oliveros's “Tudorfest,” he subsequently struck out on his own as a maker, choosing, in *Fluorescent Sound* (1964) and *Bandoneon!* (*A Combine*) (1966), to trade instructions supplied by composers for the “orientation” and “invention” inherent to technologies. As evidenced by a hastily jotted biography dateable to 1967–

69, while these experiences had *still* not convinced him of his status as a “composer,” they had clearly introduced some ripples into his sense of self:

d.t., ^pianist, orgnst., audiologist, ~~born in~~ is a native of ph. & has since 48 been devoted to the perf. of cont. mus. Much of his rep. has been esp. written for & ded. to him by leading comps. of the cont. scene. ^[He] has taught & lect. at the IFNM in darmst., & perfd. all over the world [and] he has ^for many years collaborated with j.c. & is currently working to develop the field of live electr. mus.¹

Nestled between the compulsive abbreviations of this note, one finds several telling signposts of Tudor’s thinking circa the late Sixties: first, the musician has anointed himself an “audiologist,” perhaps finding in the professional title (typically reserved for hearing specialists in the medical sector) an appealingly inscrutable substitute for “composer.” And while Tudor, in other contemporaneous autobiographical writeups, wrote that “*he and Cage* initiated the continuing trend of ‘live,’ as distinct from taped, electronic music,” here, he takes individual ownership of live-electronic music, leaving “j.c.” on the other side of an ampersand—and in the “many years” of his past.² It is probable that Tudor drafted this description for the Department of Music at University of California, Davis, which offered him a paid position as a “performing artist-in-residence” for the 1966–67 academic year; this would be appropriate, for this UC Davis residency offered Tudor the opportunity to showcase his developing live-electronic practice on his own terms, and in the West Coast environment that he had, since “Tudorfest,” found so replenishing.³

Originally, the UC Davis Department of Music had thought to secure a 1966–67 appointment for Tudor because Karlheinz Stockhausen, one of the musician’s most prominent composer-collaborators during his Darmstadt days, was slated to be at Davis at the same time.⁴ This, of course, was a mistake, for by now, not only had Tudor renounced his identity as a techno-logical

¹ Undated and unlabeled biographical note, ca. 1967–69, Box 108, Folder 5, David Tudor Papers (hereafter Tudor Papers), accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, California.

² Undated biography of David Tudor, ca., late Sixties, Pauline Oliveros Papers (hereafter Oliveros Papers NYPL), JPB 94-5, Music Division, The New York Public Library, New York, NY.

³ Correspondence regarding University of California, Davis, appointment, 1965–66, Box 16, Folder 5, Tudor Papers.

⁴ Correspondence regarding University of California, Davis, appointment, 1965–66, Tudor Papers.

piano performer, but his and Stockhausen's already-frayed relationship had been dealt its most significant blow: in 1964, Tudor had curtailed a U.S. tour with the composer in order to perform in John Cage's *Atlas Eclipticalis* (1961–62) at New York's Philharmonic Hall.⁵ “[Stockhausen] won't arrive [at U.C. Davis] until the first of November,” Department Chairman Richard Swift wrote Tudor prior to his appointment, “so you might consider coming here during the winter or spring quarters.” “[I] would not necessarily have to be [at Davis] when Stockhausen is there,” Tudor replied, “although *I imagine I could be of use to him.*”⁶

U.C. Davis got the message, and when Tudor did arrive on the University's campus to begin his residency, he planned performance series more closely keyed to his present interests, and his emerging voice as an “audiologist.” At four shows in early 1967, Tudor opted, per one newspaper writeup, to “leav[e] [the] keys untouched,” drawing from a largely live-electronic repertory, and reprising several works performed at “Tudorfest.”⁷ The Davis public was treated variously to amplified “popping, scratching, [and] hissing” of Toshi Ichianagi’s *Music for Piano # 4* (1960), the “multi-ring circus” of Cage’s *Cartridge Music* (1960), and the visual fireworks of Lowell Cross’s *Musica Instrumentalis* (1966), the duet for bandoneon and closed-circuit television whose principles were exploited in *Bandoneon! (A Combine)*.⁸ At one of his Davis concerts, Tudor received auxiliary support from a friend more than happy to share in his assertion of creative independence: Pauline Oliveros. On March 30, 1967, the pair reunited on stage, “join[ing] forces for music using tapes.”⁹

By this time, Oliveros, who was working an hour’s drive from Davis in Oakland, California, had been afforded her own major opportunity to exercise her autonomy and expand her live-

⁵ Matthew R. Rogalsky, “Idea and Community: The Growth of David Tudor’s Rainforest, 1965–2006” (PhD diss., City University of London, 2006), 42.

⁶ Correspondence regarding University of California, Davis, appointment, 1965–66, Tudor Papers (my emphasis).

⁷ William G. Glackin, “Concert Displays New Music’s Goals,” *Sacramento Bee*, February 18, 1967, 10

⁸ Glackin, “Concert Displays New Music’s Goals”; Charles Johnson, “Concert Explores Sound Mysteries,” *Sacramento Bee*, March 4, 1967, 10.

⁹ “Trombonist Will Perform Modern Works at UCD,” *Sacramento Bee*, March 26, 1967, 151.

electronic investigations. Following the “Trips Festival,” the core San Francisco Tape Music Center cohort (Ramon Sender, Morton Subotnick, and Oliveros) dispersed, and the Tape Center vacated 321 Divisadero Street. The dissolution was amicable, but dramatic. In 1965, Subotnick had succeeded in securing a Rockefeller Foundation grant for the Tape Center, and in 1966, a larger grant was offered to the group under the condition that they associate themselves with an academic institution.¹⁰ Oliveros, eager to guide the Tape Center to a new home in a role of increased responsibility, helped move the operation to Oakland’s Mills College in 1966, and assumed the title of Music Director. Artist Tony Martin, whose swirling psychedelic projections had been so crucial to the aesthetic of 321 Divisadero, followed Oliveros, filling the role of Visual Director at the newly anointed “Mills Tape Music Center.”¹¹ Subotnick and Sender went their separate ways, with the former taking up a post at New York University, and the latter decamping to a California commune.¹²

Oliveros made the most of her tenure at the Mills Tape Music Center, which, with its open studio space, courses in electronic music (taught by Tape Center personnel), and extensive concert program, honored 321 Divisadero’s emphasis on public engagement and outreach. Finding time, amidst her administrative duties, to expand her live-electronic arsenal, she learned to navigate the intricacies of the Buchla 100 series modular synthesizer (used in tandem with tape delay), and, in a significant 1967 collaboration with Tony Martin (*Circuitry for Percussion and Light*), devised means to route electronic signals between amplified percussion instruments and lightbulbs, thus constructing a dynamic synesthetic “feedback situation” for live performers.¹³ (Lowell Cross’s *Musica Instrumentalis*

¹⁰ David W. Bernstein, “The San Francisco Tape Music Center: Emerging Art Forms and the American Counterculture, 1961–166,” in *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde*, ed. David W. Bernstein (Berkeley: University of California Press, 2008), 34–35.

¹¹ Paul Hertelendy, “Sound of Future at Mills Tape Music Center,” *Oakland Tribune*, September 30, 1966, 22.

¹² Bernstein, “Emerging Art Forms and the American Counterculture,” 34–35.

¹³ Pauline Oliveros, “Memoir of a Community Enterprise,” in *Tape Music Center*, ed. Bernstein, 90–93.

was surely an influence here.) Oliveros was not in Oakland for long, however; in May of 1967, at which time her reappointment at Mills remained unconfirmed, she was offered the position of Lecturer in University of California, San Diego's newly minted Department of Music.¹⁴

Oliveros had reservations concerning the offer, for not only had she just assumed the Directorship of Mills, but the university context seemed, to her, aggressively institutional—"I worried that I was losing my status as 'anti-establishment,'" she would later recall.¹⁵ Quite possibly, the presence of an old mentor at UCSD strengthened her resolve to move. In 1965, former KPFA Music Director Will Ogdon had relocated to UCSD to build a new music department from the ground-up, and serve as its director; two years later, he was joined in the department by Robert Erickson, the teacher who had stoked Oliveros's confidence at San Francisco State College and helped shepherd the San Francisco Conservatory's "Sonics" series into being.¹⁶ In the summer of 1967, Oliveros accepted the teaching position and headed south. By Fall, she was teaching a graduate seminar on "Electronic Sound," among other courses, to a rising generation of tape-splicers and circuit-benders.¹⁷

As we will see in what follows, Oliveros's artistic activities of the Seventies cannot be disentangled from her relocation to UCSD's university environment, which provided her with a new security and stability, a network of graduate students-turned-collaborators, and, beginning in 1972, a high-tech research center and spiritual successor to the Tape Music Center. Nor can Tudor's activities of this period be understood apart from his growing independence, and his desire—shared

¹⁴ Correspondence regarding University of California, San Diego (UCSD) appointment, 1967, Box 30, Folder 3, Pauline Oliveros Papers (hereafter Oliveros Papers), MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

¹⁵ Pauline Oliveros, "The Magic Garden of Pauline Oliveros," interview by Craig Palmer, *Coast FM & Fine Arts*, July 1970, 42.

¹⁶ Robert Erickson and John William MacKay, *Music of Many Means: Sketches and Essays on the Music of Robert Erickson*, Composers of North America, no. 17 (Lanham, MD: Scarecrow Press, 1995), 146–152.

¹⁷ Pauline Oliveros, list of courses taught as UCSD, filed in "Career Narrative and Academic Biography," 1971–74, Box 29, Folder 9, Oliveros Papers.

by Oliveros—to function as a teacher, and to pass on his knowledge of the life in electronics. Tudor's offer of appointment at UC Davis had promised not only performance opportunities, but also a chance to lecture, and Tudor's response to this latter possibility is highly revealing of his new priorities. “[A] project dear to my heart,” he wrote the Music Department chair, “would be to coach or train a group of students and/or interested persons in preparing and presenting the kind of performances that I myself have had so much experience with during the past few years.”¹⁸ In and out of the classroom, Tudor and Oliveros would both accrue plenty of students and “interested persons” in the years to come, and these eager pupils would help them to craft wholly new languages of sonic expression.



Oliveros and Tudor's mid-Sixties experiments had succeeded in modeling new forms of “liveness” or presence in the electronic idiom, and had, with their emancipated listeners (*A Theater Piece*) and “self-composing” apparatuses (*Bandoneon!*), artfully rewired the roles endemic to musical creation and presentation—this we have seen. But as I suggested at the end of Chapter 3, they did something else as well: they suggested an entirely new manner of composition and performance—a new model of sonic practice—premised on embodiment. “Music,” Georgina Born has stated, “is perhaps the paradigmatic multiply-mediated, immaterial and material, fluid quasi-object, in which subjects and objects collide and intermingle.”¹⁹ Lydia Goehr, who has called musical works “ontological mutants,” would be inclined to agree.²⁰ But as Goehr also tells us, the sustaining myth of the musical “work” rests on the almost religious belief that compositions enjoy a life, and a

¹⁸ Correspondence regarding University of California, Davis, appointment, 1965–66, Tudor Papers.

¹⁹ Georgina Born, “On Musical Mediation: Ontology, Technology and Creativity,” *Twentieth-Century Music* 2, no. 1 (2005): 7, <https://doi.org/10.1017/S147857220500023X>.

²⁰ Lydia Goehr, *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music* (Oxford: Clarendon Press, 1992), 2.

wholeness, over and above the profane world of instruments and bodies—in the ethereal space of the transcendent, where material embodiment has no place.

Goehr has brilliantly reflected on this element of the *Werktrne*, or “work-concept,” in a discussion of Raphael’s (1483–1520) *The Ecstasy of Saint Cecilia* (1516–17) a painting which depicts Saint Cecilia, the patron saint of music, in her passage to sainthood. [Figure 1] Above Cecilia, an angelic choir sings from its perch in heaven, and at Cecilia’s feet, a pile of instruments lay bruised and broken. “Broken,” Goehr writes,

[the instruments] can no longer be used and are revealed to be merely the materials out of which they are made. If music as a condition is withdrawn from the instruments of the art, the instruments cease to be musical and become merely commonplace things. To give music a proper place in the passage towards sainthood, it must be converted as Cecilia is converted, rendered a medium suitable for transmitting only the pure and heavenly harmony.²¹

Oliveros and Tudor’s models of live-electronics had been premised, quite precisely, on the rejection of transcendent and the abstract in favor of the contingent and the material: in *A Theater Piece* and *Bandoneon!*, respectively, they had embedded the locus of musical “creation” and identity in the tangled, indeterminate interaction of unruly electronic assemblages and listening and performing bodies. In these “works” (if indeed they can be so understood), music came not from above, where heavenly choirs dwell in the “imaginary museum,” but from below, percolating upwards from the emergent interactions of “Trips Festival” crowds and unspooling tape loops, “saturated amplifiers” and the echoes of New York’s 69th Regiment Armory. Electronic “liveness” was achieved at the expense of eternal life. The clearest evidence that these creations short-circuited conventional composition and performance is found in their associated “scores” (or the lack thereof). While Tudor’s *Bandoneon!* survives only as a block-diagram (with parts not included), Oliveros’s *A Theater Piece* has no score: its “free speech” could not have been scripted.

²¹ Lydia Goehr, “All Art Constantly Aspires to the Condition of Music”—Except the Art of Music: Reviewing the Contest of the Sister Arts,” in *The Insistence of Art: Aesthetic Philosophy after Early Modernity*, ed. Paul A. Kottman (New York: Fordham University Press, 2017), 152.

For media theorist Sybille Krämer, meaning, knowledge, and information do not meaningfully preexist their transmission or manipulation via material things and corporeal routines—“our everyday practices with objects, symbols, instruments and machines.”²² To scratch out a note with a paper and pencil, or perform a musical composition with an instrument, is not to channel or “divine” language and music from some transcendental beyond (heavenly or otherwise): it is to *construct* them whole cloth in the space of practice. “Culture,” Krämer writes, “refers to practices that incorporate non-perceptual phenomena, such as ‘values’ or ‘sense,’ into those that have a sensory base in time in space. . . . Without incarnation there is no spirit, no meaning, no value, no abstract things—not even God.”²³ Thus understood, *mediation* is reframed as a reverse transubstantiation—as embodiment. In this chapter, I want to suggest that live-electronic performance, whose chains of contingent mediations dramatized and amplified this condition of “incarnation” or “incorporation” (Krämer’s term) in the realm of the musical, pointed Tudor and Oliveros towards embodied sonic practices leveraging new, hybrid connections between the technological and the human, the electronic and the living.

In the first of this chapter’s two sections, I track Tudor and Oliveros’s activities in 1968–69, examining them individually and together. During this time, the pair continued to parse the consequences of their live-electronic work, organizing their activities around a shared interest in the phenomenon of *resonance* (understood both literally and abstractly), and finding noted opportunities for further evolution in collaborations with Merce Cunningham.

In the second section, I chart the pair’s decisive formulation of embodied practices in the early Seventies, first examining their transformative participation in the construction of a multimedia

²² Sybille Krämer and Horst Bredekamp, “Culture, Technology, Cultural Techniques — Moving Beyond Text,” *Theory, Culture & Society* 30, no. 6 (2013): 24, <https://doi.org/10.1177/0263276413496287>.

²³ Sybille Krämer, “Writing, Notational Iconicity, Calculus: On Writing as a Cultural Technique,” *MLN* 118, no. 3 (April 2003): 529, <https://doi.org/10.1353/mln.2003.0059>.

pavilion at Expo '70 in Osaka, Japan; I argue that Tudor and Oliveros's respective contributions to Expo '70 further clarified, for the pair, the precise approaches to embodiment that they were to subsequently take up. I next track the musicians' individual paths forward: I argue that in his *Rainforest* series, which, between 1968 and 1973, evolved from a small-scale dance accompaniment to a room-scaled installation of sounding sculptures, Tudor arrived at his fullest realization of a music premised on technological animism, quite literally drawing out the implications of his *Fluorescent Sound* (1964) and *Bandoneon!* into a physical and sculptural surround; I meanwhile argue that in her *Sonic Meditations* (1971–73), group performance exercises intended to encourage heightened body awareness, active, attuned listening, and interpersonal connection, Oliveros arrived at her most sophisticated model of embodied listening, and did so via a reframing of the human body as a kind of programmable technology.

In an extended conclusion, which follows Oliveros and Tudor into the late Seventies, I reveal that these embodied practices brokered their transition from musical venues to galleries and performance spaces, thus vaulting them from the “imaginary museum” into the art museum and leaving them positioned in a newly fuzzy disciplinary space. I will show that both Tudor and Oliveros and their critical commentators were compelled to devise new names, vocabularies and frames of understanding with which to discuss the models of sonic embodiment represented by *Rainforest* and the *Sonic Meditations*, which, suspended between the space of the musical “work” and that of the artwork, laid the groundwork for the emergence of a “sound art” circa 1980, and sowed key influence among widening networks of interdisciplinary practitioners.

1. Resonant frequencies

For Oliveros and Tudor, the years immediately following 1966 marked a time of transition. *Bandoneon!* and *A Theater Piece* were ambitious, maximalist statements that had placed the creators in

circuit with dense media ecologies; Oliveros seemed to speak to this sense of entanglement when in April 1968, advertising a “Live Electronic Music” concert she had organized at UCSD with “guest artist” David Tudor, drew up a program wiring her name and those of participating performers into an electrical schematic.²⁴ [Figure 2] In 1966–68, however, searching after core principles and conceptual foundations, they began stripping away the intricate trappings of their live-electronic innovations, trading scale and complexity for exercises in refinement. Waiting for the liquid projections, strobing lights, and roaring feedback of the “Trips Festival” and “9 Evenings” to pass, the musicians listened intently for signals that might lead them forward; what they heard, quite literally, was resonance.

Indeed, as we will see below, resonance, understood as both an acoustical phenomenon and fertile metaphor, served to orient many of Tudor and Oliveros’s activities in the late Sixties. Supplanting (or supplementing) “liveness” as an organizing concern, it offered the musicians a bridge to the situated and the physical—to embodiment.²⁵ Tudor nurtured a keen interest in spatial and material resonance that had surfaced pointedly in elements of *Bandoneon!*. He allowed the reverberant characteristics of architectural space, and the vibratory properties of matter to guide his way towards his major series of *Rainforest* works, which developed dramatically between 1968 and 1973. Meanwhile, Oliveros undertook an investigation of resonance as a physical *and* interpersonal phenomenon, seeking out new ways to synchronize embodied performers with one another and with their environments by composing the act of close listening.

²⁴ “A Program of Live Electronic Music and a Combine,” concert program, 1968, Box 13, Folder 31, Oliveros Papers.

²⁵ In a short reflection on this historical moment, Adam Tinkle has discussed a shared in interest resonance among David Tudor, Pauline Oliveros, Gordon Mumma, Robert Ashley and others. While Tinkle and I align on several key points, we arrive at very different conclusions—particularly in our respective understandings of Oliveros’s theorization of the performing and listening body. Adam Tinkle, “The SAG Representative for the West Coast: Pauline Oliveros’s Resonance Aesthetics in Context, 1964–1970,” *American Music Review* XLVII, no. 1 (Fall 2017): 1–6, https://www.brooklyn.cuny.edu/web/aca_centers_hitchcock/AMR_47-1_Tinkle.pdf.

Tudor and Oliveros did not sound out these resonances in isolation; they engaged in continued collaboration, both with one another, and within a growing cross-coastal network of likeminded live-electronic composers. In what follows, I first narrate their individual development between 1966 and 1968, attending to creative consequences of *Bandoneon!* and *A Theater Piece*. Next, I turn to a shared context for the further evolution of their practices: the Merce Cunningham Dance Company. In 1968–69, during the Company’s concerted turn towards of electronic music and technological spectacle, Cunningham extended fortuitously timed commissions to Tudor and Oliveros both, occasioning their creation of significant new live-performance works.

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Tudor is known for his modesty; and yet *Bandoneon!*, his debut proper as a live-electronic composer, was anything *but* modest. A vast web of components distributed across snaking channels and scaled to the very limits of Bell Laboratories’ technological infrastructure for “9 Evenings,” the work was designed to take all the available technical means at Tudor’s disposal—a television oscilloscope, FM-radio-controlled carts, cybersonic modification modules, and the overhead lights of New York’s 69th-Regiment Armory—and throw them into sustained oscillation with the expansion and compression of a bandoneon’s bellows. A veritable feast of ideas and technological innovations, *Bandoneon!* provided Tudor with something like a kit of parts from which he could continue to draw generative inspiration in the years after “9 Evenings.”

It was, perhaps, the bandoneon itself that most immediately fired Tudor’s mind—though it did not so much carve out new creative pathways as it freshly irrigated old ones. Indeed, as Gordon Mumma has observed, Tudor found a kind of liberation in the bandoneon, whose strange sound-world of sustained, complexly harmonic drones offered him “freedom from the historical weight of the piano,” and freedom from the precision-engineered performance practice he had cultivated as a

virtuoso pianist.²⁶ It is no coincidence that Tudor's encounter with the bandoneon came not long before his decisive move to composition. However, as Mumma also points out, the bandoneon, with its wind-driven reeds, and genealogical ties to the reed *organ*, also returned him to the cathedrals of his childhood, reminding him of the machine-like organs whose labyrinthine systems of stops he had mastered with such curiosity.²⁷

Tudor would remark in a late interview that his early experience with the organ had left him “acutely conscious of the duration of sound,” and keenly interested in the kind of life that sonorities take on as a result of spatial echo and reverberation.²⁸ While dedicating himself to the piano, an instrument that encouraged a pointillist and tightly managed treatment of sound events, Tudor had suppressed this interest; but the bandoneon had brought it roaring back, reattuning him to the power and potential of resonant space to shape the unfolding of his music. *Bandoneon!* had provided a prime opportunity for a renewed study of “duration”: after settling upon the 69th-Regiment Armory as a new venue for their festival, the “9 Evenings” collaborators had discovered that the cavernous building, with its steel framework, and over 63,000 square feet of space, acted as a giant reverberation chamber, wreathing all sounds with six-second echoes.²⁹ While Billy Klüver and his fellow Bell engineers had been horrified by these echoes, which posed obvious communication problems, and threatened the legibility of musical performances, Tudor found a way to take advantage of them, using the reverberant nature of the Armory to sustain and compound the runaway feedback that powered *Bandoneon!*. As Klüver later recalled, “[It was as if] David were playing the whole Armory as an instrument.”³⁰

²⁶ Gordon Mumma, “David Tudor the Composer along the Path to *Rainforest*” (2006/2013), in *Cyberonic Arts: Adventures in American New Music*, ed. Michelle Fillion, *Music in American Life* (Urbana: University of Illinois Press, 2015), 153.

²⁷ Mumma, “With Tudor the Organist” (2013) in *Cyberonic Arts*, 144–148.

²⁸ David Tudor, interview by Jack Vees, July 12, 1995, OHV 241 r, transcribed tape recording, Major Figures in American Music, Oral History of American Music (OHAM), Irving S. Gilmore Library, Yale University, New Haven, CT, 3 https://archives.yale.edu/repositories/7/archival_objects/3185379.

²⁹ *David Tudor: Bandoneon! (A Combine)*, dir. Julie Martin and Barbro S. Lundestam (E.A.T. and ArtPix, 2010), DVD.

³⁰ *David Tudor: Bandoneon! (A Combine)*, dir. Martin and Lundestam.

After “9 Evenings,” Tudor continued his work with the bandoneon and found additional opportunities to reanimate his passion for the organ. In 1967, Mumma notes, Tudor was being pressured by Columbia Records to record new renditions of Karlheinz Stockhausen’s *Klavierstücke*—the techno-logical piano pieces of the Fifties and early Sixties that owed so much to Tudor’s unique abilities.³¹ In an assertion of creative agency that was freighted with symbolism, Tudor opted out of the Stockhausen recording, and “persuaded” Columbia to accept another project in exchange.³² The resulting 1968 recording, *A Second Wind for Organ*, collected “new pieces for pipes and reeds”: Maricio Kagel’s *Improvisation Ajoutée* (1962) for organ, Christian Wolff’s *For 1, 2 Or 3 People* (1964), performed on a two-manual Baroque tracker organ owned by sculptor Richard Lippold (1915–2002), and Gordon Mumma’s cybersonic bandoneon work *Mesa* (1966), developed originally for the Merce Cunningham dance *Place*.

Considering Tudor’s appreciation of the free unfolding of duration, so creatively exploited in *Bandoneon!*, the particular appeal of Wolff’s *For 1, 2 Or 2 People* would seem obvious. As Wolff writes of the work: “A situation is indicated, but not when one enters into it, nor, necessarily, for how long one is in it. Durations of the individual notes may be indicated as relatively short, long or free, or they may be determined by the requirements of a situation.”³³ As we will see, Tudor’s post-*Bandoneon!* flirtations with the organ, and his renewed interest in spatial resonance constitute an important context for the development of *Rainforest*, which beginning in 1973, would develop into a site-specific sound installation premised in part on spatial reverberation. Much later, Gordon Mumma drew a direct link between Tudor the organist and Tudor the installation artist:

Tudor’s large sound spaces have their origins in that aspect of his profession as a young organist who performed in dozens of different—very different—large churches and locations—with always different resonating sources and spaces. And where when a sound is started, it ends only by itself in that space. This applies [not] only to wind-driven tracker-

³¹ Mumma, “With Tudor the Organist,” 146–147.

³² Mumma, 146–147.

³³ Richard Teitelbaum, liner notes for *David Tudor: A Second Wind for Organ*, Odyssey 32 16 0158, 1968, vinyl LP.

operated pipe organs in large spaces. For the vibration-stimulated objects of Tudor's *RAINFOREST* performances, sounds fade to their endings in their own contexts.³⁴

Moving beyond the bandoneon-organ connection, and the specific matter of architectural resonance, there is another pointedly *spatial* component of *Bandoneon!* that bears even more acutely on the development of *Rainforest* in the late-Sixties, providing the latter work with its very structural cornerstone: I refer to the “moving loudspeakers” that Tudor, in his “9 Evenings” program notes, so suggestively described as “sounding physical materials.” Recall that in *Bandoneon!*, Tudor employed five remote-controlled carts, each of which piloted a resonating object around the Armory’s vast floor, and functioned as an idiosyncratic means towards spatialized audio or “surround sound.” While one of these carts conveyed an actual horn loudspeaker (which Tudor evidently named “George”), the remaining four bore implements of Tudor’s own making—spartan wood-and-metal constructions that resemble crude artworks more than functional devices.³⁵ [Figure 3] “I had made a number of large sculptures in the manner of *Rainforest*,” Tudor recalled to an interviewer decades after “9 Evenings,” making the *Rainforest* connection explicit.³⁶ He continued:

I think there were five, because Deborah Hay had a piece with dancers on platforms that could be sent around the space, and she wanted to have music, and I agreed to do the music if I could use the platforms for my sculptures. So the sounds from the bandoneon also vibrated the sculptures. My idea was that they would be sent around the room, that their sound would circulate. The audience was on three sides, so they would come close to the loudspeakers. And for that, I had to have five operators, seated on chairs, sending the platforms around.³⁷

Where exactly did Tudor’s idea for these “large sculptures” come from, and what were their underlying mechanics? How did he succeed in “sounding” them, and in what respect could they be called “loudspeakers”? The structural specifics of these *Bandoneon!* components, which were discussed only briefly in the previous chapter, must here be investigated in greater depth—so crucial

³⁴ Gordon Mumma, e-mail communication with the author, April 17, 2021.

³⁵ Nakai, *Reminded by the Instruments*, 251.

³⁶ David Tudor, “David Tudor Interviewed by Joel Chadabe,” September 8, 1993, last modified November 29, 2001, <https://daviddtudor.org/Articles/chadabe.html>.

³⁷ Tudor, interview by Chadabe.

are they to the development of *Rainforest* between 1968 and 1973. At the end of Chapter 3, I proposed, following Gordon Mumma, that Tudor's moving loudspeakers bore the influence of Oliveros's amplified apple-boxes, which Tudor experienced firsthand while performing in *Applebox Double* (1966) at the 1966 ONCE Festival Recording Concert. That Tudor carried Oliveros's interest in material resonance into the construction of his moving loudspeakers seems evident; but it is also clear that these implements, which involve more than mere amplification, derived from several competing strands of influence.

We can locate the earliest relevant development sometime between *Fluorescent Sound* and *Bandoneon!*, when, as Tudor tells it, he was struck with an idea: "The basic notion, which is a technical one, was the idea that the loudspeaker should have a voice which was unique and not just an instrument of reproduction, but an instrument unto itself."³⁸ Tudor, here, is being characteristically self-effacing, for this "notion" is far from just a "technical one." Viewed in retrospect, and in the context of Tudor's personal development, the idea that a loudspeaker could be wired to *speak for itself* is indeed rather profound. As an interpreter for Cage, Stockhausen, and other leading lights of the postwar avant-garde, Tudor acted, quite precisely, as an "instrument of reproduction." He was an exquisite instrument known and appreciated for the brilliance and clarity of his "voice" (his signal-to-noise ratio, as it were), but that voice was not his own: it was routed through him from without. There is a certain poetry to the fact that Tudor arrived at his notion of a loudspeaker with its own, *inborn* sound, just prior to his move to self-assured composition.

While perhaps long latent, Tudor's idea first took concrete form in response to a commission: in 1964 or 1965 (as ever, Tudor's accounts differ), the musician was asked to draw up a proposal for a city park in Washington. Recalls Tudor: "I proposed making some sculptures which

³⁸ David Tudor, "I smile when the sound is singing through the space": An interview by Teddy Hultberg in Düsseldorf, May 17, 18, 1988." Last modified November 29, 2001, <https://daviddtudor.org/Articles/hultberg.html#Untitled/Toneburst>.

would be permanent [and] which made sound, all day, all night, forever. And I had engineering help and started to work on the idea of sending sound through physical materials.” Elsewhere, in a more poetic register, Tudor has stated that he envisioned “an orchestra of loudspeakers all having different ‘voices’ which would all receive a common input.”³⁹ Regrettably, this “Washington park” project never materialized.⁴⁰ According to Tudor, insurmountable issue lay with the projected electrical bills: “It soon became obvious,” he says, “that the project would require a great deal of money, because huge amounts of power would have had to become involved. And it never got funded.”⁴¹ Even more regrettably, specific details concerning the project have never been uncovered; neither the projected location of the project (Washington D.C., or Washington State?) nor the commissioning body have ever been identified. As this project, if realized in the mid Sixties, would have marked Tudor’s earliest engagement with a presentational idiom—the “sound installation”—associated closely with sound art, the dearth of information is unfortunate indeed.

What is fortunate is that by the time this commission collapsed, Tudor had already begun “assembling materials” for the loudspeakers in his “sounding outdoor sculpture.” In two separate interviews, Tudor has recalled that the materials in question were “transducers that were made to activate walls,” and he has further stated that he acquired these transducers directly from their manufacturer.⁴² Now, technically, anything that converts one type of energy into another is a “transducer”: phonograph cartridges, which trace the grooves of vinyl records, and translate mechanical vibrations into electrical signals, are transducers according to this very general definition, and thus the cartridges that Cage and Tudor used in the former’s *Cartridge Music* (1960) were referred

³⁹ Tudor, interview by Hultberg.

⁴⁰ Tudor, interview by Hultberg.

⁴¹ “Composers Inside Electronics: Rainforest/David Tudor,” February 4, 1977, digitized reel-to-reel tape, 45:11, Center for Music Experiment Recordings Archives (hereafter CME Archives), UC San Diego Library, University of California, San Diego, La Jolla, CA, <https://library.ucsd.edu/dc/object/bb2117180b>.

⁴² David Tudor, “...performing is very much like cooking: putting it all together, raising the temperature,” interview by John David Fullemann, May 31, 1984, last modified on November 29, 2001, <https://daviddudor.org/Articles/fullemann.html#toneburst>; Tudor, interview by Hultberg.

to as such in the previous chapter. However, the transducers that Tudor first acquired in the mid Sixties, and which he would later use in his *Rainforest* works, were transducers of a very particular kind—devices which today might be called “tactile transducers” or a “bass shakers.”⁴³

Conventional loudspeakers comprise two key component parts: a “voice coil,” or cylindrical coil of wire immersed in a magnetic field, and a speaker cone; sound is created when an electrical current interacts with the voice-coil’s magnetic field, triggering back-and-forth displacements in the coil, and then mechanical vibrations in the cone.⁴⁴ Tactile transducers are voice-coils without a cone, typically enclosed in some sort of housing, and designed to be affixed to directly to flat surfaces; by propagating vibrations directly through wood, metal, or even glass, they can turn windows, walls, and furniture into makeshift “speakers,” causing them to radiate sound directly. While as early as 1944, one Glen Holland of Bronxville, N.Y. secured a patent for a “sound reproducing instrument” capable of transmitting vibrations to “any suitable sound producing medium, as, for instance, a table top, a pane of plate glass, or any other body,” a careful tracing of patent citations reveals that a flurry of similar inventions surfaced in the Sixties.⁴⁵

If musicologist Matt Rogalsky is correct—and there is every reason to trust his thorough reconstruction of Tudor’s “loudspeaker” conception—then the musician was likely introduced to these transducers by an article in the December 1965 issue of *Popular Mechanics*, which advertises a “fantastic coneless loudspeaker” capable of agitating dirt out of clothes and turning a “dance floor into one gigantic speaker,” [Figure 4].⁴⁶ The “coneless speaker” advertised in the article is credited

⁴³ Glenn D. White and Gary J. Louie, *The Audio Dictionary*, 3rd ed. (Seattle: University of Washington Press, 2005), 402–403.

⁴⁴ White and Louie, *Audio Dictionary*, 223–224, 418.

⁴⁵ G. Holland, Sound Reproducing Instrument, 2,341,275 (Bronxville, NY, filed November 16, 1940, and issued February 8, 1944). See, for several Sixties era patents: John F. Cain, Sonic Transducer, 3,311,712 (Pacific Palisades, CA, filed November 27, 1963, and issued March 28, 1967); H. Ries, Audio Transducer, 3,366,749 (Los Angeles, CA, filed April 9, 1964, and issued January 30, 1968); and D.E. Thielen, Dynamic Transducer with Wall Mounted Diaphragm, 3,430,007 (Sacramento, CA, filed March 16, 1966, and issued February 25, 1969).

⁴⁶ Larry Steckler, “Fantastic Coneless Loudspeaker!,” *Popular Mechanics*, December 1965, 36, 38.

to inventor William J. Ashworth of New Albany, Mississippi, and Ashworth is evidently the “manufacturer” from whom Tudor solicited his transducers.⁴⁷ Of parenthetical note given Tudor’s eventual interest in presenting *Rainforest* to audiences with disabilities, and the experience of sound via touch, is the fact that Ashworth’s earliest patent for his “electrical sound reproducing device” cites, as a reference, a bone-conduction headset designed to impart vibrations to the skulls of the deaf.⁴⁸ [Figure 5] Sounding bodies indeed.

To be clear, Tudor would not have been terribly interested in the more “recreational” uses for Ashworth’s device advertised in *Popular Mechanics*, which instructs readers to create an “underwater sound system” by fastening the “coneless speaker to a board, connect[ing] it to an amplifier, and submerg[ing] it in the nearest swimming pool.”⁴⁹ However, since he had already been dreaming of his “orchestra of loudspeakers” when he came upon the article, he would have recognized, in the invention described, the potential for “sounding physical materials.” And one of the practical drawbacks of the “coneless speaker”—namely, its tendency to impart to its sounds the timbral, textural grain of physical materials (wood, glass, or metal)—would have seemed to Tudor highly appealing. The coneless speaker, which forced and filtered sound through its *own physical make-up*, would have presented him, at last, with a means of making a loudspeaker that was more than a passive reproduction device.

Had the Washington park project actually been realized, one wonders whether Tudor would have incorporated loudspeaker constructions into *Bandoneon!*. In any case, while developing his “9 Evenings” contribution, Tudor, possessed of the proper transducers, and still animated by his

⁴⁷ Steckler, “Fantastic Coneless Loudspeaker!,” 38.

⁴⁸ E.H. Greibach, Bone Conduction Hearing Device, 2,127,468 (Brooklyn, NY, filed November 11, 1933, and issued August 16, 1938). Notably, Ashworth’s 1965 *Popular Mechanics* report features the following claim: “If you hold a unit in the palm of his hand, a deaf person can feel the vibrations of music and speech—a great help in teaching such people how to dance and talk.” John Driscoll and Matt Rogalsky, “David Tudor’s ‘Rainforest’: An Evolving Exploration of Resonance,” *Leonardo Music Journal* 14 (2004): 28, <https://doi.org/10.1162/0961121043067415>.

⁴⁹ Steckler, “Fantastic Coneless Loudspeaker!,” 38.

loudspeaker “idea,” saw a viable opportunity to bring his thinking into reality. Tudor’s first practical course of action would have been the selection of effective materials for his constructions, and Matt Rogalsky has found several notes dateable to 1966 that offer laundry-lists of physical media: one lists, variously, “sheet rock,” “glass,” wood,” “Masonite,” and “fiberglass,” while also referring to a “jointed metal const. [construction].”⁵⁰ I have found a similar note referencing “bicycle spokes or wire,” “aluminum, brass or bronze sheets or duct metal,” and “sheet rock or gypsum plaster.”⁵¹

[Figure 6] In the end, not counting his readymade “horn speaker,” Tudor built four “transducer-speakers” for use in *Bandoneon!*, all of which are briefly enumerated on his “generalized diagram” for the work. These are listed as follows:

4 transducer-speakers constructed
from materials of specific resonant frequency:

- 1) Aluminum sheets
(suspended ca. 15°)
- 2) Steel tray with vibrating
appendages
- 3) 2–14' wooden planks
mounted at 90°
- 4) Plate glass
(push-pull driven)⁵²

As we will see, in later iterations of *Rainforest*, Tudor would begin allowing the resonant properties of individual loudspeaker-constructions to *determine* the nature of the sounds used to activate them. In *Bandoneon!*, Tudor excited all four of his “transducer-speakers” with the same stream of sonic input (derived from the contact microphones on his bandoneon), thus taking a generalized, not specialized, approach to their stimulation. Given the processed and highly variable nature of the noises coursing from his bandoneon, Tudor could not have precisely tailored them to

⁵⁰ Rogalsky, “Idea and Community,” 79.

⁵¹ Unlabeled and undated materials list (c. mid Sixties), Box 36, Folder 4, David Tudor Papers (hereafter Tudor Papers), accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

⁵² David Tudor, *Bandoneon!* (1966), generalized diagram, Box 1, Folder 7, Experiments in Art and Technology Records (hereafter E.A.T. Records), accession no. 940003, Special Collections, The Getty Research Institute, Los Angeles, CA.

each of his constructions' resonant profiles even if he had wanted to; nevertheless, the note on his generalized diagram makes clear that at this time, he was already concerned with the "specific resonant frequenc[ies]" of physical objects, and thus well on his way to the sort of thinking that would bring *Rainforest* into being.

Unfortunately, while listening to the low-quality recording of *Bandoneon!*'s first staging at "9 Evenings" (like all the featured works, it was performed twice), it is impossible to discern what Tudor's moving loudspeakers sounded like. Nor does the existing film provide a comprehensive view of all four speakers "in the round"; only speakers one and three, with their sandwiched aluminum plating, and perpendicular wooden planks, respectively, can be clearly seen looping slowly and surreally about the Armory's vast expanse. And while, according to Tudor's collaborator Lowell Cross, the remote-controlled carts appeared in only one of the two *Bandoneon!* performances, affording Tudor's constructions only a brief time under the overhead spotlights, these awkward, spindly creatures would ultimately prove to be among *Bandoneon!*'s most important component parts.⁵³

In the two years after Klüver and his artist collaborators vacated the Armory, Tudor's notion of a loudspeaker orchestra entered a period of dormancy. While there is no evidence that he pursued further experiments with his transducers immediately after *Bandoneon!*, Tudor's loosely dated "electronics" papers, which comprise magazine clippings, consumer manuals, and personal notes, suggest that he may still have been collecting literature on vibration and transduction in 1966–67.⁵⁴ In any case, Tudor's loudspeaker idea would not be held in suspension for long; in 1968, a new Merce Cunningham dance titled *RainForest* would provide Tudor with an opportunity to experiment with his transducers once again. Cunningham's dance would at last give Tudor's loudspeaker

⁵³ Lowell Cross, "The Video Images for David Tudor's *Bandoneon!*," undated, Box 1, Folder 7, E.A.T. Records.

⁵⁴ See the various materials (c. 1960–1974) collected in Box 37, Folder 4, Tudor Papers.

orchestra a name, and properly germinate its development, setting off one of the most enduring series in his body of work.

♦ O ♦

Following her work on *A Theater Piece* (1966), her productive 1966–67 year spent shepherding the Tape Center through its transition to Mills College, and, finally, her move to UCSD, Oliveros continued to compose musical scenarios premised on two closely related concerns: on the one hand, she pursued new approaches to the staging of *listening* as a kind of performance or creative act; and on the other hand, she experimented with new ways to involve performers and audience members in these performances. Whereas *Bandoneon! (A Combine)* (1966) had left Tudor with a sharpened interest in the resonant and reverberant properties of spaces and materials, *A Theater Piece* had left Oliveros seeking opportunities to cultivate a kind of resonance or synchronization amongst musicians and spectators alike. The influence of electronics remained key for Oliveros, though, as ever, her metabolization of this influence was scarcely linear or straightforward.

In 1968, Oliveros was met with two especially generative opportunities for experimentation. The first came via a friendly commission from the Sonic Arts Group, or SAG (later the Sonic Arts Union, or SAU), an affiliation of four electronic musicians whom by this time were quite familiar to Oliveros and Tudor both.⁵⁵ Formed in 1966 by Gordon Mumma and Robert Ashley of Michigan's ONCE Festival cohort, and Alvin Lucier and David Behrman (1937–), electronic musicians based in Massachusetts and New York, respectively, the SAG was an ensemble dedicated to the live performance of electronic pieces by its individual members.⁵⁶ The SAG had formed with little fanfare several years after Mumma and Ashley met Behrman and Lucier at an Earle Brown/ Morton Feldman concert in 1963, and as far as musical collectives were concerned, it boasted only the

⁵⁵ "Sag Piece for Blam," 1960–1980, Box 5, Folder 21, Oliveros Papers.

⁵⁶ Alvin Lucier, *Music 109: Notes on Experimental Music* (Middletown, CT: Wesleyan University Press, 2012), 70–71.

thinnest veneer of seriousness. “We weren’t really a group,” Lucier has reflected.⁵⁷ “We didn’t improvise, we didn’t collaborate. We simply shared equipment and played in each other’s pieces.”⁵⁸

The SAG members each nurtured distinct musical interests: for example, Mumma had his “cybernetics” and “systems concepts,” Ashley was keenly interested in linguistics and speech science, and since the mid Sixties, Lucier had cultivated a small but groundbreaking body of work focused on the resonant properties of rooms and vessels, and, as we will see, the amplification of brainwaves. Despite their differences, however, the SAG cohort shared something more abstract and profound than mere equipment: common among them was a do-it-yourself, aggressively independent approach to the practice of electronic music that Lucier, by no coincidence, has linked directly to David Tudor’s influence. Recalls Lucier: “I reminded [Tudor] that he invented the table of electronics that saved our lives in the Sixties. . . . You would attend one of his concerts and notice a table filled with homemade electronic devices housed in plastic soap dishes. They reminded me of summer camp. . . . He enabled us to make our own work.”⁵⁹

Oliveros was naturally sympathetic to the SAG’s hobbyist spirit, just as she shared with the group a fine appreciation for Tudor’s tables of RadioShack components. By 1968, moreover, she had close working relationships with nearly all its members: she had been in correspondence with Mumma and Ashley for years, having featured the former’s music in the “Sonics” series in 1961, and she had met them face-to-face in 1966, when she and Tudor both attended the ONCE Festival in Ann Arbor. In August 1966, not long after that year’s ONCE iteration, Mumma wrote Tudor to say, touchingly, “I saw Pauline in NYC, at Behrman’s. . . . I think she is the SAG representative for the west coast. Couldn’t be in better hands.”⁶⁰ Oliveros first met Lucier at the 1965 Case Institute of

⁵⁷ Lucier, *Music* 109, 71.

⁵⁸ Lucier, 71.

⁵⁹ Lucier, 61–62.

⁶⁰ Gordon Mumma to David Tudor, August 27, 1966, Box 57, Folder 3, Tudor Papers.

Technology concert to which she contributed *Light Piece for David Tudor* (1965), stoking an uproar in the audience.⁶¹ At this same show, Lucier performed his canonical work *Music for Solo Performer* (1965), the composition with which he remains most closely associated today.

In *Music for Solo Performer*, an assisting “technician” attaches three electrodes to the scalp of a “solo performer” seated before an audience; these electrodes are designed to pick up the 8–13 Hz “alpha wave” generated by the human brain in “non-visualizing” stages of mental activity.⁶² A bit of history: the existence of the alpha wave was first confirmed by German psychiatrist Hans Berger in the course of his early-20th-century attempts to produce objective records of electrical activity (“cortical currents”) in the brain; Berger is credited with the invention of the electroencephalogram (EEG), a test by which such activity is detected with electrodes, and visually graphed as a wave-like tracing.⁶³ In a famous 1934 paper dubbing the alpha wave the “Berger rhythm,” physiologists E. D. Adrian and B. H. C. Mathews documented their first attempts to *listen* to this rhythm with the aid of a horn loudspeaker.⁶⁴ Acting as test subjects, Adrian and Mathews found, through close attention to the audible feedback of their contraption, that they could actively generate and sustain alpha by either closing their eyes or blacking out all ambient light in their vicinity.⁶⁵

Lucier has remarked that his work often entails the mere reframing of scientific experiments in an “artistic context,” and at root, *Music for Solo Performer* does little more than tease out and accentuate the sense of the “theatrical” already implicit in Adrian and Mathews’ research.⁶⁶ In

⁶¹ Pauline Oliveros, “Alvin Lucier” (1980), in *Software for People: Collected Writings 1963-1980*, 2nd ed. (Kingston, NY: Pauline Oliveros Publications, 2015), 191.

⁶² Mumma, “Alvin Lucier’s *Music for Solo Performer* 1965” (1967), 50–53.

⁶³ Stefan Helmreich, “Potential Energy and the Body Electric: Cardiac Waves, Brain Waves, and the Making of Quantities into Qualities,” *Current Anthropology* 54, no. S7 (October 2013): S143–S145, <https://doi.org/10.1086/670968>; David Millett, “Hans Berger: From Psychic Energy to the EEG,” *Perspectives in Biology and Medicine* 44, no. 4 (Autumn 2001): 534–535, <https://doi.org/10.1353/pbm.2001.0070>.

⁶⁴ E.D. Adrian and H.C. Mathews, “The Berger Rhythm: Potential Changes from the Occipital Lobes in Man,” *Brain* 57, no. 4 (December 1934): 356–357, <https://doi.org/10.1093/brain/57.4.355>.

⁶⁵ Adrian and Mathews, “Berger Rhythm,” 367–375.

⁶⁶ Alvin Lucier, “Origins of a Form: Acoustical Exploration, Science, and Incessancy,” *Leonardo Music Journal* 8 (1998): 8, <https://doi.org/10.2307/1513391>.

Lucier's piece, the nearly sub-audible alpha wave, which the solo performer must learn to produce by closing their eyes and concertedly spiriting away all mental imagery, is routed through a low-pass filter designed to remove "extraneous" frequencies. After this, it is amplified by loudspeakers situated near percussion instruments.⁶⁷ What the audience hears is not the low alpha wave itself, but the rattling of the instruments, which are excited by sympathetic resonance. Oliveros's recollections suggest that Lucier's *Music for Solo Performer* was an enormously influential work for her: "a most germinal piece."⁶⁸ "The performer," she has observed, "must come to terms with his/her consciousness in order to perform the piece, thus pointing the way for an extremely important trend in today's music."⁶⁹

Music for Solo Performer marked one of the earliest (indeed, possibly the *first*) uses of biofeedback in the arts.⁷⁰ Per Stefan Helmreich, the term "biofeedback," which names the real-time observation and self-regulation of bodily functions, was first deployed in 1970 amidst a burst of psychological interest in cybernetic principles and altered states.⁷¹ (Arguably, Adrian and Matthews have an ancestral claim to the practice.) Lucier's pioneering use of biofeedback set a powerful example for Oliveros, and one which—as we will see—she would return to rigorously in her *Sonic Meditations* (1971–73). However, already in 1968, when she was invited by the SAG to contribute a work to one of their shows, Oliveros was intrigued by biofeedback's potential as a means towards the staging of listening, and the unification, or synchronization, of subjects on- and off-stage. In *A Theater Piece*, she had recycled the taped speech and sounds of a roaring mass, feeding this sonic material back into the unfolding of her performance, and constructing a literal feedback loop

⁶⁷ Gordon Mumma, "Alvin Lucier's *Music for Solo Performer* 1965," in *Cybersonic Arts*, 50–53.

⁶⁸ Oliveros, "*Music for Solo Performer* 1965," 191.

⁶⁹ Oliveros, 191.

⁷⁰ See, for a survey of biofeedback in the arts, David Rosenboom, *Extended Musical Interface with the Human Nervous System: Assessment and Prospectus*, Leonardo Monograph Series (San Francisco, CA: International Society for the Arts, Sciences and Technology, 1990), 10–12.

⁷¹ Helmreich, "Potential Energy," S144–S145.

between performers and audience members. Might biofeedback allow her to establish a new type of connection *without* the aid of tape? Oliveros thought so, and while she was not yet equipped with the tools necessary to delve into the brain, as Lucier had, she realized that she could ingeniously leverage contact-microphone amplification in a study of the heartbeat.

Titled *Valentine for SAG* (1968, originally *Heart Piece for BLAM*) and premiered in June 1968, the piece that Oliveros wrote for the SAG involves the live staging of a card game (Hearts) featuring four players; the hearts of all four players are amplified by microphones placed on their chest cavities, and the card-table is also wired for amplification.⁷² *Valentine for SAG* boasts additional components, including a projected image of the Queen of Hearts, and the reading of a historical text concerning the making of playing cards, but the conceptual core of the piece, or the focus of its “interest,” lies in the “players’ real involvement in the game of Hearts and their peripheral interest in the hearing of their own bio-feedback loop while the game is in progress.”⁷³ “If the players’ interest is real,” Oliveros explains, “audience sensitivity should increase, and the players’ heart rates should change significantly with various events during the game.”⁷⁴ Premised on a feedback loop of sensitization, *Valentine for SAG* asks performers and audience members to participate, together, in a process of delicate synchronization. “If no relationship develops between audience member [sic] and the performance scene,” Oliveros states, “then the audience member is a *closed system* waiting for a pulse of some different intensity and quality to act upon him and change his motionless state.”⁷⁵

With *Valentine for SAG*, Oliveros succeeded in opening up a new kind of communication channel between performers and audience members. She additionally found a way to incorporate listening—in this case, the players’ perception of their own amplified heartbeats—into the structure

⁷² Elliott Schwartz, *Electronic Music: A Listener’s Guide* (London: Secker & Warburg, 1973), 246–249.

⁷³ Schwartz, *Electronic Music*, 247–248.

⁷⁴ Schwartz, 248.

⁷⁵ Schwartz, 248 (my emphasis).

of the performance. In this work, however, “participation” and synchronization unfolded primarily on the level of the “autonomic nervous system.”⁷⁶ Oliveros was still seeking ways to explore these concerns on the level of complete consciousness. Later in 1968, Oliveros found a new opportunity to experiment with listening, and this time, she forewent technology entirely. This occasion for further investigation came in September of that year, when she received a commission from the Aeolian Chamber Players, an affiliation of avant-garde-minded musicians then serving as the “resident ensemble” at New York’s Sarah Lawrence College.⁷⁷

The work she devised for them, *Aeolian Partitions* (1969), closely resembles *Pieces of Eight* (1965) in many notable respects. Entailing the use of props, a slide-projector, and “extra-musical” activities on the part of its performers—the work calls for flute, violin, cello clarinet, and piano, but also demands the involvement of a “page turner,” and two “extras”—*Aeolian Partitions* finds Oliveros smuggling winking symbolism into both its music and its stage-setting in order to lampoon concert convention.⁷⁸ There is one portion of *Aeolian Partitions*, however, which in its own, absurdist way, attempts quite movingly to choreograph listening and person-to-person connection among its performers and audience members. Oliveros’s means towards this choreographed listening is telepathy. Indeed, in the latter half of *Aeolian Partitions*, which is given over to what Oliveros terms a “telepathic improvisation,” each musician on stage is instructed to do the following:

Concentrate on a single performer. When you hear an interval or a chord mentally, play one of the pitches and assume that you are sending the other pitch or pitches to the other performer by telepathy. Play only long tones, but vary dynamics, vibrato and timbre. Try to influence different performers and to make silences by becoming mentally blank.⁷⁹

This “telepathic improvisation” is not only for the enjoyment of the performers: audience members are also invited to focus on particular performers and “influence” them to play specific

⁷⁶ Schwartz, 248.

⁷⁷ *Aeolian Partitions* (1969), manuscript score, Box 1, Folder 8, Oliveros Papers.

⁷⁸ Heidi Von Gunden, *The Music of Pauline Oliveros* (Metuchen, NJ: Scarecrow Press, 1983), 78–80.

⁷⁹ *Aeolian Partitions* (1969), manuscript score, Oliveros Papers.

pitches. Now, to be sure, Oliveros's invitation towards telepathy in *Aeolian Partitions* can be interpreted as merely another comic put-on: a gesture towards audience participation which, like the offertory in *Pieces of Eight*, is more satirical than actual. On the other hand, Oliveros was, at around this time, cultivating a genuine curiosity regarding the parapsychological, and in view of Oliveros's later integration of telepathy into her *Sonic Meditations*, I believe this structural component of *Aeolian Partitions* must be taken seriously.⁸⁰

By the late Sixties, Oliveros had emerged from a decade of intensive experimentation with tape with an acute desire to conjure that medium's capacity for expanded receptivity, awareness, and performative freedom in the minds and bodies of (human) musicians. *Pieces of Eight*, with its attempts to bend the concert format to the more fluid contours of an “oral tradition,” had represented only the initial manifestation of this desire. *A Theater Piece*, meanwhile, had leveraged actual tape in its dramatic, amplified staging of the listening experience. While by no means weary of electronic media circa 1968, it is clear that Oliveros, at this stage, wanted once again to effect a reverse “relay” with tape technology and channel its effects through embodied performers; and what better way to model the “expanded” perception afforded by tape than via the “extrasensory perception” (ESP) of telepathy? In the context of *Aeolian Partitions*, which, notably, makes prominent instrumental use of a radio in its first half, I believe Oliveros’s “telepathic improvisation” functions as a kind of technological pantomime. As an invitation towards “wireless” influence and connection, it invites performers and audience members alike to assume the role of transmitters and receivers scanning

⁸⁰ Oliveros's surface interest in the parapsychological is most clearly evidenced by her continued use of telepathy as a component of performance through to the mid Seventies. There are, however, ample suggestions in Oliveros's writings of a deeper fascination (and knowledge of) parapsychological research. See, e.g., in a 1973 report, Oliveros's reference to extrasensory-perception experiments carried out at Maimonides Hospital in Brooklyn. Oliveros, “Meditation Project: A Report” (1973), in *Software for People*, 161–162.

for common wavelengths or resonant frequencies. “Assume that you are *sending* the other pitch or pitches to the other performer,” Oliveros instructs.⁸¹

The telepathy in *Aeolian Partitions* has a more pragmatic function as well. Recall that in *Pieces of Eight*, Oliveros explicitly instructed performers to listen intently for sonic cues. Oliveros requested an intensity of listening from her performers not only because she wanted them to hear their relevant cues, but because she knew that this disposition of attentiveness—of *close listening*—would be powerfully legible in performance, and, perhaps, inspire an empathic recognition in audience members. In *Aeolian Partitions*, telepathy provides a similar pretext for Oliveros to encourage close concentration on the part of her musicians and their audiences—a concentration guaranteed to be visible (and audible) to even the most skeptical subjects involved.

Conceptually eclectic and stylistically marooned between Oliveros’s theater pieces of the Sixties, and her *Sonic Meditations* of the Seventies, *Aeolian Partitions* is a transitional work. However, with its framing of the performer as a transmitter sweeping for frequencies—resonances—it represents an important waystation along Oliveros’s path towards a new type of sonic embodiment, and a techno-logical realization of listening as performance. In 1969, she would continue down this path under the aegis of the Merce Cunningham Dance Company, powerfully and provocatively integrating the web of concerns present in *Valentine for SAG* and *Aeolian Partitions*.

T ♦ O

Throughout the Fifties and Sixties, the Merce Cunningham Dance Company functioned as a generative creative laboratory for its Musical Director, John Cage, occasioning major collaborative works (*Variations V*, 1965) and variations on his existing works (*Music Walk with Dancers*, 1960). Undoubtedly, Cage’s close relationship with Cunningham also fed powerfully into his conception of

⁸¹ *Aeolian Partitions* (1969), manuscript score, Oliveros Papers (my emphasis).

“theatre,” which was premised on the simultaneous appreciation of aural and visual phenomena. After the Company’s wearying 1964 world tour, which precipitated the resignation of Robert Rauschenberg from his role as its artistic director, and which left the group “on the brink of financial, physical, and emotional bankruptcy,” changes began unfolding within Cunningham’s ranks: for one thing, beginning with the complexly wired *Variations V*, premiered 1965 at New York’s Lincoln Center, the Company began moving concertedly into the realm of high technology.⁸² Additionally, because Cage, still the Company’s Musical Director, was insufficiently fluent in electronics to realize the more intricate technological visions of Cunningham and his collaborating composers, the Company’s longtime musical accompanist, David Tudor, and its new all-purpose technician, Gordon Mumma, assumed places of greater importance behind the scenes.

Tudor had been with the Cunningham Company since its very genesis, lending his virtuoso pianism to Cunningham’s dances throughout the Fifties and early Sixties; Mumma, meanwhile, had joined the Company after contributing his own *Mesa* (1966) to Cunningham’s dance *Place* (1966), coming aboard to assist Cage and Tudor with the formidable task of taking *Variations V* and all its attendant “gadgets” on tour.⁸³ During the Company’s “Mumma years” (1966–73), the musical language of electronics crept into Cunningham’s dances with increasing frequency—much to the chagrin of dancer Carolyn Brown, who found the sounds a deafening racket.⁸⁴

In view of these changes in the Company’s aesthetic and personnel c. 1966–1970, it is not surprising that during this time, Tudor and Oliveros found near-contemporaneous opportunities to contribute music to dances—and thus to extend their ongoing experiments in a valuable new context. It was evidently in 1967 that Cunningham first asked Tudor to write an accompaniment for

⁸² Mumma, “From Where the Circus Went” (1975), in *Cyber sonic Arts*, 109–139.

⁸³ Mumma, “From Where the Circus Went,” 112.

⁸⁴ Carolyn Brown, *Chance and Circumstance: Twenty Years with Cage and Cunningham* (Evanston, IL: Northwestern University Press, 2009), 364.

a new dance (*RainForest*, 1968) then untitled.⁸⁵ Whether Tudor was still actively working on his transducer-loudspeakers at this time is unknown; but Tudor's recollection suggests, tellingly, that his decision to repurpose his materials from *Bandoneon!* (*A Combine*) (1966) was more or less immediate: "So [the *Bandoneon!* loudspeakers] worked OK, and those things sat around and Merce Cunningham asked me for a piece. Well, I have those things lying around, so I might as well put them to use."⁸⁶

Exactly which "things" Tudor had sitting around is unclear, for in returning to his loudspeaker idea with Cunningham's dance in mind, Tudor seems to have quickly realized that he would need to make much smaller transducer-loudspeakers that he could travel with and manipulate on a tabletop. It is possible that he saved some of the "sounding materials" used in *Bandoneon!* (for example, the aluminum plating used for one of the speakers), finding that he could repurpose them on a smaller scale. Matt Rogalsky has found a materials list whose numbered items—"cymbal," "wood box," "springs," "sheet," "wood tray,"—provide a sense of what kinds of objects Tudor might have used, and some of these materials are physically extant.⁸⁷ It is also likely that Tudor saved and repurposed the transducers he had obtained from William Ashworth, although he appears to have discovered a new make of transducer around the time of the Cunningham commission. Filed in Tudor's electronics papers is a packet of "general engineering data" (dated 1968) concerning the Rolen Star Audio Transducer, a device manufactured by Rolen Electronics in Linden, California.⁸⁸

[Figure 7] The Rolen Star appears on a list of Cunningham's musical repertory equipment dated August 1969 and notably, the Merce Cunningham Trust's "music and sound information" document for *RainForest* stipulates the need for "audio transducers (Rolen Star transducer, or similar)."⁸⁹

⁸⁵ Rogalsky, "Idea and Community," 94.

⁸⁶ Tudor, interview by Fullemann.

⁸⁷ Rogalsky, "Idea and Community," 117–118.

⁸⁸ "Rolen Star" transducer ephemera, c. 1968, Box 37, Folder 4, Tudor Papers.

⁸⁹ "Musical Repertory Equipment as of August 24, 1969," 1969, Box 29, Folder 10, Tudor Papers; "RainForest Music Info," Asset ID 12340, Merce Cunningham Dance Capsules, Merce Cunningham Trust, New York, NY, <https://dancecapsules.mercecunningham.org/overview.cfm?capid=46076>.

Ultimately, at some point in late 1967 or early 1968, Tudor settled on an approach to his new adaptation of the transducer-speakers: for Cunningham's dance, he would employ "eight instrumental loudspeakers, sculpturally constructed from materials having different resonating characteristics," with each "instrumental loudspeaker" (a noteworthy phrase also found in the *Bandoneon!* materials) bearing one transducer.⁹⁰ These eight transducers would excite their associated objects using input from signal generators, such as sine- or square-wave oscillators, and the transduced signals, as "modulated" or filtered by the sounding materials, would be amplified by eight contact microphones, one for each "instrumental loudspeaker."⁹¹ Tudor's choice to excite his materials using oscillators and "very simple waveform[s]" marked a significant development in his thinking around the so-called "instrumental loudspeaker": he recognized, at this time, that the use of relatively colorless sounds lacking in timbral complexity would leave more room for his materials to assert themselves sonically, announcing their grain and texture.⁹² "The simplest possible input," he has often stated, "gives the most complex output."⁹³

In the time leading up to the premiere of Cunningham's dance at the State University of New York, Buffalo, Tudor "went on with his experiments," evidently acquiring a cymbal and a "large metal sheet," and Mumma, at Tudor's request, combed through shops on Canal Street in New York City, searching for more transducers and "World War II throat microphones."⁹⁴ Still, Cunningham's dance—and Tudor's accompaniment—had no name. Mumma recalls that when Cunningham at last announced that he would title his choreography *RainForest* (so capitalized), Tudor said, "now there's a title," and appropriated the name—*sans* the capital F.⁹⁵ Given what we

⁹⁰ Rogalsky, "Idea and Community," 100.

⁹¹ Rogalsky, 100.

⁹² "Composers Inside Electronics: Rainforest/David Tudor," CME Archives.

⁹³ Rogalsky, "Idea and Community," 100.

⁹⁴ Rogalsky, 95.

⁹⁵ Rogalsky, 95.

know, in retrospect, of *Rainforest*'s longer development—as we will see later on, subsequent iterations of Tudor's work indeed made use of taped nature sounds as sonic input—it is surprising to learn that the name “Rainforest” was not, originally, Tudor's own.

Contemporary critics were none the wiser: after Cunningham's *RainForest* finally premiered at SUNY Buffalo, with the Company dancers donning flesh-colored leotards, and the floating presence reflective, helium-filled pillows (courtesy artist Andy Warhol) providing a silvery visual flourish, the *New York Times'* Clive Barnes remarked that Tudor's music “suggests the clatter of machines in a steel undergrowth, while mechanical bird cries can be heard against what sounds like a hydroelectric waterfall.”⁹⁶ Watching footage of the premiere and listening to the reasonably clear recording of Tudor's music, one can appreciate Barnes's reaction: the whirring, droning, and purring signals passing through Tudor's sounding materials and their attached contact microphones occasionally call to mind a menagerie of birds and insects hovering somewhere in the darkness of the rafters.⁹⁷ And indeed, as Rogalsky has pointed out, Tudor remarked in a later interview that his 1968 *RainForest* accompaniment employed “oscillators that made animal-like and bird-like sounds.”⁹⁸

However, this illusory “program” or thematic is liable to distract. In the austerity and simplicity of its electronic sounds, what Tudor's first *Rainforest* iteration most clearly constitutes is a searching, probing study of resonances embedded in material things, and made available through technological means. In the tradition of Cage's *Cartridge Music* (1960), with its revelation of “small sounds” audible only through amplification, the accompaniment is a focused exercise in technological disclosure that allows objects (“instrumental loudspeakers”) a chance to speak for

⁹⁶ Clive Barnes, “Dance: Cunningham Finally Makes It,” *New York Times*, May 16, 1968, 51.

⁹⁷ “*RainForest*,” filmed by Richard Leacock, produced and written for television by David Oppenheim, filmed for the Public Broadcast Laboratory of National Educational Television at the second Buffalo Festival of the Arts, March 9, 1968, videocassette, 27 min., Merce Cunningham Video Archive, Jerome Robbins Dance Division, New York Public Library Digital Collections, New York Public Library, New York, NY,

<https://digitalcollections.nypl.org/items/1e5c3980-b2b9-0131-b176-3c075448cc4b>.

⁹⁸ Tudor, interview by Fullemann.

themselves—on the urging of human agents. At the Buffalo premiere, Tudor and Mumma were the human performers carrying out the work of excitation, gently twisting the knobs of oscillators and test-tone generators and awaiting dynamic responses from the wood and metal implements spread before them. The “action” of *Rainforest* performers, one of Tudor’s descriptions states, “should be to *discover* (in real time) and *disclose* the resonating points of the different instruments.”⁹⁹

In February 1969, less than a year after the premiere of Cunningham’s *RainForest* (and Tudor’s *Rainforest*) in Buffalo, New York, Oliveros wrote Tudor to announce that “after [their] last conversation, [she had] composed a new piece for Merce.”¹⁰⁰ Oliveros’s remark suggests, quite plausibly, that Tudor brokered this opportunity before her. And given the explicit focus on resonance in Oliveros’s piece, one is led to believe that she discussed *Rainforest* with Tudor before setting to work on her new composition. Then again, however, Oliveros already had resonances of different sorts on her mind: in her *Valentine for SAG* (1968) and *Aeolian Partitions* (1969), Oliveros had played with waves, wavelengths, and frequencies, both real and notional (“extrasensory”), and now—perhaps in response to Tudor’s “instrumental loudspeakers”—she opted to engage with the concept of “resonant frequency” directly. The most proximal influence on Oliveros’s piece for Cunningham seems to be John Joseph O’Neill’s 1944 biographical study *Prodigal Genius: The Life of Nikola Tesla*, whose photocopied pages she retained in her papers. One particular passage from the text, blocked off in brackets, served as a spur to her new exercise in resonant *sounding* and performed listening; the passage describes an experiment that Nikola Tesla (1856–1943), the noted inventor and electrical engineer, carried out in his New York City laboratory:

In order to carry out what he expected to be some minor and very small-scale [vibration] experiments, [Tesla] screwed the base of one of his small mechanical oscillators to an iron supporting pillar in the middle of his laboratory and set it into oscillation. It had been his observation that it took some time to build up its maximum speed of vibration. The longer it operated the faster the tempo it attained. . . . One of the many objects around the laboratory

⁹⁹ Rogalsky, “Idea and Community,” 100 (my emphasis).

¹⁰⁰ Pauline Oliveros to David Tudor, February 7, 1969, Box 57, Folder 8, Tudor Papers.

would suddenly go into violent vibration as it came into resonance with the fundamental vibration of the oscillator or some harmonic of it. As the period of the oscillator changed, the first object would stop and some other object in resonance with the new rate would start vibrating.¹⁰¹

Reading of Tesla's exploratory frequency sweeps and their aftermath (evidently, Tesla caused a “minor earthquake” when he tuned his oscillator to the resonant frequency of his building, drawing the attention of the police), Oliveros had an idea: what if she composed a piece for Cunningham that took the form of a live experiment like Tesla's? Could she choreograph a scenario in which she and Cunningham's musicians (she had Tudor and Mumma quite specifically in mind) carried out the work of testing their acoustical environment? Her thinking unfolding along these lines, Oliveros eventually produced *In Memoriam Nikola Tesla, Cosmic Engineer* (1969), which she contributed to Cunningham's dance *Canfield* (1969). A synthesis of the various attunement and synchronization procedures she had been exploring in years previous, and a most ingenious means of staging the act of listening, Oliveros's work comprised three discrete sections, each with its own “dramatic action” and technological flourishes.

In the first section of *In Memoriam Nikola Tesla*, the performing musicians start a conversation amongst themselves regarding the acoustical environment of whatever venue or theater they happen to be in; Oliveros allows for both direct observation, and comparison to “other performance spaces both real and imaginary.”¹⁰² Just as the telepathy in *Aeolian Partitions* is intended for serious execution, this conversation is not to be taken lightly or jokingly: “The essential aspect of the discussion,” Oliveros states, “is that the musicians actually describe their own *real* personal responses to the environment. The conversations must be real in order to be dramatically viable.”¹⁰³ The conversation comprising *In Memoriam Nikola Tesla*'s first section is broadcast over a PA system,

¹⁰¹ John J. O'Neill, *Prodigal Genius: The Life of Nikola Tesla* (New York, NY: Cosimo, 2006), 158–162. The photocopied excerpt is filed in Box 10, Folder 15, Oliveros Papers.

¹⁰² Description of *In Memoriam Nikola Tesla, Cosmic Engineer* (1969), Box 10, Folder 15, Oliveros Papers.

¹⁰³ Description of *In Memoriam Nikola Tesla, Cosmic Engineer* (1969), Oliveros Papers.

and thus heard, in its entirety, by the audience. During the second section of the piece, Oliveros asks that the performers “test the environment in order to find the resonant frequency of the space.”¹⁰⁴ “[E]xplore whole space sonically to find resonant frequencies,” reads a note written by Tudor, who regularly featured as an *In Memoriam Nikola Tesla* performer.¹⁰⁵ [Figure 8] The testing is to be described, in real-time, over walkie-talkie, and particularly interesting observations are to be broadcast over the PA system. Throughout sections one and two, in the tradition of *A Theater Piece*, the unfolding discussion, and the sounds of any adjoining environments—the lobby, basement, stage, and dressing rooms—are recorded to tape.

In Memoriam Nikola Tesla culminates in a moving finale in which two or more audio generators producing tones “not to exceed” 100 Hz sweep upward from inaudibility to extreme loudness, “listening” for resonant responses from the surrounding building. As the tones rise in volume, sounds recorded in sections one and two of Oliveros’s work are selectively played back. “If the search for the resonant frequency has been successful,” Oliveros explains, “then the frequency of the generators selected by the musicians can cause the performance space to add its squeaks, groans, and other resonance phenomena to the general sound. Thus the space performs in sympathy with the musicians.”¹⁰⁶ In certain superficial respects—namely, in virtue of its focus on resonance—*In Memoriam Nikola Tesla* would seem to resemble Tudor’s *Rainforest* of 1968; and indeed, Oliveros states that in developing the piece, she was inspired by “the nature of the virtuoso musicians, David Tudor and Gordon Mumma.”¹⁰⁷ Despite their difference of scale, both *Rainforest* and *In Memoriam Nikola Tesla* are studies or exercises in a kind of resonant *searching*—a plumbing for sympathetic frequencies in “sounding materials” and architectural surrounds. What’s more, both pieces make

¹⁰⁴ Description of *In Memoriam Nikola Tesla, Cosmic Engineer* (1969), Oliveros Papers.

¹⁰⁵ Preparatory notes for Oliveros’s *In Memoriam Nikola Tesla, Cosmic Engineer* (1969), Box 11, Folder 9, Tudor Papers.

¹⁰⁶ Description of *In Memoriam Nikola Tesla, Cosmic Engineer* (1969), Oliveros Papers.

¹⁰⁷ Description of *In Memoriam Nikola Tesla, Cosmic Engineer* (1969), Oliveros Papers.

crucial use of technological procedures—transduction, amplification, and recording, variously—in their choreographed acts of revealing.

There is, however, a critical difference that separates Oliveros and Tudor's Cunningham compositions, and a grasp of this difference is necessary to an understanding of the musicians' next steps. Moving from *Bandoneon!* to *Rainforest*, Tudor allowed himself to be guided by the resonances of his "instrumental loudspeakers," whose sounds were so compelling that he turned excitedly back to them upon receiving Cunningham's commission over a year after "9 Evenings." The resonance that interested Tudor was a resonance trapped in *things* and standing in for a voice long consigned to inaudibility. It is thus the austere purr of wood and metal that reigns in the footage capturing the Buffalo premiere of Cunningham's *RainForest*; tucked somewhere behind the scenes, Tudor and Mumma remain in shadow.

In Oliveros's *In Memoriam Nikola Tesla*, the resonances and sounds of a given venue, which would seem the ostensible focus of the work, are in fact of secondary concern. Operating quite like telepathy in *Aeolian Partitions*, this sonic phenomenon provides a pretext for the staging of exploratory listening—hence Oliveros's insistence upon the conversation being "real" (and thus "dramatically viable"). And while *In Memoriam Nikola Tesla*'s aural patchwork does include piercing tone generators and recycled recordings, the sounds that feature most prominently are those of the listener-performers talking amongst themselves. The resonance that interested Oliveros, and which she captured so effectively in her Tesla homage, is a resonance heard and recognized by human listeners with the aid of technological instruments. It is a resonance, in other words, whose locus lies in the environmentally attuned and embodied listener listening for sympathetic vibrations. Whether audiences and critics found Oliveros's intervention legible or even approachable is uncertain; in a 1970 review of *Canfield*, critic and curator Marcia Tanner lamented that "technicians" were "running

the show” with their “cool, anonymous engineer’s talk.”¹⁰⁸ While Oliveros may not, then, have achieved her ideal of audience participation, she was moving in the proper direction, guided, like Tudor, by resonance.

2. Sonic Embodiment

In 1968 and 1969, resonant frequencies guided Tudor and Oliveros inexorably towards bodies. While Tudor was drawn towards the sounding bodies of his “instrumental loudspeakers,” Oliveros was drawn towards the listening bodies of performers and audience members. While in retrospect, we can see that embodiment was strongly at issue in the live-electronic experimentation of *Bandoneon! (A Combine)* (1966) and *A Theater Piece* (1966), which respectively amplified the agency of a technological system, and the agency of a listening mass, we have seen that questions of liveness more properly animated these works. Tudor and Oliveros’s creations of the mid Sixties were, nevertheless, necessary prerequisites to the embodied sonic practices they would undertake beginning in 1970. Indeed, *Bandoneon!* and *A Theater Piece* can be understood as having offered *prototypes* of embodiment that their creators circled back to in the late Sixties, led by the signals and signposts of resonant frequencies.

In this section, I discuss Tudor and Oliveros’s decisive move towards models of sonic embodiment between 1970 and 1973. First, in a sort of prelude, I briefly detail the musicians’ participation in the design and operation of an ambitious multimedia pavilion helmed by Billy Klüver and a large band of collaborators for the 1970 world’s fair, Expo ’70, in Osaka, Japan. I want to argue that Tudor and Oliveros, who were respectively involved with the pavilion’s “hardware” (its enormously complex built-in sound-system) and “software” (its live musical performances, or “live

¹⁰⁸ Marcia B. Siegel, “Come in, Earth. Are You There?” (1970), in *Merce Cunningham: Dancing in Space and Time*, ed. Richard Kostelanetz (New York: Da Capo Press, 1998), 75–76.

programming”), found in the project further creative cues that helped lead them beyond their resonant “searching” and into a fertile period of embodied experimentation.

Next, I detail this experimentation at length, looking individually at Tudor and Oliveros’s major projects of the early Seventies: the fourth iteration of the former’s *Rainforest*, brought to bloom in 1973, and the latter’s *Sonic Meditations*, composed between 1971 and 1973. Besides having been developed in close succession (and at a time when Tudor and Oliveros were in continued communication), these works share several key characteristics. First, as we will soon see, they both emerged from “workshop” environments: while Tudor developed the fourth iteration of *Rainforest* in collaboration with students whom he was teaching at an experimental-music summer camp, Oliveros developed the first of her *Sonic Meditations* in the company of an all-female ensemble comprised of colleagues and graduate students at UCSD.

Second, in their modes of presentation (premised on physicality, situated experience, and, indeed, embodiment), these works pressed Oliveros and Tudor beyond recognizably musical idioms: we will see that in *Rainforest*’s 1973 iteration (retroactively classed as *Rainforest IV*), Tudor magnified his instrumental loudspeakers to the scale of room-size installations, according them a physical and plastic presence implied but not consummated by *Bandoneon!*. We will meanwhile see that in the *Sonic Meditations*, Oliveros succeeded in codifying a new type of performance activity—the meditation—premised on receptive listening, and, for the most part, requiring the command of one’s body and ears alone. With these works, Tudor and Oliveros grafted a new kind of flesh onto the musical work, resituating it in resonant bodies, both material and human, and bringing musical composition and performance closer to sculptural construction and performance art. The consequences of this development will be addressed at the end of this chapter, and in this dissertation’s Conclusion.

Particularly in my discussion of Oliveros and her *Sonic Meditations*, I will toe close to the arguments of others who have located in these works a decisive turn to the body. However, I want

to argue that a prevalent interpretation of these works—one premised on the notion that they exchange technology for the naturalism of the somatic—can be productively supplemented through an attention to their entanglements with mediation.¹⁰⁹ As should be clear given everything discussed in this project, Oliveros and Tudor arrived at this juncture—this culminating point of embodiment—via their extended exploration of electronic media. And the resonant bodies modeled in *Rainforest* and the *Sonic Meditations* are tied ineluctably to the work of mediation. Tudor’s “instrumental loudspeaker,” the structural cornerstone of *Rainforest*, is a fundamentally *technological* entity; and Oliveros’s meditating listener is a fundamentally *techno-logical* subject, albeit one redeemed, and spared the fate of Tudor in his role as a piano-playing “automaton.” Much more than abandoning technology for naturalism, these works erect a new, second nature atop the essence of the electronic.

T ♦ O

For all the financial, technological, and creative capital funneled into “9 Evenings” (in all, the event represented 8,500 volunteer hours on the part of Bell Laboratories engineers, and \$160,000 in funds), the festival failed to live up to the mammoth expectations stoked among critics and audiences.¹¹⁰ Nevertheless, unphased by the negative press, festival mastermind Billy Klüver regarded “9 Evenings” not as a cataclysmic *end*, but rather as a valiant first attempt to draw artists and engineers into generative collaboration—and he was not yet willing to give up on this project of cross-disciplinary synthesis. In late September 1966, just weeks before “9 Evenings,” Klüver incorporated a New York State non-profit called Experiments in Art and Technology (E.A.T.); “9 Evenings” artists Robert Rauschenberg and Robert Whitman, and engineer Fred Waldhauer (Tudor’s collaborator on *Bandoneon! [A Combine]*, 1966), were the organization’s official

¹⁰⁹ This argument appears in, e.g., Tinkle, “SAG Representative.”

¹¹⁰ W. Patrick McCray, *Making Art Work: How Cold War Engineers and Artists Forged a New Creative Culture* (Cambridge, MA: The MIT Press, 2020), 129–131.

cofounders.¹¹¹ E.A.T. was to serve, per Klüver, as a “transducer between the artist and the industrial laboratory”—as a mechanism capable of carrying out the artist-engineer “matchmaking” central to “9 Evenings” on a larger, nationwide scale.¹¹²

By the spring of 1969, E.A.T could boast that it had coordinated “over 500” creative collaborations.¹¹³ And the organization had, by this time, finally signed on to a project as vast in scale and ambition as “9 Evenings”: soft-drink juggernaut PepsiCo, Inc.’s pavilion for the 1970 world’s fair in Osaka, Japan. The improbable opportunity arose, in Fall 1968, via a fortuitous connection with David Thomas, the Vice-President for marketing coordination and planning of PepsiCo’s international division.¹¹⁴ As W. Patrick McCray recounts, in the early stages of Expo ’70’s planning, in exchange for consulting with fair personnel regarding the management of concessions, PepsiCo. was given its own freestanding pavilion—an honor bestowed on only two other American corporations (Eastman Kodak, and IBM).¹¹⁵ Thomas had been handed the reins of the “Pepsi Pavilion,” which was to take the form of a massive, faceted dome, and initially, he no clear idea of what to *put* under this dome and its plastic white paneling—that is, until he spoke to sculptor Robert Breer (1926–2011), his next-door neighbor.¹¹⁶ A longtime associate of Klüver (who, incidentally, had been trying to make inroads into the planning of the United States Expo ’70 pavilion), Breer told Thomas of E.A.T, and the latter’s interest was piqued.¹¹⁷

¹¹¹ McCray, *Making Art Work*, 130. As W. Patrick McCray observes, that E.A.T. was incorporated *before*, and not after “9 Evenings” is a fact of the chronology lost on most historical commentators, likely because the organization was “announced” in a flurry of newspaper articles issued following a widely attended “coming-out party” held in Rauschenberg’s loft in October 1967; it is any event that the organization did not commence fundraising and outreach until after the showing at the Armory.

¹¹² McCray, 130.

¹¹³ Introduction to TECHNE and E.A.T., *TECHNE: A Projects and Process Paper*, April 14, 1969, 1.

¹¹⁴ McCray, *Making Art Work*, 203–206.

¹¹⁵ McCray, 204–205.

¹¹⁶ McCray, 205–206.

¹¹⁷ McCray, 206.

In December 1968, E.A.T. delivered an official pitch to PepsiCo., and soon after, secured creative control of the pavilion.¹¹⁸ In the months leading up to the pitch, Breer quickly assembled a team of artists, enlisting David Tudor, Robert Whitman, and sculptor Forrest Myers (1941–), and began coordinating brainstorming sessions; Rauschenberg was called to participate in due time, and engineers Fred Waldhauer and John Pan were also brought into the fold.¹¹⁹ The artists shared a general interest in raw sensory experience and the fluid, dynamic properties of lights, lasers, and sound: Whitman was known for works of “expanded cinema” that integrated film projections into sprawling, imagistic environments or installations, Myers nurtured an interest in lasers, and had constructed sculptures making use of searchlights, and Tudor, of course, had been pursuing the properties of *resonance*, whether in larger spatial surrounds (as in the Armory, and in his continued work with the organ and bandoneon), or on a smaller scale (as in the 1968 iteration of *Rainforest*).¹²⁰ Rauschenberg, rather in tune with Tudor’s live-electronic concerns of recent years, had himself begun constructing large “feedback” situations that placed live spectators in circuit with responsive sculptures: in his *Soundings* (1968), lights flutter on and off behind a massive row of silkscreened plexiglass panels, activated by voices and other ambient sounds.¹²¹ [Figure 9]

Following a certain amount of wheel-spinning, the group eventually began to map out an abstractly experiential environment that in its final form would feature a “scintillating show of laser light” (courtesy Tudor collaborator Lowell Cross), an involved system of precision spotighting (courtesy the Tape Center’s Tony Martin), and a remarkably complex thirty-seven speaker sound-system arrayed in an overhead grid.¹²² In their effort to construct what Rauschenberg termed an

¹¹⁸ McCray, 210–211.

¹¹⁹ Nilo Lindgren, “Into the Collaboration,” in *Pavilion*, ed. Billy Klüver, Julie Martin, and Barbara Rose (New York: Dutton, 1972), 11, 19–20.

¹²⁰ Lindgren, “Into the Collaboration,” 11–15.

¹²¹ Pamela M. Lee, “Gifts from the Street? Early Media Works,” in *Robert Rauschenberg*, ed. Leah Dickerman (New York: The Museum of Modern Art, 2016), 214–220; Walter Hopps, ed., *Robert Rauschenberg* (Washington, DC: National Collection of Fine Arts, Smithsonian Institution, 1976), 16–18.

¹²² Elsa Garmire, “An Overview,” in *Pavilion*, ed. Klüver, Martin, and Rose, 173–178.

“invisible environment,” or an environment premised more on sensory stimulation and delicate special effects than on concrete artworks, the Pavilion team seems to have drawn direct inspiration from art critic and theorist Jack Burnham (1931–2019), who in a visionary 1968 article titled “Systems Esthetics” had announced a shift, in artistic thinking, from a concern for objects, to a care for organizational systems joining matter, energy, and information in dynamic interrelationships.¹²³ “Nothing iconic (iconographic),” Tudor scrawled on a Pepsi Pavilion note bearing Burnham’s name, making seeming reference to Burnham’s *Software* exhibition at New York City’s Jewish Museum (September 16–November 8, 1970). “Most of *Software* is *aniconic*,” Burnham had written in that show’s catalogue—“its images are usually secondary or instructional while its information often takes the form of printed materials.”¹²⁴

Even with its turn away from straightforward visual representation, the Pepsi Pavilion had to adhere to some concrete physical contours, and ultimately, its swirl of spectral phenomena and abstract experiences was housed beneath a massive hemispherical mirror (nested within the pavilion’s geodesic dome) measuring ninety feet in diameter. A “rhombic arrangement” of speakers pitched over the heads of visitors was so that music could be dynamically spatialized via alternations between “line sound” (the rapid switching of sounds from speaker to speaker), “point sound” (the channeling of sound through a single speaker), or “environmental sound” (the projection of sound from all directions).¹²⁵ [Figure 10] To this already elaborate sound-system, Gordon Mumma, enlisted by Tudor, contributed an eight-channel modification console programmable by punch-cards and magnetic tape, and capable of manipulating sounds via frequency-modulation (the shifting of a sound’s pitch upward or downward), amplitude-modulation (the manipulation of a sound’s

¹²³ Jack Burnham, “Systems Aesthetics” (1968), in *Dissolve into Comprehension: Writings and Interviews, 1964–2004*, ed. Melissa Ragain, Writing Art Series (Cambridge, MA: MIT Press, 2015), 115–117; McCray, *Making Art Work*, 209–212.

¹²⁴ Burnham, “Notes on Art and Information Processing” (1970), in *Dissolve into Comprehension*, 154.

¹²⁵ Garmire, “An Overview,” 189–191.

waveform, or “amplitude envelope”), and a filter function capable of stripping away particular frequencies.¹²⁶

The Pavilion’s gridded sound-system, to which Fred Waldhauer and engineer Larry Owens contributed their technical expertise, had, from early on, taken shape in accordance with Tudor’s idiosyncratic ideas, some of which, You Nakai observes, bore the impress of his work on *Bandoneon!*.¹²⁷ Originally, imagining himself as a “rock performer,” he had drawn up preliminary plans for a “rock environment” designed to house dynamic live performances: the environment was to feature, variously, a “closed-circuit t.v. system which sends the image of each musician. . .to screens or surfaces. . .in various parts of the space,” “sounding sculpture, to be designed by artists, conceived as electronic percussion instruments,” and, most crucially, an “audio system covering [the] entire space, or many well-defined spatial areas, programmed in such a way as to create *constant sound-movement*.¹²⁸ “[Rock groups] all have the same density of sound,” Tudor explained, “and I felt there ought to be some means of creating an unpredictable space relationship that would vary the source of the sound.”¹²⁹

As an organizing premise, “rock performance” quickly fell by the wayside, both for aesthetic reasons, and because the spatial constraints of the dome quickly became evident; per Tudor, like the tabletop *Rainforest* objects of 1968, which asserted their own tenor and texture in response to whirring oscillators, the pavilion “became its own space, with its own characteristics.”¹³⁰ And yet Tudor’s insistence on a “physical” and sculptural “sound space” was still honored by the multi-speaker array and its capacity for real-time spatialization; so too did Tudor’s notion that the space could be oriented towards use by live performers (rock-stars or otherwise) dictate the final form of

¹²⁶ Mumma, “A Brief Introduction to the Sound-Modifier Console and *Sunflower Burst*” (1972), in *Cyberonic Arts*, 65–72.

¹²⁷ Lindgren, “Into the Collaboration,” 54–57; Nakai, *Reminded by the Instruments*, 277–279.

¹²⁸ “Rock Environment,” c. 1969, Box 17, Folder 3, Tudor Papers (my emphasis).

¹²⁹ Lindgren, “Into the Collaboration,” 18.

¹³⁰ Lindgren, 18.

the sound-system, which, capable of relaying any sounds fed to it by microphones and a tape-recorder bank, and programmable via paper tape and punch cards, was effectively an “instrument,” conceived “so that the sound would not be fixed in advance but would result from. . .visiting artists playing it.”¹³¹

Thus, while Tudor approached the sound-system (and the broader pavilion) as a dynamic entity with its own inclinations, limitations, and inborn characteristics (his notes make reference to the “resonant frequencies of the air,” and “speaker systems that work like the human larynx”), this large-scale “instrument” differed from the *Rainforest* objects and the self-composing *Bandoneon!* in that it welcomed the voices of others.¹³² Borrowing a distinction central to computation and information-processing, and perhaps still thinking of critic Jack Burnham, the pavilion team understood their creation as operating on two different registers: “hardware” and “software.” Writing in a 1970 catalogue commemorating the Pepsi Pavilion, engineer John Pan creatively likened the domed structure and its innards to the Jacquard loom, a media-archaeological ancestor of the computer that had revolutionized the nineteenth-century textile industry with its “reading” of weaving patterns off of punched cards:

The punched cards are called software in contrast to the hardware of the loom. . . . [N]o one can hope to realize all the potentials of a programmable loom. The different possibilities are truly astronomical. Given enough time, it is possible to go through all the patterns systematically, but most of the patterns thus generated would be uninteresting. It takes an artist (weaver) to pick out the interesting ones and to propose new patterns to try out.¹³³

Tudor, having collaborated so closely on the design of the Pavilion’s sonic “hardware,” could not help but design some of his own “patterns,” and drawing on a vast library of of “natural environmental sounds” collected by geographer Peter Poole and E.A.T. assistant Ritty Burchfield, he produced a total of nine programs, four of which later earned inclusion in his

¹³¹ Lindgren, 15.

¹³² “Meeting with Cyril Harris and Billy Klüver,” March 6, 1969, Box 17 Folder 3, Tudor Papers.

¹³³ John W. Pan, “Software,” in *Pavilion*, ed. Klüver, Martin, and Rose, 269–270.

catalogue of works.¹³⁴ The sounds on the Pepsi tapes included, variously, footsteps, heartbeats, raindrops, “sea sounds,” mosquito and insect chatter, earthquake rumbles, bird mating calls and croons, and the chirps and whistles of electromagnetic activity in the earth’s ionosphere. Two of Tudor’s “Four Pepsi Pieces” (*Anima Pepsi*, 1970, and *Pepsi Bird*, 1970) scattered and swept this strange source material about the Pavilion’s vast speaker grid, using Mumma’s modification console, and the sound-system’s spatialization capabilities to sculpt vivid sound compositions, or “environments,” in the round. However, the other two “Pepsi Pieces” that survive in Tudor’s catalogue (*Pepscillator*, 1970, and *Microphone*, 1970) make use of no source material whatsoever, and creatively demonstrate the musician’s abiding interest in effects somehow *inherent* to the physical make-up of technological systems (“hardware”).¹³⁵ In You Nakai’s formulation, Tudor “conceived of the interior of the *Pepsi Pavilion* as a giant modifier and potential generator of sound.”¹³⁶ Whereas *Pepscillator* chained together the inputs and outputs of Mumma’s sound-modification channels, generating electronic feedback “without using any external input material of any kind,” *Microphone* entailed the generation of acoustic feedback via the interaction of shotgun microphones and speakers.¹³⁷ Much as a work like *Microphone* fulfilled the Pavilion team’s ambitions towards an “invisible environment,” conjuring a charged “sound space” out of thin air, its play of feedback also emphasized the physical fact of the Pavilion’s enclosed space, bidding it to announce itself as a contained system—a resonant body.

Additional programs (“software”), and more eager “weavers,” were needed, and in June of 1969, E.A.T. secured PepsiCo’s approval for an ambitious “live programming” initiative designed to bring a continuous rotation of resident artists, or “programmers,” to Osaka.¹³⁸ Visiting artists, E.A.T.

¹³⁴ Rogalsky, “Idea and Community,” 162–170.

¹³⁵ Rogalsky, 154–159; Nakai, *Reminded by the Instruments*, 289–300.

¹³⁶ Nakai, *Reminded by the Instruments*, 283

¹³⁷ Nakai, 295–298.

¹³⁸ McCray, *Making Art Work*, 295–298.

proposed, would be able to make use of the Pavilion's "two major programmable elements"—the spherical mirror and the sound-system—and additionally, they could construct any scaffolding or support structures necessary for performances and activities.¹³⁹ (Only the suspension of people from the dome's ceiling was taken off the table outright.) PepsiCo, not bothering to issue a contract, approved a tentative programming budget of \$100,000.¹⁴⁰ A typewritten brainstorming document dated July 1969 suggests that the Pavilion team had set their hopes high early on: counted among the possible invitees are New York Jets quarterback Joe Namath, French explorer and naval officer Jacques Cousteau, and quantum physicist Richard Feynman.¹⁴¹ An undated note written in Tudor's hand lists more familiar, and plausible, names drawn from the Sonic Arts Group and San Francisco Tape Music Center cosmos, including Pauline Oliveros, Alvin Lucier, Anna Halprin, David Behrman, and Terry Riley.¹⁴²

The Pavilion team's plan to host twenty-four resident programmers in total did not come to fruition. In a dramatic turn of events that dwarfed the critical controversy following "9 Evenings," PepsiCo ousted Klüver and company from Osaka unceremoniously and prematurely, having grown infuriated by the ballooning costs of the live programming; the Pavilion opened to the public on March 13, 1970, and on April 20, E.A.T. was informed that their services were no longer required, effective immediately.¹⁴³ Several programs were successfully mounted before Pepsi would seize control of the dome, piping songs like "It's a Small World" through the rhombic speaker grid. The very last of these "software" selections before the takeover came from Pauline Oliveros.¹⁴⁴

¹³⁹ "Live Programming for the Pepsi Pavilion: Request for Proposals — October 15, 1969," in *Pavilion*, ed. Klüver, Martin, and Rose, 272–274.

¹⁴⁰ Calvin Tomkins, "Outside Art," in *Pavilion*, ed. Klüver, Martin, and Rose, 133–134.

¹⁴¹ "Live Programming," July 10, 1969, Box 17, Folder 3, Tudor Papers.

¹⁴² Undated note regarding live programming ("materials"), c. 1969, Box 17, Folder 3, Tudor Papers.

¹⁴³ McCray, *Making Art Work*, 242–245.

¹⁴⁴ Recalled Tudor in 1994: "You know, it was an opportunity to invite people to work, work in the Pavilion, which was a gorgeous opportunity and an interesting space. So, uh, I guess the last person who was invited would have been Pauline, Pauline Oliveros." David Tudor, "Interview with David Tudor," by Matthew R. Rogalsky, November 2, 1994, last modified November 29, 2001, https://daviddtudor.org/Articles/rogalsky_inter1.html.

Piecing together Oliveros's final contribution to the Pavilion is something of a puzzle, as her papers contain materials related to two separate Expo '70 projects. One of these works, whose specifics are documented only in handwritten notes and sketches, bears the title *A Pavilion Electronic Mantra*, or simply *Electronic Mantra* (1970). [Figure 11] It was Oliveros's intention, in this "chant"-like piece, to feed pre-recorded strands of vocal and electronic music through Mumma's modification console and subject the raw material to continual shifts in "intensity" and "timbre," and alternating spatialization patterns.¹⁴⁵ The material was to remain anchored by a "central tonality," but fluctuate, in emphasis, between the "predominantly vocal" and the "predominantly electronic": the human and the technological, warp and weft, were to be drawn into a delicate weave. To enrich the sensory experience and focus the attention of Pavilion visitors, lighting was to be modulated "from below and above and to [the] periphery."¹⁴⁶

In keeping with her concerns for a liveness and resonance extending into the bodies of human subjects, positioned as active listeners, Oliveros stipulated, in a draft of *Electronic Mantra*, that "live sources may be added during any part of the program and will be subject to the same kind of modification as recorded material."¹⁴⁷ A remark made by Billy Klüver in E.A.T.'s in-house "newspaper" following Expo '70, suggests that not only was *Electronic Mantra* performed at the fair (under a pithier name), but that this "optional" live component was indeed put into play—with a little help from Pavilion staffers: "*Pep-Psi* is a recording of mantras sung by two Chinese girls and played on a cello and accordion. The hostesses were asked to sing with the mantras and to guide the visitors in exploring the sound reflective qualities of the dome."¹⁴⁸ This description calls to mind

¹⁴⁵ Pauline Oliveros, *Electronic Mantra* (1970) notes and diagrams, Box 3, Folder 6, Tudor Papers.

¹⁴⁶ Pauline Oliveros, *Electronic Mantra* (1970), notes and diagrams, Tudor Papers.

¹⁴⁷ Pauline Oliveros, *Electronic Mantra* (1970), notes and diagrams, Tudor Papers

¹⁴⁸ Billy Klüver, "The Pavilion," *TECHNE: A Projects and Process Paper*, November 6, 1970, 2.

nothing so much as Oliveros's *In Memoriam Nikola Tesla, Cosmic Engineer* (1969), with its performance of embodied listening under the guise of acoustical analysis.

Curiously, however, *Electronic Mantra* (or rather, *Pep-Psi*), is not documented in the *Pavilion* catalogue published in 1972. Included, instead, is a live-programming proposal for a work called *A-OK* (1969) devised by Oliveros in collaboration with her then-partner Lynn Lonidier (1937–1993), a poet. An elaborate live-performance work taking a cue from the Pavilion's circular structure, *A-OK* calls for groups of violinists, conductors, and a chorus to form concentric rings around a centrally situated “accordionist” (whom Oliveros refers to as “yours truly”) placed on a revolving platform manually rotated by four individuals.¹⁴⁹ [Figure 12] Audience members take their place along the outermost ring. The work, in essence, is a tuning ritual, or an exercise in collective resonance: *A-OK* begins when its conductors enter and, signaled by the chief conductor, begin resonating 220 Hz (A3) and 440 Hz (A4) tuning forks; the violinists tune *scordatura* A-E-A-E before settling on repetitive A patterns, the chorus sounds A3’s and A4’s, and the accordionist introduces A4’s with her right, then left, hands before sliding into a “continuous drone.”¹⁵⁰ “Chants,” tremolos, and occasional dissonances are brought in bit by bit as all the groups continue sounding, and eventually, the audience is invited to sing; all the while, light sources cycle gradually through different colors, mapping out a full spectrum, and a tape-delay system, fed sound from suspended microphones, draws the resonating A’s into a series of feedback loops.

It is unclear whether *A-OK* was ultimately performed; the only published photos of Oliveros in Osaka, which depict her standing behind one of the Pavilion’s control consoles, and chatting with engineers beside a bank of tape-decks, paint an ambiguous picture.¹⁵¹ One key specification in *A-OK*’s score, however, makes the work worthy of mention. Above the tape-delay instructions,

¹⁴⁹ Pauline Oliveros and Lynn Lonidier, *AOK* (1969), Box 1, Folder 4, Tudor Papers.

¹⁵⁰ Pauline Oliveros and Lynn Lonidier, *AOK* (1969), Tudor Papers.

¹⁵¹ Pauline Oliveros and Lynn Lonidier, “A-OK,” in *Pavilion*, ed. Klüver, Martin, and Rose, 307.

suspended in parentheses, we find the following caveat: “optional.” Whereas in *Pep-Psi*, live performance is the optional ingredient—a decoration to be wound around an electronic core—in *A-OK*, the human performers constitute the work’s *sine qua non*. Composed, one imagines, almost back-to-back with *In Memoriam Nikola Tesla*, in which tape still played a central structural role, this work strikes a more complex pose with regard to technology, not *rejecting* the mediating force of the reel-to-reel recorder, but rather, casting it as unnecessary to its exercise in resonant embodiment. It is meanwhile highly suggestive that Oliveros and Lonidier would have submitted this work in response to E.A.T.’s call for “live-programming,” or “software,” for in the absence of electronics, what, or who, was being programmed? *A-OK* sustains—but also points beyond—Oliveros’s back-and-forth relays with media, suggesting a transcendent exit from the dialectical churn of her endless loops. In this regard, it offers crucial anticipation of Oliveros’s *Sonic Meditations* (1971–73), which, not long after her return to the United States, would bring her developing theorizations of embodiment to their fullest realization.

“Hardware” and “software,” sound-sculpting and live-programming: two perspectives on the resonant body. In what follows, just as we will see Oliveros’s Expo ’70 contributions echoed in her imminent turn to the programming of the human listener, we will see how Tudor’s “Pepsi Pieces,” and his intimate engagement with the Pavilion’s physical exoskeleton, may have offered him still further orientation in his path towards a technological animism expanded in scale. Circa 1970, having long circled *around* bodies, tilting their ears towards their resonances, Oliveros and Tudor both sat poised on the edge of a sonic embodiment promising a wholesale transformation of the musical work. It is to this transformation that we now, at last, turn.

♦ T ♦

Tudor may have been forcibly ousted from the Pavilion project with all the others, but he did not leave Osaka empty-handed. For one thing, unwilling to leave geographer Peter Poole’s

hundreds of hours of environmental recordings in the hands of Pepsi, who demanded that E.A.T. turn over all their materials prior to their untimely departure, the Pavilion team smuggled the tapes off the fairgrounds by either lofting them over the perimeter fence, or wheeling them out in cleaning carts.¹⁵² For Tudor, these tapes were more than mere souvenirs: they came to constitute an enduring reservoir of “input” material that the musician deployed again and again in different projects and contexts.¹⁵³ And in addition to the tapes, Tudor took from his work on the “invisible environment” an equally powerful intangible: the experience of sculpting sound in a vast spatial surround and appreciating it in all its tactility. “Sound space is more physical,” Tudor had remarked regarding the Pavilion; “I can almost touch it.”¹⁵⁴

Not long after Tudor flew back to the United States with these materials and experiences in tow, he returned to *Rainforest* with the intention of fueling its continued growth. A preemptive clarification: while Tudor would begin, over the course of the Seventies, to speak of *Rainforest* in terms of discrete, numbered “versions” each distinguished by consistent characteristics, this taxonomy would not reliably stabilize until 1980. More to the point, as Matt Rogalsky observes, Tudor’s performance practice was so rooted in “experimentation and constant change”—e.g., the tweaking, adding, and switching out of materials, not to mention the backdating of notes and diagrams—that it is most proper to speak of the numbered *Rainforest* versions as “points in a continuum.”¹⁵⁵ What one can say with reasonable certainty is that by the early Seventies, Tudor had begun to expand the parameters of *Rainforest* as conceived for Cunningham, and he had begun to regard the work as a kind of theme subject to modulation and variation.¹⁵⁶

¹⁵² Rogalsky, “Idea and Community,” 155–156.

¹⁵³ See Nakai, *Reminded by the Instruments*, 441–472.

¹⁵⁴ Lindgren, “Into the Collaboration,” 18.

¹⁵⁵ Driscoll and Rogalsky, “An Evolving Exploration of Resonance,” 25.

¹⁵⁶ Rogalsky, “Idea and Community,” 100. A sheet of instructions dated March 1968 but, Rogalsky suspects, drafted in 1972 or later, enumerates five performance “options” for *Rainforest*: option one describes the “Cunningham version,” options two and three stipulate the excitation of the “instrumental loudspeakers” using *voices* (one voice, in the case of option two, and “up to eight voices,” in the case of three), option four dictates the use of “various taped materials” as

There are several respects in which Tudor's experience at the Pepsi Pavilion fed generatively into his further development of *Rainforest* after 1970, pressing it towards a fuller, and more fully realized form of resonant embodiment. Most proximally, the smuggled tape library inspired a new manifestation of *Rainforest* devised for simultaneous performance with a vocal work by John Cage titled *Mureau* (1972); for this *Rainforest* "version," which would later be dubbed *Rainforest III*, Tudor retained the small-scale, tabletop manner of presentation that characterized his 1968 Cunningham accompaniment, but exchanged his original sources of sonic input—tone-generators and oscillators—for the "natural" sounds he had rescued from Osaka.¹⁵⁷ In this way, *Rainforest III*, which routed brainwaves, water and bird sounds, and earth vibrations through "instrumental loudspeakers," found Tudor finally making good on the title he had appropriated from Cunningham and introducing shades of nature into his physical materials.

This change of source material marked a noted development in *Rainforest*'s longer evolution; but with its familiar scale and structure, the so-called *Rainforest III* was more a stepping-stone than a creative rupture. More significant than Tudor's incorporation of "natural" sounds in this early-Seventies iteration was a developing change in the way that he *talked* about the "nature" of *Rainforest*. You Nakai has called attention to a revealing interview that Tudor and Cage gave to Berkeley's KPFA on May 29, 1972 while touring Europe. Speaking from Brussels, Tudor offered the following observation in response to query about the current state of his work, and his turn to electronics: "Well, I feel that I have something that I can call my work when I discover a natural process. Or, when I discover an instrument as a *natural object*. That's how my piece *Rainforest* came about."¹⁵⁸

input, and option five suggests a kind of "unplugged" *Rainforest* performed in a small space without use of an "auxiliary sound system." Options two through four are defined not only by their input selections, but by specifications concerning the number of output channels. Together, options two and three describe what Tudor would later call *Rainforest II*; option four describes *Rainforest III*.

¹⁵⁷ Rogalsky, 171–181.

¹⁵⁸ Nakai, *Reminded by the Instruments*, 340–342; John Cage and David Tudor, interview by KPFA, May 29, 1972, https://archive.org/details/AM_1972_05_29 (my emphasis). You Nakai has helpfully transcribed a portion of this interview here: <http://remindedbytheinstruments.info/transcripts.html>.

Tudor again invoked his vision of a “whole forest” of individually sounding loudspeakers (which, we will recall, had its roots in his unrealized “Washington Park” project of the mid Sixties), and, regarding the principle of embodied resonance key to the “instrumental loudspeaker,” state, “[A]ll of a sudden I saw that that itself was a natural process because that instrument *didn’t need any music in it.*”¹⁵⁹

While characteristically cryptic, these remarks index a meaningful shift in Tudor’s conception of his own practice, his philosophy of technology, and his approach to music, and *Rainforest* is sited at the very center of this shift. Here, Tudor ascribes to the figure of the “instrumental loudspeaker” not only a singular voice, but also an inborn nature: technology, in this formulation, has become more than just a vessel of resonance or “liveness”: it has become a life-form animated by its own unfolding logic, and possessed of a sound no longer demanding the title of “music.” And Tudor’s invocation of his “forest” of loudspeakers, dreamt but never realized, suggests, most acutely, the continued influence of his work on the Pepsi Pavilion, with its “environmental” scale, and swirl of field recordings sculpted in three dimensions.

Tudor’s remarks on KPFA suggest a culmination in his thinking—a long-gestating synthesis urged on by his recent experiences; but in 1972, there is reason to believe his theorizations were being fed by old influences as well as new. On or around May 22 that year, roughly one week before Tudor took to KPFA’s airwaves, he sat down for a different interview—this one solo—with Victor Schonfeld. This discussion, held in London during the same international tour with Cage, would be published, in the August 1972 issue of *Music and Musicians* under the title “From Piano to Electronics” (the magazine cover advertising it as “my metamorphosis —David Tudor”).¹⁶⁰ As might be recalled from Chapter 1, this interview, in its published, monologic form, may represent

¹⁵⁹ Tudor, interview by KPFA (my emphasis).

¹⁶⁰ Victor Schonfeld interview transcript and related materials, c. May–June 1972, Box 59, Folder 4, Tudor Papers.

Tudor's longest and most crystalline account of his career arch, stretching, as it does, from the musician's *techno-logical* piano interpretation (for Cage, Feldman, Stockhausen, and others) to his *technological* exploration—work with “electronic circuitry.”

And in this Schonfeld interview, we find both calls back to automatism—“Being an instrumentalist carries with it the job of physical preparations for the next instant,” “I had to learn to be able to cancel my consciousness of any previous movement”—and moving invocations of a new technological “Nature.”¹⁶¹ “When you’re making music through these electronic media,” Tudor remarks, “it’s not enough to make montages of this and that unless you make the final sound come alive.”¹⁶² And elsewhere: “[E]ach output mechanism has its own bias. So I must see what its properties are as a natural phenomenon, and not spend my time making it do something against its nature.”¹⁶³ When we first encountered this interview, we had neither the context nor the conceptual tools necessary to parse the evolution it charts. We can now read it as an account, from an “instrumentalist” who subordinated his own body to a techno-logic, of a body given back to technology, with all the life, and freely expressed “Nature,” denied the piano-playing automaton.

Rainforest needed an outlet for its dramatic spatial expansion, and its full growth into a genuine “forest”; and Tudor needed an outlet for the developed articulation of his emergent theorizations, and his experiences (both new and old). In 1973, at last, the appropriate pretext to him via a teaching assignment. Indeed, at this time, Tudor was contacted by Czech composer and conductor Petr Kotik (1942–), whom he had first met while touring Europe with the Cunningham Company in 1964. In 1972, Kotik had traveled with his family to a holiday resort near Chocorua, New Hampshire (Stafford’s-in-the-Field), and he had returned from his trip with a desire to organize

¹⁶¹ David Tudor, “From Piano to Electronics,” *Music and Musicians*, August 1972, 24, 26.

¹⁶² Tudor, “Piano to Electronics,” 26.

¹⁶³ Tudor, 26.

some kind of new music workshop series in Chocorua's rustic surround.¹⁶⁴ Kotik regarded Stafford's-in-the-Field, which boasted considerable room for visiting students and instructors, and an “enormous barn” (a viable locale for performances), as an ideal site for such a workshop. After obtaining funding from the Rockefeller Foundation, and minting a new non-profit organization named New Music in New Hampshire (NMNH), Kotik began enlisting instructors for a three-week workshop that was to take place at Stafford's between June 21 and July 11, 1973.¹⁶⁵

Ultimately, Kotik secured the involvement of five outside instructors, each of whom organized their own course or workshop: composer Julius Eastman (1940–1990) planned a course on “body discipline,” the use of the voice, and the structuring of “sounds and space”; Sonic Arts Group member David Behrman organized a workshop in “designing, building and performing on electronic music synthesizers”; fellow SAG founder Gordon Mumma devised an “introduction to solid-state electronics for creative artists”; the politically vocal experimentalist Frederic Rzewski (1938–2021) opted to teach “improvisation and composition in real time”; and Tudor, at last, developed a workshop with the spare title “Rainforest.”¹⁶⁶ Reads Tudor’s brief course description on the New Music in New Hampshire flyer: “Experimental electronic workshop in sound transformation without modulation: building and performance.”¹⁶⁷ For his part, Kotik, who also acted as an instructor, designed a course on “open form” in musical composition.¹⁶⁸

In total, as Matt Rogalsky notes, New Music in New Hampshire yielded a respectable 28 students (enrollment was capped at fifty), and around fifteen of these students participated in Tudor’s “Rainforest” workshop.¹⁶⁹ We do not know exactly what Tudor’s original intentions were

¹⁶⁴ Rogalsky, “Idea and Community,” 185–187.

¹⁶⁵ Rogalsky, 185–187.

¹⁶⁶ “New Music in New Hampshire” flyer, 1973, Box 18, Folder 13, Tudor Papers.

¹⁶⁷ “New Music in New Hampshire” flyer, 1973, Tudor Papers.

¹⁶⁸ “New Music in New Hampshire” flyer, 1973, Tudor Papers.

¹⁶⁹ Bill Viola recalls a group of “about 15” assembling on the first morning of Tudor’s workshop. This number is corroborated by an enrollment list in Tudor’s files. Bill Viola, “David Tudor: The Delicate Art of Falling,” *Leonardo Music*

for his course, for there is little in the way of preparatory material contained in his papers; nor do we know exactly what his enrolled students expected, for while some were musicians—and may possibly have known of *Rainforest* via its inclusion in Cunningham's 1968 dance—others were artists or interdisciplinary practitioners. As we will see, the diverse backgrounds of Tudor's students contributed crucially to *Rainforest's* next evolutionary step. One key figure who found his way to Tudor's workshop was the artist John Driscoll, who in 1971, had earned an interdisciplinary M.F.A. from SUNY Buffalo; prior to his time at Buffalo, Driscoll had studied sculpture at Temple University.

For several years before New Music in New Hampshire, Driscoll had been working to unite interests in music and the plastic arts, and he had already begun working in the nascent interstitial discipline of “sound sculpture,” which was premised on the construction of physical objects made to sound via electronic or manual excitation.¹⁷⁰ Driscoll was drawn to Chocorua after coming across a the 1972 catalogue documenting the Pepsi Pavilion, and originally, he had intended to study with Mumma and Behrman. Driscoll had some familiarity with Mumma and Behrman’s music, having encountered it on the Sonic Arts Union’s 1972 LP (*Electric Sound*).¹⁷¹ Driscoll’s ultimate decision to work with Tudor was spurred by a chance encounter with a garden sprinkler:

As I was heading to a workshop on home-built electronics by Gordon Mumma and David Behrman I was intrigued by chirping sounds coming from an adjacent room. Upon looking into the dark room, I noticed a common garden sprinkler suspended from the ceiling. This sprinkler was emitting the chirping sounds. I was puzzled as to what was going on. It turned out that the late composer David Tudor was presenting a *Rainforest* workshop on “acoustical signal processing.” I did not understand this term at the time, but I was convinced that this chirping garden sprinkler was a solution to my desire to integrate sound and sculpture.¹⁷²

Journal 14 (2004): 49, <https://doi.org/10.1162/0961121043067406>; Undated enrollment list, Box 18, Folder 13, Tudor Papers.

¹⁷⁰ John Driscoll, “Resonance: From the Architectural to the Microscopic,” *Leonardo Music Journal* 22 (2012): 25, https://doi.org/10.1162/LMJ_a_00088.

¹⁷¹ John Driscoll, interview with the author, November 8, 2019, New Hyde Park, NY. The full details for the Sonic Arts Union record are as follows: Sonic Arts Union (Alvin Lucier, Robert Ashley, David Behrman, and Gordon Mumma), *Electric Sound*, Mainstream Records MS/5010, 1972, vinyl LP.

¹⁷² Driscoll, “Resonance: From the Architectural to the Microscopic,” 25.

Another figure who cut a less-than-straightforward path towards Tudor's Chocorua workshop was a young Syracuse graduate named Bill Viola (1951–). Today, Viola is known as a key second-generation pioneer of video art; Viola took to the medium of video with great intensity beginning in 1973, quickly refining a style centered on interests in optical and auditory perception, human corporeality, and the material and technological idiosyncrasies of the video medium itself. Frequently, Viola's video works of the Seventies took the form of room-scaled installations taking account of the spatial mechanics of projection. What is not typically appreciated in considerations of Viola is that before he turned concertedly to video, he worked primarily in music and sound. While at Syracuse, he played drums in a band, took courses in electronic music, familiarizing himself with early synthesizers, and worked with circuitry and tape recorders.¹⁷³ By the time he arrived at New Music in New Hampshire, he seems to have already begun work on sound installations exploring the interactions of vibrations and soundwaves in enclosed spaces. Evidently, Tudor's interest in resonance served to entice Viola to the Chocorua workshop in the first place. The young artist's recollections of his arrival, and his initial encounter with Tudor bear extended quotation, for they provide the clearest picture of exactly how the "Rainforest" workshop began to unfold:

I took a Greyhound bus from Syracuse, having signed up for Tudor's sessions knowing nothing of *Rainforest* other than what I had read in the brochure, something about "exciting" physical objects with sound to discover their resonant frequencies. On the first morning, a group of about 15 of us assembled in a small upstairs room, which had already been set out with tables bearing electronic equipment and some strange objects. . . . [David] demonstrated the basic principle behind *Rainforest* by running a sine tone from an audio oscillator into a metal can using a device called a transducer, which we soon realized acted like the magnetic driver part of a loudspeaker without the surrounding collar. As the oscillator swept the pure tone slowly up through the audible sound spectrum, the object would vibrate and physically rattle, giving off a loud, complex array of sound frequencies, or otherwise fall still and quietly reproduce only the originally pure sound source.¹⁷⁴

¹⁷³ Bill Viola, "An Interview with Bill Viola," by Raymond Bellour, *October* 34 (Autumn 1985): 91–94, <https://doi.org/10.2307/778491>.

¹⁷⁴ Viola, "Delicate Art of Falling," 49.

According to Viola's recollection, Tudor, who had always been a man of very few words, did not take readily to the social dynamic of the workshop, and spoke initially in "halting sentences," avoiding eye contact, and slipping into lengthy periods of silence.¹⁷⁵ Eventually, however, Tudor warmed, and a rapport formed among the group; this happened organically, and partly because of the tactile and intuitive nature of *Rainforest*, which could be taught with spare discussion, and via hands-on demonstration. Viola recalls that as soon as Tudor's students had a grasp of the transduction principle central to *Rainforest*, they began experimenting with transducers themselves, treading out into the hot summer sun to scavenge wooden planks, cookie sheets, barrels and bedsprings. Under Tudor's (sometimes tacit, sometimes explicit) instructions, they settled on individual objects, and set to work exciting them with different sonic input; it was the task of the workshop students to discover which sounds their objects *liked*, and what they best responded to. The act of resonant searching and technological disclosure that had brought Tudor to the *Rainforest* principle in the first place was now the principle behind his workshop, which asked only that the students listen closely for the purr of resonant frequencies and "release" them as effectively as they could.

Fashioning their scavenged objects into considerably larger "instrumental loudspeakers" that demanded their own support and suspension systems, Viola and his fellow workshop participants found themselves magnifying the scale of *Rainforest* considerably, giving the work a spatial, sculptural, and resolutely *embodied* presence that had always been *implicit* in it, but which Tudor had not opted to explore himself (unless one considers *Rainforest*'s early anticipation in the more sizable, remote-controlled constructions of *Bandoneon! [A Combine]*, 1966). Remarks Viola, "David seemed truly delighted to see what was previously a table-top setup designed for road performances with the

¹⁷⁵ Viola, 49.

Merce Cunningham Dance Company expand into a large-scale singing junkyard.”¹⁷⁶ It is thus that Tudor, heeding the intuitions and inclinations of his students, surrendered *Rainforest* to *space*, allowing it to take on a form that invited an entirely new form of embodied participation. Since first beginning his explorations into “live” electronics, Tudor had always sought to construct technological systems that he could set into motion—animate—and watch unfold; at Chocorua, he was orchestrating a similar unfolding, but this time around, he had welcomed human collaborators into the fabric of this process. *Rainforest* was now a fully open system, or ecosystem, that joined embodied listeners and embodied loudspeakers in a richly physical encounter.

For the workshop’s culminating presentation on July 7, 1973, Tudor invited each of his students to contribute an object to an installation scaled to the interior of a barn, and to route sounds to their instrumental loudspeakers for the duration of a five-and-a-half-hour performance titled *Sliding Pitches in the Rainforest in the Field*. [Figure 13] The magnified scale of the piece encouraged a number of changes: for one thing, the installation boasted a structural porosity that invited inhabitation and participation by audience members, who were free to “mill around and explore [the] objects.”¹⁷⁷ No longer confined to the limits of a stage, *Rainforest* was now placed on a level ground with listeners and made continuous with their physical space. Additionally, in order to optimize the sonic presence and effect of this new, expanded *Rainforest*, Tudor employed a system of contact microphones and conventional, surround-sound loud-speakers that picked up the murmurs of each resonating object, and reflected them throughout the space. This alteration served not only to magnify the sculptural and dimensional nature of the piece, but also to knit the instrumental loudspeakers into a newly complex web of feedback effects. Explains Gordon Mumma: “Because the ‘instrumental loudspeakers’ are affected by the sounds of the conventional loudspeakers [in the

¹⁷⁶ Viola, 49.

¹⁷⁷ Rogalsky, “Idea and Community,” 243.

performance space], a recycling phenomenon takes place that makes the entire electronic-acoustic apparatus of *Rainforest* an ecologically balanced sound system.”¹⁷⁸

The version of *Rainforest* inaugurated in Chocorua’s rustic environs owes much to Tudor’s students and their varied disciplinary backgrounds, and the musician’s choice to cede a degree of creative control in the work’s construction should be regarded as a conscious act of creative generosity. This act was not entirely spontaneous; recall that while corresponding with the U.C. Davis Department of Music regarding his 1966–67 residency, Tudor stated that “a project dear to [his] heart would be to coach or train a group of students and/or interested persons in preparing and presenting the. . . performances that I myself have had so much experience with [. .].”¹⁷⁹ And indeed, regarding the Chocorua *Rainforest*, Tudor would make the following telling remark later in life: “Sometimes, when I work on an electronic principle that’s still revealing itself to me, I don’t like to give it out. . . . [But] in [the] last manifestation [of *Rainforest*] I had already decided I was through with that piece. *I was going to give it away.*”¹⁸⁰

But it is also true that by 1973, Tudor was primed for *Rainforest*’s expansion into the spatial surround, and its extension into a newly physical, and inhabitable “sound space.” What was strung up in the barn in July 1973 bore the impress of the Pepsi Pavilion’s “environmental” scale; it echoed the strange, remote-controlled ballet staged in *Bandoneon!*; and it even contained traces of Antonin Artaud’s hallucinatory “theatre of cruelty,” with its “musical instruments” used “as objects, as part of the set,” its “vibratory action” and “visual language of things,” and its “language [manifest] as expressive, dynamic spatial potential.”¹⁸¹ Tudor’s was a forest with a dense and intricate network of

¹⁷⁸ Gordon Mumma, “Live-Electronic Music,” in *The Development and Practice of Electronic Music*, ed. Jon H. Appleton and Ronald C. Perera (Englewood Cliffs, NJ: Prentice-Hall, 1975), 297.

¹⁷⁹ Correspondence regarding University of California, Davis, appointment, 1965–66, Tudor Papers.

¹⁸⁰ David Tudor, “Presenting David Tudor,” interview by Bruce Duffie, April 7, 1986, accessed February 26, 2022, <http://www.bruceduffie.com/tudor3.html> (my emphasis).

¹⁸¹ Antonin Artaud, “The Theatre and Its Double,” *Antonin Artaud: Collected Works*, trans. Victor Corti, vol. 4 (London: John Calder, 1999 [1964]), 73, 68.

roots, and while it had succeeded in modeling a striking new form of sonic embodiment, it was not done growing yet.

◆ O ◆

For all their differences—most notably, their inverse relationship with technology—Olivero's *Pep-Psi* (1970) and *A-OK* (1969) had one thing in common: an underlying current of meditative calm. With their plays of ambient lighting, their emphasis on gradual shifts in sound, and their drone-like treatment of tonality, both works aspired towards a sense of wholeness, continuity, and sonic refuge. “The effect will be an electronic mantra *without beginning or ending*,” Oliveros wrote of *Pep-Psi*.¹⁸² The delicate touch and nearly therapeutic character of these pieces registered a change in Oliveros's thinking which, while in development for several years, reached a point of culmination circa 1970.

Since arriving at UCSD in Fall 1967, Oliveros had found a new stability in university life, and a renewed sense of fulfillment in teaching. While courses like “Audio Circuitry for Musicians” and “Electronics in Music” afforded her opportunity to pass on her knowledge of tape-delay systems and Buchla boxes, accrued over so many years at the San Francisco Tape Music Center and the Mills College Tape Center, “The Nature of Music,” a class oriented towards the “general student,” gave her the chance to simply “get people to listen, compose, and perform,” regardless of working skill level.¹⁸³ Under Oliveros's guidance, students in the “The Nature of Music” dabbled in group improvisation, graphic notation, and tape composition, among other activities, coming to appreciate experimental music as an approachable, not restrictive or rarefied, field.¹⁸⁴ And this was no one-way exchange: Oliveros's course documents reveal that her classes functioned as laboratories for her own creative exploration, and in more than one place, one can find glints and fragments of future

¹⁸² *Electronic Mantra* (1970) notes and diagrams, Oliveros Papers (my emphasis).

¹⁸³ Pauline Oliveros “Interview with Pauline Oliveros,” by Beth Anderson, *Ear Magazine*, March 1981, 12–13.

¹⁸⁴ Oliveros, interview by Anderson, 12–13.

compositions scattered about the margins of her lecture notes. As we will soon see, the classroom thematic of accessibility and participation so central to her teaching exerted a crucial influence on the direction of her practice in the late Sixties and early Seventies.

Just as Oliveros was drawing inspiration from her students, however, she was also finding campus unrest and inescapable violence all around her. Speaking to art critic Moira Roth in 1977, she offered a vivid recollection of the moment:

I came to UCSD in 1967 and the Vietnam War protests and atrocities were at their height. A student at UCSD sat in the plaza, poured kerosene on himself and burned himself to death. Then, I was watching my television set when Robert Kennedy was assassinated. I had been asleep, just before it happened I woke up and saw it. I felt the temper of the times. I felt the tremendous fear and—what can I say—the opposite of calm. Everybody was in an uproar and I began to feel a tremendous need to find a way to calm myself. The pressures were too great. The social events were simply mirrors of what was inside. I began to retreat. I didn't want to play concerts. I began to turn inward.¹⁸⁵

In the mid Sixties, when met with the roiling currents of Berkeley's Free Speech Movement, Oliveros had answered to outside turmoil with pointed politics and elaborate theatics; now, half a decade later, her most immediate response to sociopolitical unrest was naked horror. Fortunately, what Oliveros ungenerously describes as her “retreat” did not represent a retreat from music altogether—far from it. As we will see, Oliveros's inward turn at UCSD inspired a period of fierce focus and productivity and helped push her towards a groundbreaking new model of practice. Nor did Oliveros's desperate reach for calm represent a turn away from her usual stable of concerns; if anything, the chaos of the late Sixties encouraged her to further follow the resonances that had inspired works like *In Memoriam Nikola Tesla, Cosmic Engineer* (1969) and her Expo '70 contributions, and led her, bit by bit, towards the listening and sounding body. “I had already been very interested in listening to long tones and listening to the environment,” Oliveros remarked to Roth of this time, “but I began to see these interests in a more extended way.”¹⁸⁶

¹⁸⁵ Pauline Oliveros “An Interview with Pauline Oliveros,” by Moira Roth, *New Performance* 1–2 (1977): 49.

¹⁸⁶ Oliveros, interview by Roth, 49.

Earlier in the Sixties, Oliveros had returned again and again to concerns around participation and listening, which, since *Pieces of Eight* (1965), she had addressed in the context of public performances held in more-or-less traditional venues. What Oliveros largely grappled with in her “theater pieces” was rigid concert convention, and the very structure of live musical presentation, which rested fundamentally on a legible separation between performers and audience members, and an array of engrained expectations concerning dress, etiquette, and the like. Now, because she “didn’t want to play concerts” anyway, Oliveros found that she no longer needed to worry about the mechanics of concert-hall presentation. Setting aside concerns around the nature of public performance, Oliveros began to consider her practice in newly theoretical terms. Where before she had tried to unmake and remake the nature of *live* music (electronic or otherwise), she now set about unmaking and remaking the nature of music.

Oliveros’s changing thought was guided by a growing interest in what biographer Heidi von Gundun broadly terms “consciousness.” To “consciousness” we might add “attention” and “awareness.”¹⁸⁷ While Oliveros, opting never to submit to any single belief system, was intellectually omnivorous at this time, many of her curiosities followed the broader contours of the Human Potential Movement (HPM), the psychotherapeutic embrace of countercultural ideals and Eastern philosophy headquartered at retreats and “growth centers” like Esalen, in Big Sur, CA.¹⁸⁸ Taken together with Oliveros’s references to (and compositional use of) of telepathy, the sly reference to “psi phenomena,” or extrasensory perception lodged in the title of *Pep-Psi* would suggest that she opened herself to even the more fringe beliefs associated with the HPM and its offshoots.

¹⁸⁷ Von Gundun, *Music of Pauline Oliveros*, 87–89.

¹⁸⁸ Elizabeth Puttick, “Human Potential Movement,” in *Encyclopedia of New Religious Movements*, ed. Peter B. Clarke (New York: Routledge, 2006), 286–288. Oliveros makes reference to the Human Potential Movement in Oliveros, interview by Anderson, 13.

Arguably, this expanding philosophical cosmos found its earliest expression in Oliveros's practice in the form of the *mandala* (Sanskrit for "circle"), which crept into her performances as a structuring agent or object of meditation as early as 1970. According to Von Gunden, Oliveros likely learned of the ritual symbol from the work of Carl Jung, who wrote of it as an archetypal image called upon, across cultures, to "defend[the] psychic totality against outside influences and . . . unite the inner opposites."¹⁸⁹ The disposition of performers and audience members in *A-OK* quite clearly reflects Oliveros's embrace of the mandala form.

Another consequence of Oliveros's "inward turn" and "consciousness studies" was her renewed focus on the accordion, which, increasingly, she used to play long, droning tones that she could sing along with. "It began to relax me," she recalls.¹⁹⁰ (Notably, such accordion drones feature in both *Pep-Psi* and *A-OK*). At around the same time that she began droning, Oliveros met a T'ai Chi instructor named Chungliang "Al" Huang (1937–), who was teaching dance at Long Beach City State College, and leading T'ai Chi sessions in Rancho Santa Fe.¹⁹¹ As Von Gunden recounts, Oliveros found that her new focus on drones meshed comfortably with the "slowly moving body patterns" of T'ai Chi, and she began improvising along with Huang's classes, working to integrate the breathwork of T'ai Chi into her approach to the accordion.¹⁹²

Oliveros's relationship with Huang encouraged her to delve further into an exploration of the body, and after deciding that she wanted to learn karate, she became acquainted with the

¹⁸⁹ Von Gunden, *Music of Pauline Oliveros*, 93–95; C. G. Jung, "Flying Saucers: A Modern Myth of Things Seen in the Skies" (1958), in *The Collected Works of C.G. Jung, Volume 10: Civilization in Transition*, ed. Gerhard Adler, trans. R.F.C. Hull, 2nd ed., Bollingen Series 20, 307–436 (Princeton, NJ: Princeton University Press, 1970), 325–327.

¹⁹⁰ Oliveros, interview by Roth, 49.

¹⁹¹ Von Gunden, *Music of Pauline Oliveros*, 87–89. Circa 1970, Al Huang had a growing national presence, in part because of his unusual career trajectory: born in China during World War II, he came to America as a teenager and studied architecture at the University of California at Los Angeles before pivoting to modern dance. In 1966, he used a Ford Foundation grant to study T'ai Chi in Taiwan and proselytized the practice in the United States upon his return, publishing a popular book on the practice with a foreword from Alan Watts. See, e.g., Michael Robertson, "What T'ai Chi Is Doing for Dance," *The New York Times*, September 21, 1980, 8.

¹⁹² Roth, "Interview with Oliveros," 49.

implausible character of Lester Ingber (1941–), a karate instructor who, after study at the Niels Bohr Institute, had received his PhD in theoretical nuclear physics from UC San Diego in 1966.¹⁹³ A consultant at the RAND Corporation from 1965–66 who, in the late Sixties, had published papers in “atomic, nuclear, astro-, and elementary particle physics” Ingber subsequently turned his attention to the discipline of karate, exploring its links to the mechanisms of consciousness, and attempting to connect its teaching philosophy to educational institutions.

Ingber’s complexly intellectual and spiritual practice—documented in such publications as *Karate Kinematics and Dynamics* (1981)—helped to sharpen Oliveros’s interest in the mechanics of attention.¹⁹⁴ While Oliveros had always been interested in attention—the “telepathic improvisation” in *Aeolian Partitions* (1969) is nothing if not an exercise in attentive listening—Ingber’s writings and teachings gave her a new vocabulary with which to articulate these concerns. In a diaristic, somewhat stream-of-consciousness essay for the journal *Numus West* published in 1973, Oliveros reflected on one of her many meetings with Ingber, and the sort of questions it left her asking:

Lester Ingber (Karate Master and Theoretical Physicist) pointed out yesterday morning that in order to examine a minute lapse in attention, that the probe, attention, must focus to a smaller point than the lapse in attention. . . . In order to take in a large area, one must learn to de-focus the eyes. . . . What is the reaction time, I wonder, between focus and de-focus? The range? From micro-vision to macro-vision? From external to internal? Can one observe the switching function from external to internal? How about de-focusing the ears? How fine is the focus needed to comprehend intelligence or information? How to listen to music as a whole, time becoming space?¹⁹⁵

These ideas—regarding attention, focus, and the circulation of “information” between a subject and their environment—were not merely points of passive rumination for Oliveros. These new concerns encouraged her to understand waking consciousness and perception—and by extension, the act of listening—as finely structured activities open to dissection and renovation. Turning “inward,” towards “consciousness,” Oliveros found an expansive and intricate interiority

¹⁹³ Lester Ingber, undated curriculum vitae, Box 13, Folder 19, Oliveros Papers NYPL.

¹⁹⁴ Von Gundten, *Music of Pauline Oliveros*, 91–92.

¹⁹⁵ Oliveros, “Many Strands” (1973), in *Software for People*, 86.

that she could “compose” and reconfigure as if were another one of her masterful tape-delay systems. Circa 1968–1969, Oliveros had not yet found a consistent notational and conceptual language with which to communicate her attention- and perception-focused thinking; however, in a December 1968 letter to Tudor, she provided a glimpse of what was to come. “Enclosed my new do it yourself music,” she wrote, her invocation of “DIY” cheekily capturing her newly inner-directed practice.¹⁹⁶ The “music” enclosed consisted of two “movements” numbered with Roman numerals, one of which read, simply:

II

Search for vibrating objects.¹⁹⁷

While only a germinal articulation of her *Sonic Meditations* (1971–73), this “do-it-yourself music,” which interestingly recalls La Monte Young and George Brecht’s “event scores” in its cryptic, one-line structure, finds Oliveros taking an important step: carving away the theatrical trappings, thematic programs, and technological accessories crowding works like *In Memoriam Nikola Tesla, Cosmic Engineer*. In exchange, it extracts the lone act of exploratory search (for resonance, sure enough), and presents it as a kind of music. Neither an instrument nor a stage is necessary for its “performance” and appreciation. Certainly, Tudor, surrounded by the “vibrating objects” of *Rainforest*’s 1968 Cunningham iteration, could have performed Oliveros’s work with ease.

Ultimately, it was in the close company of women that Oliveros brought her new thinking to fruition in 1970–71. At least since *Pieces of Eight*, which, if we are to believe Tape Center regular Stuart Dempster, leveraged the proxy figure of Ludwig van Beethoven in a critique of entrenched musical chauvinism, Oliveros had written compositions that probed incisively at issues of gender, and in particular, the underrepresentation of women in music. Naturally, these were concerns that

¹⁹⁶ Pauline Oliveros to David Tudor, December 18, 1969, Box 11, Folder 9, Tudor Papers.

¹⁹⁷ Oliveros to Tudor, December 18, 1969, Tudor Papers.

Oliveros felt acutely: not only had she herself battled through a string of patronizing, infantilizing male teachers while fighting for visibility in Houston and in San Francisco, but she had also grown up watching her mother and grandmother work valiantly to support her with money from their own musical practices.

And since a very early age, Oliveros's consciousness of gender identity had only been sharpened and nuanced by her closely coupled concerns around her sexuality. Perhaps it was Oliveros's presence on a college campus circa 1970 that inspired a renewed focus on these issues; perhaps it was the climbing volume of the women's liberation movement. In 1995, Oliveros would recall that she was closely in tune with Jill Johnston's writing in the *Village Voice*, and the work of Gloria Steinem, Rita Mae Brown, Adrienne Rich, and Susan Sontag.¹⁹⁸ (Johnston was indeed among Oliveros's long-distance friends and correspondents around 1970). Oliveros opted, at this time, to assemble an informal performance circle of female colleagues, and out of this network came the first of the *Sonic Meditations*.

As Oliveros tells it, the group of ten women that she eventually dubbed the Women's Ensemble—or, more often, the ♀ Ensemble—arose out of her efforts to develop a support system for female musicians, and particularly graduate students, who had been “less visible around the university community.”¹⁹⁹ As Martha Mockus has keenly observed, there are clear resonances between the ♀ Ensemble with the “consciousness-raising” (CR) groups that provided second-wave feminist activists with spaces to share experiences, examine female stereotypes, and “discover the socially conditioned and automatic roles” forced upon women.²⁰⁰ The initial strands of the ♀ Ensemble coalesced around T'ai Chi teacher Al Huang's workshop, to which Oliveros invited other

¹⁹⁸ Pauline Oliveros and Fred Maus, “A Conversation about Feminism and Music,” *Perspectives of New Music* 32, no. 2 (Summer 1994): 188, <https://doi.org/10.2307/833606>.

¹⁹⁹ Oliveros, interview with Anderson, 12–13.

²⁰⁰ Mockus, *Sounding Out*, 49–51. Clydene Ross-Valliere and Bonnie Moore Randolph, “Consciousness Raising Groups,” *The American Journal of Nursing* 79, no. 5 (May 1979): 922, <https://doi.org/10.2307/3462300>.

musicians keen to improvise, and after a time, Oliveros began inviting a growing circle of female associates to her house for weekly meetings. [Figure 14] Significantly, some of the women were musicians, and some were not; this diversity of skill levels would prove important for Oliveros.

At her weekly meetings with the Ensemble, which lasted two-to-three hours, and which were non-verbal for select stretches of time, Oliveros and her group dabbled in various forms of breathwork, massage, and body work, drawing on practices borrowed from Al Huang, Lester Ingber, and dancer and kinesiologist Elaine Summers (1925–2014), a figure of growing importance to Oliveros.²⁰¹ Oliveros’s recollections suggest that she did not, at first, regard the Ensemble’s activities as “meditations.” Notably, as Oliveros related to Moira Roth in 1977, she had done “some meditative work” by 1970–71, having composed mandala-structured musical rituals like *Meditation on the Points of the Compass* (1970), an “inter-religious, multi-lingual choral composition” that begins with a candle-lighting ceremony and a moment of collective silence.²⁰² While Oliveros concedes that such work (among which we might count *Pep-Psi* and *A-OK*) had a “meditative feel” she places it on the other side of the practical and theoretical rupture represented by the *Sonic Meditations*.

That shift came at some point in 1971, when Oliveros “articulated [an exercise] for the group based on breath.”²⁰³ “Every sound that comes out of an instrument or voice,” Oliveros has explained, “comes with the breath.”²⁰⁴ Recognizing singing’s derivation from breath, an involuntary action, Oliveros wondered whether she could lead her Ensemble towards a type of involuntary *singing* by simply asking them to make their breath audible; the resulting sounds, bearing no trace of intention or conscious imposition, would be rooted solely in the resonant modes of the vocal cords. Oliveros found the exercise highly effective, and after cycling through several variations on this

²⁰¹ Mockus, *Sounding out*, 41–45.

²⁰² Oliveros, interview by Roth, 49; Von Gunden, *Music of Oliveros*, 95–97.

²⁰³ Oliveros, interview by Roth, 49.

²⁰⁴ Oliveros, interview by Roth, 49.

activity, she realized that what she was making was a new kind of music. Rejecting the notion that her exercises constituted “compositions,” she called them “meditations.”

Oliveros has discussed this critical transition as a shift from production of “objects” to a kind of emergent creation distributed between bodies: “instead of making objects (music to be looked at and appreciated in certain ways), [I] was going toward making group work where everyone’s part was contributing to a whole piece.”²⁰⁵ Between March and November of 1971, Oliveros and her ♀ Ensemble developed eleven *Sonic Meditations*, and initially, these were all transmitted orally. (In this respect, among others, they fulfill the project of “orality” begun with *Pieces of Eight* and *A Theater Piece*, 1966). These first eleven *Meditations* branch out in several generative directions, with each exercise locating itself within Oliveros’s fourfold division between “actually making sounds,” “actively imagining sounds,” “listening to present sounds,” and “remembering sounds.”²⁰⁶ The breathing meditation described above naturally became *Meditation I*, and eventually earned the title “Teach Yourself to Fly.”²⁰⁷

In its final form, *Meditation I* uses a delicate play of language to underscore the involuntary nature of the sounds desired from performers: “Allow your breathing to become audible,” it reads, avoiding any suggestion of sounds *made* or *produced*.²⁰⁸ Other *Meditations* rely upon more willful actions and activities: *Meditation V*, titled “Native,” instructs: “Take a walk at night. Walk so silently that the bottoms of your feet become ears.”²⁰⁹ *Meditation VI* (“Sonic Rorschach”) one of the few *Meditations* to call explicitly for the use of a technological accessory, asks performers to “flood a darkened room with white noise for thirty minutes or much longer” (and later introduce a “brilliant

²⁰⁵ Oliveros, interview by Roth, 49.

²⁰⁶ Pauline Oliveros, “Introduction II,” in *Sonic Meditations* (Baltimore, MD: Smith Publications, 1974), n.p.

²⁰⁷ Pauline Oliveros, “I – Teach Yourself to Fly,” in *Sonic Meditations*, n.p.

²⁰⁸ Oliveros, “I – Teach Yourself to Fly,” n.p. (my emphasis).

²⁰⁹ Pauline Oliveros, “V – Native,” in *Sonic Meditations*, n.p.

flash of light").²¹⁰ Notably, one of several listed “variations” on “Sonic Rorschach” permits the use of a “natural source of white noise,” such as a waterfall.²¹¹

While the *Meditations* were generally designed for group performance, certain of the exercises (for example, *Meditation V*, “Native”) are theoretically suitable for solo execution. Oliveros makes no strict demands concerning performance locales (only broad suggestions in select cases), and none of the works demand specific musical knowledge. In these respects, the *Sonic Meditations* are highly adaptable between contexts, and open to use by virtually anyone. Upon publishing all twenty-five of her *Meditations* in 1974, Oliveros placed special emphasis upon the participatory ideal underlying the works, indicating that she regarded them as sufficiently accommodating to wholly erase the distinction between performers and audience members that she had been problematizing for years. Her curiously third-person introduction to the *Sonic Meditations* publication bears longer quotation, so immense are the implications at play:

Pauline Oliveros has abandoned composition/performance practice as it is usually established today for Sonic Explorations which include everyone who wants to participate. She attempts to erase the subject/object or performer/audience relationship by returning to ancient forms which preclude spectators. She is interested in communication among all forms of life, through Sonic Energy. She is especially interested in the healing power of Sonic Energy and its transmission within groups. [. . .]

Because of the special procedures involved, most all of the meditations are available to anyone who wishes to participate regardless, or in spite, of musical training. All that is required is a willing commitment to the given conditions. Sound making during the meditations is primarily vocal, sometimes hand clapping or other body sounds, sometimes using sound producing objects and instruments.²¹²

Oliveros’s caveat regarding “willing commitment” is significant, for despite their *technical* universality, many of the *Sonic Meditations* are apt to present challenges for first-time performers, and thus require a degree of training and honing. For every *Meditation* like “Teach Yourself to Fly,” which asks for nothing but the passive sounding of one’s vocal cords, there is a *Meditation* like

²¹⁰ Pauline Oliveros, “VI – Sonic Rorschach,” in *Sonic Meditations*, n.p.

²¹¹ Oliveros, “VI – Sonic Rorschach,” n.p.

²¹² Oliveros, “Introduction II,” n.p.

“Pacific Tell” (*Meditation III*), which, reviving the telepathic communication underlying *Aeolian Partitions*, asks participating performers to send and receive “sound images,” and assumes that all involved are capable of “becoming mentally blank” in preparation for mind-to-mind transmission.²¹³ Nevertheless, the structural intervention at the heart of the *Sonic Meditations*, which employ the adaptable and repeatable structure of the score (stipulated orally or written down), but excise everything musical from that loose armature, is of immense consequence.

The most provocative dimension of the *Meditations*, which, with sparing exceptions, require use of nothing but the voice or limbs, is their nomination of the body as a self-sufficient instrument. Indeed, as activated by the *Meditations*, the body becomes both a *means* of performance and the locus of that performance’s unfolding. The body, in no small sense, becomes the “work.” This observation, which has been made by numerous historical commentators, is generally accurate; and yet it provides only a partial picture of the *Meditations*, risking conceptual reduction, and occluding a very significant vein of Oliveros’s thought. To speak of these works as a culminating exit from media experimentation and an arrival on a plane of naked naturalism is to diminish Oliveros’s complex electronic imaginary while also simplifying her practice, sanding off its generative tensions.

We can reclaim this texture, and more comfortably situate the *Meditations* in our longer narrative, by inquiring after exactly what *type* of body Oliveros addressed; for closer investigation reveals a techno-logical subject lodged deep within their fabric. Quite surprisingly given the historical significance and scholarly attention ascribed to the *Meditations*, no existing analyses of these works address this aspect of the embodiment they serve to model. One suspects that the central problem is this: while nearly all relevant commentators have discussed the roots of the *Meditations* in Oliveros’s ♀ Ensemble, which provides a convenient narrative frame for the standard interpretation of the works, only eleven of the twenty-five total *Meditations* derived from this context. The

²¹³ Oliveros, “III – Pacific Tell,” in *Sonic Meditations*, n.p.

remaining fourteen were authored not in 1971, but nearly two years later in Winter 1973, in connection with a research initiative—“Meditation Project”—organized by Oliveros and funded by the Rockefeller Foundation.²¹⁴

Oliveros’s “Meditation Project” came about thus: beginning in the late Sixties, Will Ogdon, the chairman of UCSD’s music department, began laying out plans for a musical Research Center that would exist separately from the music department, operate “free of academic goals,” and provide “technical studios, [a] performance space, documentary capability and resident experts.”²¹⁵ Noting that one of the original intentions for the Center was to place knowledgeable engineers in communication with technology-curious musicians, Oliveros remarked that the projected institution

²¹⁴ According to Oliveros’s own conflicting recollections, either eleven or twelve *Meditations* were composed in 1971, and it is difficult to secure confirmation one way or the other. In one “Career Narrative” likely drafted in late 1972, Oliveros writes, “[O]ver the last two years I composed XII Sonic Meditations.” She continues, looking ahead to the “Meditation Project”: “In January 1973 I will begin my three month tenure as Faculty Fellow in Project for Music Experiment which is funded by the Rockefeller Foundation. . . . I propose to continue my exploration of *Sonic Meditations*.” “Career Narrative: 1957–1972,” in file labeled “Curriculum Vitae,” ca. 1972, Box 29, Folders 11–12, Oliveros Papers. However, in a summary of “Professional Activities” drafted in 1974, she dates *Sonic Meditations XII–XXV* to Winter 1973 (January–February). “Professional Activities 1974,” in file labeled “Curriculum Vitae,” Oliveros Papers. There is ample reason to count *Meditation XII* (“One Word”) as part of the “second batch” of *Meditations*, regardless of its date of authorship: when, in 1971, Oliveros published the *Meditations* in the experimental music periodical *Source: Music of the Avant-Garde* (or *Source Magazine*), she included only eleven *Meditations*. More significantly, when Oliveros published all twenty-five *Meditations* in 1974, she drew a sectional division between *Meditations I–XI* and *Meditations XII–XXV*. In a 1976 issue of *The Painted Bride Quarterly*, Oliveros published the second batch of *Meditations* in isolation, beginning with *Meditation XII*, and ending with *Meditation XXV*. See Pauline Oliveros, “On Sonic Meditation,” *The Painted Bride Quarterly* 3, no. 1 (Winter 1976): 54–68. What is clear, and what is more decisive for the present account, is that the second batch of *Meditations* derived largely from Oliveros’s “Meditation Project.” In a summary of her research initiative written in Fall 1973, Oliveros states that her *Sonic Meditation XIII* (“Energy Changes”) “was composed for the occasion” of a collaboration with dancer Elaine Summers, and states further that “some of [her] observations” during the “biofeedback training” component of “Meditation Project” (discussed in the present chapter) “led directly to successful meditation training exercises and new *Sonic Meditations*.” See Oliveros, “Meditation Project: A Report,” (1973) in *Software for People*, 159, 163. And in her 1976 article for *The Painted Bride Quarterly*, Oliveros introduced *Meditations XII–XXV* by writing that, “In the winter of 1973, a research fellowship in the Project for Music Experiment [was funded]. . . . As a result of this work, the following new meditations were articulated and composed.” Heidi Von Gunden has cited the consequential role of the “Meditation Project” in the production of the 1973 *Meditations*, noting that “the research was an impetus for Oliveros to compose *Meditations XII to XXV*.” Few accounts explicitly register the fact that Oliveros’s *Meditations* were composed at two different times and in two different contexts, and some commentators are content to date all the works to 1971. See, e.g., Thomas Porcello and Justin Patch, *Re-Making Sound: An Experiential Approach to Sound Studies* (New York: Bloomsbury Academic, 2022), 160. Other accounts date the *Meditations* in observance of their years of publication; For example, John Kapusta has recently described them as “a 1971 set of eleven instruction-based works (expanded to twenty-five in 1974).” John Kapusta, “Pauline Oliveros, Somatics, and the New Musicology,” *The Journal of Musicology* 38, no 1 (2021): 3. While this dating is wholly sound, I have chosen to date the *Meditations* to 1971–1973, and thus to emphasize the direct link between *Meditations XII–XXV* and Oliveros’s Winter 1973 “Meditation Project.”

²¹⁵ Oliveros, “On the Need for Research Facilities for New Music and the Related Arts” (1979), in *Software for People*, 198.

“embodied many of the old Tape Center ideals.”²¹⁶ In 1972, buoyed by a \$400,000 grant from the Rockefeller Foundation, and further funds from the Ford Foundation, the Project for Music Experiment (later to become the Center for Music Experiment) launched under the directorship of Roger Reynolds, taking up roost in a former marine camp bowling alley.

Over the course of the Seventies, the PME/CME would become a key site of experimentation and exploration for Oliveros.²¹⁷ More immediately, between January and March of 1973, it provided her with a venue for her elaborately conceived “Meditation Project,” which was intended to further her development of the *Sonic Meditations* and offer a forum for the wider exploration of “mental and physical exercises in concentration (or attention) and awareness, in their relationship to the techniques of rehearsal and performance of music.”²¹⁸ Entailing exercises practiced for two hours daily, and demanding regular attendance from its participants (musicians and non-musicians), the “Meditation Project” involved several of the contacts Oliveros had made while at UCSD, including dancer Elaine Summers, who taught a “Body Awareness” workshop, instructor Al Huang, who taught T’ai Chi and calligraphy, and a Dr. Ronald Lane of Muir Counseling service, who acted as the project’s “consulting psychologist.” While Summers worked to sensitize project participants to the idiosyncrasies of their bodies, organizing exercises involving self-massage, the massaging of a partner, and the identification of conscious and unconscious tensions, Lane gathered data on the changing psychological profiles of individual participants, distributing detailed questionnaires concerning emotions and the precise content of dreams.²¹⁹

Most relevant to the present account, Oliveros’s “Meditation Project” drew extensively on biofeedback studies carried out with the help of graduate student Bruce Rittenbach in an EEG

²¹⁶ Oliveros, “On the Need for Research Facilities,” 198.

²¹⁷ Oliveros, 198.

²¹⁸ Oliveros, “Meditation Project: A Report,” 158.

²¹⁹ Oliveros, 158–164.

laboratory at UCSD's medical school. It is not known exactly what, or who, first motivated Oliveros to integrate biofeedback, and the study of alpha-wave production, into the "Meditation Project."²²⁰ One could posit that Oliveros drew influence from Lucier's work with alpha production in *Music for Solo Performer* (1965), of which she had firsthand experience, and it is also worth recalling the musician's exploration of heartbeat regulation in *Valentine for SAG* (1968). But it is most significant to note that by 1973, Oliveros was more than familiar with the growing body of biofeedback and self-regulation texts rushing into the HPM's broader discursive currents.²²¹ A bibliography of texts distributed to "Meditation Project" participants offers an especially clear sense of how Oliveros's intellectual cosmos might have grown between 1970 and 1973. One finds, variously, The Tibetan Book of the Dead, Aldous Huxley's countercultural touchstone *The Doors of Perception* (1954), and Carlos Castaneda's *The Teachings of Don Juan* (1968), but also *Biofeedback* (1972) by Lewis M. Andrews and Marvin Karlins, the edited volume *Biofeedback and Self-Control* (1973), and Gay Gaer Luce's *Biological Rhythms in Psychiatry and Medicine* (1970).²²¹

The name of Robert Ornstein (1942–2018)—circa 1973, a Stanford psychology professor, and former researcher at UCLA's Langley Porter Psychiatric—appears twice on Oliveros's bibliography. While mentioned less in connection to Oliveros than, for example, Al Huang and Lester Ingber, Ornstein was a crucial touchstone for the musician in the late Sixties and early Seventies.²²² A widely celebrated author of approachable psychological studies who praised the benefits of Yoga, Sufism, and Zen Meditation while understanding the human as a "computer-like" information-processor, and impugned the "inaccessibility, difficulty, and. . .elitist 'professionalism' encrust[ing] traditional psychologies" while also castigating the HPM's "sexual athletics, investment

²²⁰ Helmreich, "Potential Energy," S145.

²²¹ "Meditation Project" bibliography, ca. Winter 1973, Box 11, Folder 5, Oliveros Papers.

²²² Von Gundten has discussed Oliveros's discovery of Ornstein's work; see Von Gundten, *Music of Oliveros*, 90–92.

schemes, parties [and] incomprehensible doctrines,” Ornstein practiced a grounded yet open approach to the plural “psychologies” of early Seventies.²²³

Invested precisely in braiding together the “esoteric” and the modern, mysticism and technology, his writing seems to strive for a reconciliation of what Theodor Roszak, in *The Making of a Counterculture* (1969), variously described as the “objective consciousness” of the “technocracy,” and the visionary experiences and “sacramental presences” to which the “shaman and the artist” afford us access.²²⁴ Oliveros would have been primed to embrace Ornstein’s writing, which she evidently sought out after he came to San Diego to lecture.²²⁵ While I have, in this section, paid much attention to the fuzzier edges of Oliveros’s thought around 1970—the Jungs and the Castanedas, the extrasensory and the parapsychological—it is just as necessary to call attention to the other regions of her philosophy, still defined by a belief in technology’s redemptive potential. Recall, for a moment, how Oliveros got here: as a leading member of the San Francisco Tape Center (and a director of its Mills successor), Oliveros charted a path through the countercultural moment marked by an unyielding belief in the power of electronic media to transform music and the self. In the mid Sixties, as FSM activists were marching across college campuses with computer punch-cards strung around their neck, she was deploying tape-delay as a “technology of consciousness.”²²⁶

After her encounter with “live-programming” at the Pepsi Pavilion, Oliveros would have been especially keen to put Ornstein’s writings on sensory “retuning,” and the modification of the nervous system’s “program,” into direct practice.²²⁷ The extended reflections on biofeedback in Ornstein’s *On the Psychology of Meditation* (1972, co-authored with psychiatrist Claudio Naranjo),

²²³ Claudio Naranjo and Robert E. Ornstein, *On the Psychology of Meditation*, (New York: The Viking Press, [1971] 1974), 176; Robert E. Ornstein, *The Psychology of Consciousness*, 2nd revised ed. (New York: Penguin Books, [1972] 1986), 182–187.

²²⁴ Theodore Roszak, *The Making of a Counter Culture* (Garden City, NY: Anchor Books, 1969), 205–238, 258–264.

²²⁵ Von Gundun, *Music of Oliveros*, 90–92.

²²⁶ Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2008), 234.

²²⁷ Naranjo and Ornstein, *Psychology of Meditation*, 176.

included on the “Meditation Project” bibliography, may have provided Oliveros with a particularly valuable cue as she set about expanding the scope of the *Meditations*:

Once we decide that it seems desirable to alter a certain process in humans, we can attempt to bring this dimension into awareness through *amplification*. . . . One could build a machine to detect the alpha rhythm and to signal us when we produce it. Such a machine would bring the faint signal (the alpha rhythm) into awareness through a circuitous route. The faint signal would be detected on the top of the skull; the amplified and filtered signal could be converted into a tone, which could then bring the information into awareness. . . . [S]ince alpha is associated with progress in meditation, this may be a way of receiving information about one of the physiological changes brought about by meditation.²²⁸

Ultimately, while hampered by “bureaucratic delays,” which pushed back biofeedback training until the fifth week of Oliveros’s project, these experiments figured significantly in the research initiative. In the project’s most basic application of biofeedback, Rittenbach took “before-and-after” EEG measurements of each participant, paying particular attention to alpha-wave production. “Alpha,” Oliveros would note, echoing Ornstein, “is a correlate of the meditative state.”²²⁹ Rittenbach additionally secured equipment from Alpha Metrics and set up a biofeedback “training laboratory” in which subjects could monitor their brainwaves using headphones and learn to “emulate meditative states” (i.e., achieve significant alpha-wave production). Finally, Oliveros, Lester Ingber, Rittenbach, and Lin Barron (Oliveros’s then-partner) met three times a week to undergo biofeedback training. According to Oliveros, the group “used respiration to control the pitch of an oscillator, and the amplitude of alpha brain waves to trigger the oscillator on and off.”²³⁰ Electrodes were also placed on different regions of the scalp corresponding to “known functions” (e.g., auditory and visual activity), and mental states were monitored in relation to auditory feedback.²³¹ Hundreds of pages of EEG readouts contained in Oliveros’s papers are a testament to the assiduousness with which the studies were carried out. **[Figure 15]**

²²⁸ Naranjo and Ornstein, 221–222 (my emphasis).

²²⁹ Oliveros, “Meditation Project: A Report,” 160.

²³⁰ Oliveros, 163.

²³¹ Oliveros, 163.

Oliveros has stated that these biofeedback experiments bore significantly on the development of new training exercises, and generated new *Sonic Meditations*, and while none of the *Meditations* that emerged from the “Meditation Experiment” (*Meditations XII–XXV*) call for the use of biofeedback *equipment*, several bear the obvious impress of Oliveros’s experience with this technology. *Meditation XIII* (“Energy Changes”) asks performers to assume the disposition called for in *Valentine for SAG* without the aid of amplification equipment or a card table, instructing: “Establish contact mentally with all of the continuous external sounds and include all of your own continuous internal sounds, such as blood pressure, heart beat [*sic*] and nervous system.”²³² Meanwhile, *Meditation XV* (“Zina’s Circle”) places performers in a circle and designates one subject as a “transmitter,” instructing them to “star[t] a pulse that travels around the circle” by squeezing the hand of the performer next to them. “The squeeze should be quickly and sharply made,” Oliveros states, “to resemble a light jolt of electricity.”²³³

One of the most peculiar *Meditations* of the 1973 batch is “Pure Noise” (*Meditation XXIII*), which, in a seeming callback to the premise of *Sound Patterns* (1961–62), instructs performers to emulate “the purest tone possible” (as if they were human oscillators) before introducing “more and more partials,” and eventually sounding out a “noise band.”²³⁴ It is significant that Oliveros would choose, in one of her final *Sonic Meditations*, to return to the analogical play of *Sound Patterns*, for that work, as analyzed in Chapter 2, struck a decidedly ambivalent pose with respect to technology. In “Pure Noise,” however, there is no such ambivalence—only a suggestion of technology swallowed into the the flesh-and-blood body and mined for its affordances.

Understood in this way, and considered in the context of the “Meditation Project” and its alpha experiments, the *Sonic Meditations*—particularly those written in 1973—do not suggest an end

²³² Oliveros, “XIII – Energy Changes,” in *Sonic Meditations*, n.p.

²³³ Oliveros, “XV – Zina’s Circle,” in *Sonic Meditations*, n.p.

²³⁴ Oliveros, “XXIII – Pure Noise,” in *Sonic Meditations*, n.p.

to Oliveros's relationship with technology, or an unproblematic rejection of media in favor of a "nature" (human or otherwise) unsullied by the electronic. Rather, they suggest that in biofeedback, and in the notion of the listener as a self-regulating system seeking after an "amplified" awareness (Ornstein), Oliveros discovered a model of embodiment capable, at least provisionally, of transcending the movement of the "relay" that had structured her relationship with technology for so long—indeed, since she placed a reel-to-reel recorder in the window of her San Francisco apartment. This embrace of this avowedly hybrid body did not amount to Oliveros's exit from the "endless loops," or back-and-forth exchanges of agency, that had traced out the contours of her practice as a live-electronic performer—not exactly. Rather, Oliveros found a way to draw that play of feedback into the listening self, rendering the tape-machine, as in *A-OK*, "optional."

In the years immediately following the "Meditation Project," the notion of the body considered as a techno-logical medium continued to play on Oliveros's imagination. In 1975, she reunited many of her collaborators from the "Meditation Project" (Bruce Rittenbach, Lester Ingber, and Lin Barron), whom she had newly formalized as the Sonic Meditations Research Group (SMRG), for a performance titled *Bio-Theatre* (1975). The *Bio-Theatre*, the group's description read,

is a sound/light presentation using brainwaves, respiration, and other bio-potentials to control an electronic music synthesizer and lighting display. The 'bio-performer' controls the environment by altering his or her mental modes. The experimental presentation is the result of research at UCSD under the auspices of CME by the Sonic Meditations Research Group, whose concerns are modes of consciousness as related to composition and performance.²³⁵

In the figure of the "bio-performer" *performing* listening and sounding, and controlling their environment through mental self-regulation, respiration, and "bio-potentials," we find an even clearer articulation of the hybrid listening subject forged in the crucible of the *Sonic Meditations*. And it is this subject that looms in the background of Oliveros's writings on these works, which refer to

²³⁵ *Bio-Theatre* (1975) description, Box 1, Folder 17, Oliveros Papers.

them as “software for people,” and speak of consciousness as a tool of “information-processing.”²³⁶ This model of sonic embodiment, which projects the technological and its affordances into the human, could be said to represent an inversion of Tudor’s “instrumental loudspeaker,” possessed of its own “nature” and animacy; by the same token, it could be seen to call up specters of the technological automaton in Tudor’s past. But if there is a techno-logic at work in Oliveros’s meditation practice, it is an evolved, and a *redeemed* techno-logic.

Having read Ornstein and Naranjo’s *On the Psychology of Meditation* and Ornstein’s *Psychology of Consciousness*, Oliveros would have understood well his concept of “deautomatization,” understood to mean the “dismantl[ing] [of] the automatic selectivity of ordinary awareness” and the “awaken[ing] [of] a fresh perception”—the “undoing of the normal automatization of consciousness.”²³⁷ For Ornstein, the work of deautomatization lay at the root of meditation, of achieving alpha, and, we might say, of listening. It described not the rote regimentation of the senses, or the reduction of awareness, but a revelatory rebooting of one’s “programming,” or an “opening up” of consciousness. It even described the “growing [of] a new organ of perception.”²³⁸ For Oliveros, this new organ was a hybrid ear ever evolving, ever amplifying, and always listening.

Conclusion: “The condition of music”

In this chapter, we have charted Tudor and Oliveros’s decisive move to new models of sonic embodiment between 1968 and 1973, and, following Sybille Krämer, we have identified the roots of this embodiment in the plays of “incorporation” brokered by electronic mediation. We have tracked our practitioners’ explorations of resonance, followed them to Osaka, and at last, arrived in a barn and a biofeedback laboratory, where new bodies, and new manners of listening, were built up piece

²³⁶ Oliveros, “Software for People” (1978), in *Software for People*, 177–190.

²³⁷ Ornstein, *Psychology of Consciousness*, 197–198; Naranjo and Ornstein, *Psychology of Meditation*, 192.

²³⁸ Naranjo and Ornstein, *Psychology of Meditation*, 192.

by piece from transducers, scrap metal, electrodes and an electroencephalogram. Here, in a concluding account of Tudor and Oliveros's activities between 1973 and 1980, I examine how *Rainforest* (post-Chocorua, 1973–) and the *Sonic Meditations* (1971–73) came to enjoy a rich and unexpected life outside the world of experimental music, placing their creators on newly fuzzy disciplinary terrain.

With these culminating projects, as we have seen, Tudor and Oliveros brought their individual philosophies of music and mediation to their fullest realization; but they also provocatively short-circuited working parameters of musical composition and performance, wresting Lydia Goehr's musical "work" from the space of abstraction and ideality, and installing it in physical, situated bodies. Whereas *Rainforest* suggested a music inherent in a feedbacking "forest" of "instrumental loudspeakers," each possessed of its own life and "nature, the *Meditations* collapsed music into the body of the human listener, understood as an information-processor—a "bio-performer."

Additionally, developed in "workshop" contexts, and among networks of cross-disciplinary students and collaborators, these projects were both motivated by a desire, on the part of their creators, to make music newly available to a wider variety of listeners; and embodiment promised new manners of access and participation. With its expanded scale and spatial collapse of performance/audience divisions, *Rainforest*'s Chocorua iteration (which, we will recall, marked Tudor's attempt to "give [the piece] away"), made music inhabitable and tactile in the most literal sense; it rendered the musical "work" plastic. Meanwhile, Oliveros's *Meditations*, which, we will recall, demanded no prior musical training, placed the locus of the "work" in techno-logical bodies and their capacity for sounding, or simply just listening—understood as an active, not passive, performance. As we will see below, the widened horizon of access implicit in Oliveros and Tudor's new models of sonic embodiment helped to carry *Rainforest* and the *Sonic Meditations* beyond music's

institutional limits, and into museums and performance spaces. In these new contexts, they challenged the available vocabularies of critics and audiences, encouraging the construction of new definitional frameworks suspended between disciplines.

That a turn to embodiment would pave Oliveros and Tudor's path from the "imaginary museum" to the art museum is curious indeed, for in modern art criticism, music has long been posited as a model of *disembodiment*, purity, and abstraction towards which the other arts should strive. In 1877, Walter Pater observed that "all art constantly aspires to the condition of music"; for Pater, this "condition" was one in which the distinction between "matter" and "form" is completely obliterated—covered over, per Goehr, by an "indivisible unity."²³⁹ Over the course of the 20th century, in moments of aesthetic upheaval or crisis, music's transcendent "condition" has regularly been raised up as an ideal for the "sister arts" and pressed in service of a formalist agenda.

In his "Towards a Newer Laocoon" (1940), which narrates the history of avant-garde painting as a progression from representation to abstraction, corruption by literature to medium specificity or "purity," art critic Clement Greenberg held that only by following the example of music—with its "remoteness from imitation," "pure form," and "abstract," "immediately sensuous" character—did painting locate its true and "legitimate" essence.²⁴⁰ In "Towards a Newer Laocoon," Greenberg situated this essence in an embrace of flatness—the "opacity" of the support—and in a rejection of illusionism. Later, he would speak of a "purely optical experience" separated from the "tactile," and of a matter "incorporeal [and] weightless."²⁴¹ Per Caroline A. Jones, Greenberg's privileging of the incorporeal, or the disembodied, was not incidental, but rather fundamental to the formalist method he espoused, which demanded a carefully maintained segmentation of the

²³⁹ Goehr, "All Art Constantly Aspires," 141–142.

²⁴⁰ Clement Greenberg, "Towards a Newer Laocoon" (1940), in *Art in Theory, 1900–2000: An Anthology of Changing Ideas*, ed. Charles Harrison and Paul Wood, 2nd ed. (Malden, MA: Blackwell Publishing, 2003), 562–568.

²⁴¹ Michael Fried, *Art and Objecthood: Essays and Reviews* (Chicago: University of Chicago Press, 1998), 161.

senses.²⁴² And as Jones explains, it was the sense of sight, in particular, that promised refuge, or escape, from the mess and matter of the body.

[I]n developing the method subsequently known as ‘formalism,’ [Greenberg] fetishized sight, which had traditionally been the sense capable of producing the most ‘distance’ from the body. Formalism offered the user a set of positivist protocols that could *produce* isolated sensations abstracted from the bourgeois body . . . always ordinated by sight.²⁴³

It was no coincidence that Oliveros and Tudor’s resolutely *corporeal* music found acceptance in the art world when it did. It is most important to observe that by the mid Seventies, the modernist doctrine of medium specificity so dear to Greenberg had given way to expressions of artistic hybridity and interdisciplinarity, or what Fluxus artist Dick Higgins memorably termed “intermedia.”²⁴⁴ In 1967, art critic Michael Fried, who shared many of Greenberg’s formalist investments, had prophesied the “crumbling” of disciplinary dividing lines (between, e.g., music and the arts) in an essay titled “Art and Objecthood,” which wielded the epithet “theater” in describing the corrupted intermediate zone towards which all the arts seemed to be tilting.²⁴⁵ But Fried’s dreaded “theater,” which indeed spread virally in the Seventies, implied more than just the mixing of mediums; equally important for us, and for Oliveros and Tudor, “theater” named an emergent sensibility premised not on weightless, incorporeal form, but the construction, or staging, of embodied and situated beholding experiences.

For Fried, as for Greenberg, the most successful modernist art promised to momentarily deliver the viewer from their bodies, into a transcendent space of “absorption” or “opticality” located outside of time; in contrast, “theatrical” or “literalist” art emphasized situated embodiment as a condition of both artwork and viewer, consigning the beholding experience to the tyranny of

²⁴² Caroline A. Jones, “The Mediated Sensorium,” in *Sensorium: Embodied Experience, Technology, and Contemporary Art*, ed. Caroline A. Jones (Cambridge, MA: MIT Press, co-published with the MIT List Visual Arts Center, 2006), 8.

²⁴³ Jones, “The Mediated Sensorium,” 8.

²⁴⁴ Dick Higgins, with an appendix by Hannah Higgins, “Intermedia,” *Leonardo* 34, no. 1 (2001): 49–54, <https://doi.org/10.1162/002409401300052514>.

²⁴⁵ Fried, “Art and Objecthood” (1967), in *Art and Objecthood*, 148–172.

duration—mundane temporality. The ease with which *Rainforest* and the *Sonic Meditations* circulated among art-world spaces in the mid Seventies perhaps owes to the success of the theatrical sensibility, which by 1975, had found heightened expression in such mediums or “intermedia” as performance art, installation art, body art, and video art. As critic Douglas Crimp observed in a 1979 postmortem of the decade, making notable mention of “sound installations,”

The mode that was thus to become exemplary during the seventies was performance—and not only that narrowly defined activity called performance art, but all those works that were constituted *in a situation* and *for a duration* by the artists or the spectator or both together. It can be said quite literally of the art of the seventies that ‘you had to be there.’ For example, certain of the video installations of Peter Campus, Dan Graham, and Bruce Nauman, and more recently the sound installations of Laurie Anderson not only required the presence of the spectator to become activated, but were fundamentally concerned with that registration of presence as a means towards establishing meaning.²⁴⁶

Duration had always been a condition of music—or, rather, a precondition. With *Rainforest* and the *Sonic Meditations*, however, Tudor and Oliveros announced a “music,” or a more uncomfortably *situated* sonic art, equally premised on the presence of human and technological bodies in rooted in place. Once, gazing up at the “imaginary museum” in search of formal truths, and models of purity, abstraction, and transcendence, sculpture, painting, and poetry had aspired to music’s condition. Now, in a curious role reversal, music would creep through the backdoor of the real museum, taking on the resonances of blooming postmodern practices. The sister arts, in a show of repayment, would be all too happy to provide it a home.



Tudor’s Chocorua workshop was transformative for his students, so much so that by the spring of 1974, several of its participants—John Driscoll, Bill Viola, Linda Fisher, Ralph Jones (1951–), and Martin Kalve (1951–)—had already reunited with their teacher, forming a *Rainforest* “performance group.” Dedicated to the continued presentation of *Rainforest* in its newly expanded

²⁴⁶ Douglas Crimp, “Pictures,” *October* 8 (Spring 1979): 77, <https://doi.org/10.2307/778227>.

form, the group, per Matt Rogalsky, was fluid in its composition, with members joining when time and geography allowed.²⁴⁷ Tudor, who enthusiastically reprised his role as an older mentor, was a consistent and dedicated presence within the group; he appeared at 26 out of the 28 *Rainforest* presentations staged between 1973 and 1982.²⁴⁸ It is perhaps fair to say that *Rainforest's* extended lease on life in the Seventies and early Eighties did not encourage the work's further *evolution* so much as its *concretization*. Afforded regular opportunities to remake the work in a variety of spaces and with variable personnel, Tudor and the Chocorua alumni could further clarify and define the core elements of the 1973 *Rainforest* iteration (ultimately dubbed *Rainforest IV*, and hereafter referred to as such).

Per John Driscoll, *Rainforest IV* was distinguished from prior *Rainforest* iterations by the following characteristics, among others: “The creation of a visual and sonic environment with 16–40 suspended sculptural speakers”; “The size of the sculptural speakers (some as large as 12 x 12 ft)”; and “The projection of a strong acoustical presence in the space by each sculpture.”²⁴⁹ Driscoll emphasizes the identity of the *Rainforest IV* objects (“instrumental loudspeakers”) as “sculptures” or “sculptural speakers,” and no doubt, his choice of language owes to his own artistic background. This marked emphasis on *Rainforest IV*’s visual and spatial qualities, however, would also seem to reflect the type of venues that so readily embraced the work: museums. Indeed, between 1973 and 1982, *Rainforest IV* found itself suspended in the atria, solaria, and exhibition halls of museums across the United States (and indeed, Europe). Many of these engagements owed to the dedicated outreach of Driscoll and Viola, who, already connected to several major art institutions, secured Tudor numerous connections well outside of his usual professional network.

²⁴⁷ Rogalsky, “Idea and Community,” 264–266.

²⁴⁸ Rogalsky, 266.

²⁴⁹ Driscoll and Rogalsky, “Evolving Exploration,” 28–29.

By some date in the late Seventies, the density of *Rainforest IV*'s museum appearances was such that Tudor felt possessed to draw up a list labeled "exhibitions" enumerating all of his art-world appearances. This list retroactively gathered events like "9 Evenings" and works such as *Fluorescent Sound* (1964), presented at Stockholm's Moderna Museet, but it also began collating each new *Rainforest* staging.²⁵⁰ Under "Rainforest 4," we find the following bulleted items:

- Ft. W. Art M. [Fort Worth Art Museum] 75
- LA County M. [Los Angeles County Art Museum] 75
- De Saisset Art M. [The de Saisset Museum at Santa Clara University] 75
- Cont. Arts M. [Contemporary Arts Museum Houston] 75
- Walker Art Cent. [Walker Art Center] 76
- Espace P.C. [L'Éspace Pierre Cardin] 76
- Carpenter Center for the Visual A., Harvard U. [Carpenter Center for the Visual Arts] 76²⁵¹

Critics who encountered *Rainforest IV* in the museum context seem, occasionally, to have struggled to classify what they were seeing and hearing; the work seemed, to them, "music," but not *exactly*. "'Rainforest' isn't music, it's musical," read one representative headline that appeared in the *Minneapolis Star* on the occasion of *Rainforest IV*'s Walker Art Center staging; "Music 'Molded' at Museum," read an earlier headline in the *Syracuse Herald Journal*.²⁵² Ultimately, as if seeking to avoid the "music" question entirely, both critical commentators and the *Rainforest* performance group converged upon one word in particular in description of the work: "environment." The term was the coinage of *Rainforest* cohort, and it is quite possible that Tudor's memories of the "environmentally scaled" Pepsi Pavilion motivated its uptake. Appearing in circulated statements and in descriptions either in isolation, or with the appended qualifier "electro-acoustic," it quickly gained traction. Critics introduced their own plays on the descriptor, variously trotting out "electronic environment," "electronic ecology," "aural environment," and "environment of

²⁵⁰ Undated list of "Exhibitions," c. 1970s or early 1980s, Box 109, Folder 23, Tudor Papers. Note that Matthew Rogalsky dates the Contemporary Arts Museum Houston performance to 1976 (June 5–6), not 1975. Rogalsky, "Idea and Community," 457.

²⁵¹ Undated list of "Exhibitions," c. 1970s or early 1980s, Tudor Papers.

²⁵² Roy M. Close, "'Rainforest' isn't music, it's musical," *The Minneapolis Star*, June 14, 1976, 28; Greg Miller, "Music 'Molded' at Museum," *Syracuse Herald Journal*, March 9, 1973, 10.

electronic sound.”²⁵³ In what respect could Tudor and his collaborators call *Rainforest IV* an “environment,” and in what respect could museums and critics *accept* it as an “environment”?

The notion of the “musical environment” or “sound environment” was not wholly foreign to the artistic cosmos in which Tudor traveled, for indeed, such classifiers were commonly deployed with reference to modern dance. In the 1967 edition of *Impulse*, an annual magazine of contemporary dance, Tudor’s friend and Cunningham collaborator Gordon Mumma honored the brief of the issue—which centered on the “dancer’s environment”—by writing on “Four Sound Environments for Modern Dance.”²⁵⁴ Describing the musical components of four Cunningham dances in which he had been involved, and speaking most extensively on *Variations V* (1965), Mumma found the concept of the “environment” amiable for grasping Merce’s philosophy of musical accompaniment, which (like John Cage’s “theatre”) was premised on the coexistence but *independence* of visual and sonic phenomena.

“Mr. Cunningham,” states Mumma, “has expanded the concept of music for modern dance. He has encouraged the function of music as an environment for choreography. . . . His choreography exists for its own reasons, for the theatre of human movement in space, and does not have to be driven or set to anything.”²⁵⁵ This, however, is not the precise sense in which Tudor seems to have deployed the term. In a note dating to the Seventies (which, muddying the analytical waters, refers to the Chocorua *Rainforest* as *RF III*), Tudor indeed suggests that *Rainforest IV*’s “environmentality” *precluded* the possibility of dance integration:

RF III (NH version) is an environmental piece → The listeners ~~can walk~~ move thru the space at will, ~~perceiving~~ observing the hanging objects & their changed ~~both the~~ natural & reflected changed amplified sounds. Lighting has to be from below (bad for dancers). Without very elaborate pre-planning I don’t see how this event could live with dancers—cats, dogs, birds maybe. the lengths of cable, which are ~~so~~ extreme ~~that compromises &~~ have

²⁵³ Observe the language used in, e.g., Herman Trotter, “Tudor Rainforest Gives New Aural Experience,” *Buffalo Evening News*, May 13, 1974; Thomas Putnam, “‘Rainforest’ Adventure in Electronics,” *Buffalo Courier-Express*, May 13, 1974; and William Weber, “Rainforest: An Electronic Ecology,” *Los Angeles Times*, November 20, 1975, 32.

²⁵⁴ Gordon Mumma, “Four Sound Environments for Modern Dance,” *Impulse*, 1967, 12–15.

²⁵⁵ Mumma. “Four Sound Environments,” 13.

to be laid out across the floor with the shortest possible routing, & compromises are inadvisable.²⁵⁶

Tudor's note, and similar statements made by members of the *Rainforest* performance group, help us to understand that what made the work an "environment" was its invitation to navigation and intimate physical exploration by listeners. *Rainforest IV*, it should not be forgotten, remained a performance or an "event" lasting a particular duration (per Driscoll, 3–6 hours), and requiring the presence of performers actively routing sounds to their suspended objects. As one *Rainforest IV* performer has related, however, the aim of this iteration of the work, with its extended time-frame as well as its spatial expansion, was to cultivate a continuously changing but *tangible* presence inhabitable by embodied listeners, no longer separated by a proscenium stage: "[The sounds are] everywhere. . .they're drifting through the whole space, and sonic material is shared in that way. . . . The whole space is communal, acoustically."²⁵⁷

Additionally, the fact that *Rainforest IV* inhered in technological sounding bodies, or "instrumental loudspeakers," meant that each staging of the work was "site-specific" in a very literal sense: the shape, size, and resources of each venue dictated the scaling and disposition of *Rainforest IV*'s "hardware," which needed to be safely suspended, connected with cables, and wired into a physical sound-system. Curators hoping to stage *Rainforest IV* needed to give the performance group more than just an abstract sense of the spaces they would be using; they thus provided the performers with museum floorplans and corresponded with them regarding suspension systems.²⁵⁸

[Figure 16] When, in 1975, the *Rainforest* group appeared at the L.A. County Museum of Art

²⁵⁶ Undated note regarding spatial needs for *Rainforest IV* (referred to as "RF III"), ca. 1970s, Box 109, F19, Tudor Papers.

²⁵⁷ "Interview of The Rainforest Group," CME Archives. I have unfortunately been unable to identify the speaker.

²⁵⁸ Floorplan of Fort Worth Museum solarium, materials related to 1975 performance of *Rainforest IV* at the Fort Worth Museum, Fort Worth, TX, Box 19, Folder 8, Tudor Papers.

(LACMA), they were able to repurpose cables originally used to exhibit sculptor Alexander Calder's mobiles.²⁵⁹

Circa 1975, the art world would have been especially primed to welcome a music-turned-“environment” into its wings. In the Sixties, Michael Fried’s fears of an emergent “theatricality” threatening to stage and *situate* the beholding experience had been stoked, in large part, by the Minimalist sculptures of Robert Morris and Tony Smith (1912–1980)—hulking, sometimes platonic solids that demanded circumambulation and physical engagement by viewers, made newly aware of their contingent and durational perception. In art historian Hal Foster’s estimation, one of the implications of Minimalism, with its *emplaced* phenomenology, was that galleries and exhibition halls themselves could and should be regarded as spaces of artistic investigation. According to this narrative, discrete objects thus gave way to “installations” taking stock of the broader spaces and institutional power structures through which museum visitors move.²⁶⁰ Even before sculptural Minimalism, however, Allan Kaprow had regarded, as a necessary adjunct to his “Happenings,” the richly visual and material “environments” in which they unfolded. Kaprow’s notion of the “environment,” which grew out of his understanding of Jackson Pollock’s painting as an “arena”—“a floor plan of a gladiatorial combat,” rendered the whole gallery (or field, or warehouse. . .) a canvas.²⁶¹

The “installation,” which we can regard as a close relative of the “environment,” was but one of several means by which artists of the Seventies shifted emphasis to the physical presence of the body—“constituted *in a situation and for a duration*.” Equally key were the strands of “body art”

²⁵⁹ Correspondence regarding 1975 performance of *Rainforest IV* at Los Angeles County Museum of Art, Los Angeles, CA, Box 19, Folder 7, Tudor Papers.

²⁶⁰ Hal Foster, *The Return of the Real: The Avant-Garde at the End of the Century* (Cambridge, MA: MIT Press, 1996), 55–60.

²⁶¹ Richard Schechner, “Extensions in Time and Space. An Interview with Allan Kaprow,” *The Drama Review: TDR* 12, no. 3 (Spring 1968): 154–155. Kaprow is channeling Harold Rosenberg’s well-noted interpretation of Pollock’s work; see Harold Rosenberg, “The American Action Painters,” *Art News*, January 1952, 22–23, 48–50.

which, through either live performances staged for audiences, or photographic and filmic documentation, resituated the locus of the artwork in the artist's theatricalized, sexualized, or otherwise aestheticized body. While body art was not the exclusive province of female artists, art critic Lucy Lippard, writing on the genre in 1976, observed that the genre evolved in tandem with a growing "feminist consciousness."²⁶² Per art historian Amelia Jones, the use of the body as a medium affords feminist artists a potent means of subverting the "fetishistic and scopophilic 'male gaze,'" and probing the latent male-gendered character of art criticism and reception, with their insistence upon a "disinterested" (and disembodied) viewing.²⁶³ Just as the idiom of the "installation" eased the transition of *Rainforest IV* into museum spaces, the efflorescence of body art and "performance art" (a broader umbrella category) helped smooth the art-world assimilation of Oliveros's *Sonic Meditations* (1971–73), born in part in the explicitly feminist context of the ♀ Ensemble.

Over the course of the Seventies, and onward into the Eighties, the *Sonic Meditations* short-circuited music criticism's operative terminology in much the same manner as *Rainforest IV*, inviting headlines such as "Not What We Thought Music Was" and "The Unexpected Music," and prompting remarks such as this representative comment (courtesy critic John Rockwell) in the May 25, 1980 *Sunday Times*: "One might wonder, whether, given Miss Oliveros's apparent indifference to the specific sounds produced, it is music at all."²⁶⁴ In such critical assessments, neologisms like "conceptual music" came to the rescue, and while many fall apart under the slightest scrutiny, the term "performance music," which Bérénice Reynaud tacked to Oliveros's meditation practice in

²⁶² Lucy R. Lippard, "The Pains and Pleasures of Rebirth: European and American Women's Body Art" (1976), in *From the Center: Feminist Essays on Women's Art* (New York: E.P. Dutton, 1976), 121–123.

²⁶³ Amelia Jones, *Body Art/Performing the Subject* (Minneapolis: University of Minnesota Press, 1998), 1–14.

²⁶⁴ "Not What We Thought Music Was," *The Santa Fe Reporter*, October 12, 1978, 14; Joan Schnorbus, "The Unexpected Music," *San Dieguito Citizen*, June 7, 1978, A1–A2; John Rockwell, "The Musical Meditations of Pauline Oliveros," *Sunday Times*, May 25, 1980, 19–20.

1979, is suggestive and revealing.²⁶⁵ As we have seen, at their most radical, the *Sonic Meditations* recast an activity (listening) often presumed to be passive as a dynamic, projective process entailing the fine honing of attention, and a vulnerable, but valuable, reach beyond the boundaries of the self.

Listening is rendered a *performance*, and the ear *performative*, as the “bio-performer” is drawn into a live circuit linking consciousness to environment. The performer of the *Sonic Meditations*, meanwhile, is most often left to her own fleshy devices: the techno-logized body is made to constitute the “work.” Is it not wholly appropriate to consider the *Sonic Meditations* a species of “body art” or “performance art” animated, in many respects, by those genres’ grounding feminist ideals?

Upon the earliest introduction of the *Sonic Meditations*, not all art institutions detected in them the cross-disciplinary resonances suggested here. For example, while the Long Beach Art Museum initially secured the ♀ Ensemble’s involvement in a 1972 exhibition titled “22 Artists — Invisible/Visible,” the institution indelicately disinvited Oliveros and her collaborators upon recognizing the “inward-directed” character of the *Sonic Meditations*. “The setting on Preview Opening night,” wrote Museum Director Jason D. Wong to Oliveros, “is that of a cocktail party. We know that the atmosphere will not be one conducive to any kind of meditation.”²⁶⁶ Replied Oliveros: “We suggest that you hire a strolling accordionist for your cocktail party and request for her to play *Melancholy Baby*. We intend to stay home and meditate.”²⁶⁷ As the Seventies drew on, however, and as the idiom of “performance” assumed an ever greater presence in the art world, the suitedness of Oliveros’s meditation practice to art spaces—particularly those of an “alternative” character—appears to have become more patent.

²⁶⁵ The phrase “conceptual music” is John Rockwell’s. Bérénice Reynaud, “New Music, New York,” *Performance Art Magazine*, January 1979, 32–34.

²⁶⁶ The Women’s (♀) Ensemble/Long Beach Museum of Art correspondence, 1972, Box 12, Folder 4, Oliveros Papers.

²⁶⁷ The Women’s (♀) Ensemble/Long Beach Museum of Art correspondence, 1972, Oliveros Papers.

In 1975, Oliveros was invited to participate in a “Performance Conference” (“Performance: Personal and Public Issues”) at the Los Angeles Woman’s Building (established 1973), an inclusive, many-pronged space comprising a community art gallery (Womanspace), the Feminist Studio Workshop (an art school founded by art historian Arlene Raven, designer Sheila de Bretteville, and artist Judy Chicago, 1939–), and the Associated Women’s Press, among many other initiatives.

[Figure 17] Described by Lucy Lippard as “the first efficient and encompassing alternate structure for women’s art,” the Woman’s Building provided a powerful anchor for feminist and lesbian culture; its extended invitation to Oliveros marked a recognition of both the politics central to her work, and the increasingly encompassing nature of her practice.²⁶⁸ In September 1979, in another confirmation of her practice’s plausibility as “performance” she was invited to serve as an artist in residence at the San Francisco art space 80 Langston Street, which traded in such “time- and non-object-oriented art forms” as performance and video.²⁶⁹ (321 Divisadero Street, the old home of the San Francisco Tape Music Center, would have been just a ten-minute drive away.) And when, a bit earlier in 1979, the Contemporary Arts Center in New Orleans, LA celebrated “A Decade of Women’s Performance Art” with a major survey exhibition, Oliveros was featured in the esteemed company of artists Carolee Schneemann (1939–2019), Joan Jonas (1936–), Adrian Piper (1948–), Hannah Wilke (1940–1993), and Laurie Anderson (1947–).²⁷⁰

As performances, however, the *Sonic Meditations* did not exclusively travel via the bodies of Oliveros and her collaborators. While, as I have noted, the *Meditations* were initially transmitted orally, it was in print that they reached most readers and listeners. Since the mid Sixties, when she exchanged conventional notation for prose instructions, Oliveros had been cultivating a techno-

²⁶⁸ Correspondence and materials related to Oliveros’s appearance at the Women’s Building in 1975, Box 14, Folder 7, Oliveros Papers; Lucy Lippard, “The L.A. Women’s Building” (1974), in *From the Center*, 98.

²⁶⁹ Materials related to Oliveros’s appearance at 80 Langton Street in 1979, Box 15, Folder 1, Oliveros Papers.

²⁷⁰ Flyer advertising “A Decade of Women’s Performance Art” at the Contemporary Arts Center, New Orleans, LA, Box 15, Folder 1, Oliveros Papers.

logical “orality” in her practice, and the *Meditations*, transmitted body-to-body, bio-performer-to-bio-performer, represented the fullest and most sophisticated realization of this orality. However, Oliveros surely realized the limitations of the “oral tradition” as regards her transmission’s signal strength, and by the Seventies, through her little-discussed engagements with the Fluxus tradition, she was well aware of alternative models for the propagation of performance. As we saw in Chapter 3, Oliveros first encountered Fluxus at “Tudorfest,” which featured the work of George Brecht—the architect of the “event score.” Oliveros has indicated that Tudor introduced her to additional Fluxus material, and in 1965, she came across *Water Piece*, a “word score” or “event score” from Yoko Ono’s 1964 artist’s book *Grapefruit*, in the *New York Times*.²⁷¹ While Ono has received far less attention from art historians than, for example, Brecht or La Monte Young, she was just as active in the early Fluxus cosmos as her male colleagues, both making work of her own, and hosting performances in her lower Manhattan loft. Seeming a key precedent for some of Oliveros’s more *koan*-like meditations (*Meditation V*, “Native” comes to mind), *Water Piece* instructs the following:

Steal a moon on the water with a bucket
Keep stealing until no moon is seen on the water.

In a late interview, Oliveros characterized her discovery of *Water Piece* as one of three significant milestones in her artistic development.²⁷² That Fluxus work remained a noted point of reference for her is evidenced by a large folder of Fluxus materials (simply labeled “Fluxus”) that survives in her archive at the New York Public Library.²⁷³ So, yes—Oliveros was familiar with Fluxus. And she would have known and appreciated that Fluxus circulated its scores not only via physical performance, but in anthologies and via the international post, which, per Charlie Gere,

²⁷¹ Pauline Oliveros, “Deep and Wide: An Interview with Pauline Oliveros,” by Miya Masaoka, May 29, 2002, accessed February 26, 2022, <http://miyamasaoka.com/writings-by-miya-masaoka/2002/deep-and-wide-an-interview-with-pauline-oliveros/>. Oliveros would seem to be referring to the following *New York Times* article: Raymond Ericson, “An Event Is Not a Happening,” *New York Times*, March 21, 1965, 467.

²⁷² Oliveros, interview by Masaoka.

²⁷³ Miscellaneous “Fluxus” materials, Box 5, Folder 36, Oliveros NYPL.

Fluxus artists regarded as one vast “telecommunications network.”²⁷⁴ Oliveros indeed distributed her *Sonic Meditations* by mail (they can be found, for example, in Tudor’s correspondence files); but since she was amenable to venues such as artists’ books, ‘zines, and periodicals, she opted for other means of transmission as well.

In 1971, Oliveros published her first set of *Meditations* in the experimental music journal *Source: Music of the Avant-Garde*. Since 1966, *Source* had provided Tudor, Oliveros, Mumma, Lucier, and many other like-minded composers in their orbit with a forum for conversation, the publication of experimental essays, and the propagation of new scores. Oliveros’s 1971 *Source* contribution is primarily notable because it marked her first attempt to share the *Meditations* beyond her immediate network of friends and collaborators; however, the publication is also significant in that Oliveros used it to publicly come out as a lesbian. Reads her opening line: “Pauline Oliveros is a two-legged human being, a female, lesbian, musician, composer among other things which contribute to her identity.”²⁷⁵ In *Source*’s latter years of publication (it ran from 1966 to 1973), it became a noted incubator of emerging strands of sound art, providing many of that vexed genre’s representatives with an early platform.

After publishing in *Source*, Oliveros continued to communicate through similar channels: in 1976, she published her essay “On Sonic Meditation” in the Philadelphia-based literary magazine the *Painted Bride Quarterly*; there, her contribution was slotted beside a John Giorno poem. In 1975, by which time Oliveros had forged close relationships with Fluxus-affiliated conceptual artist Alison Knowles (1933–), and Annea Lockwood (1939–), a New Zealand-born composer and sound artist, Knowles and Lockwood invited Oliveros to contribute to a two-issue magazine titled *Women’s*

²⁷⁴ Charlie Gere, “A Short History of Art and Telecommunication,” *Contemporanea* 17, no. 4 (August–September 2014): 497–499, <https://www.jstor.org/stable/24653720>.

²⁷⁵ Pauline Oliveros, “Sonic Meditations,” in *Source: Music of the Avant-Garde, 1966–1973*, ed. Larry Austin and Douglas Kahn (Berkeley: University of California Press, 2011), 342.

*Work.*²⁷⁶ (1975) Knowles and Lockwood's publication invoked the history of Fluxus while responding to the quiet chauvinism of that movement with an all-female cast of contributors. Oliveros's contribution was a prose score for an “environmental theater piece” titled *Link* (1971), which, in its resemblance to performance art, evidences a close conceptual relationship with the *Sonic Meditations*.



As I have suggested here, the assimilation of Oliveros and Tudor's embodied sonic practices into museums in the Seventies had a great deal to do with the state of the art world at that time: it is of critical importance that circa 1975, the “condition” of their music, now *incorporated* into technological and techno-logical bodies, reflected the broader condition of artistic practice, which, in an actualization of Michael Fried's most chilling nightmares, had swung powerfully towards the embodied, the situated, and the indexical. As I will argue in this dissertation's Conclusion, however, the convergence observed here must be understood as more than just a passing *coincidence* warranting curiosity alone. Around 1980, a growing wave of sonic practices every bit as hybrid as *Rainforest IV* and *Sonic Meditations*, and equally problematic in their relationship to music and its imaginary “works,” would buoy the emergence of a “sound art,” sowing the seeds of a complex and hyphenated genre that has persisted to this day. And as we will see, Oliveros, Tudor, and their pupils participated in this early foundation-laying, placing their resonant bodies at sound art's very genealogical roots.

²⁷⁶ Mockus, *Sounding Out*, 63.

Conclusion: After Mediation

Over the course of this dissertation's four chapters, I have charted David Tudor and Pauline Oliveros's transformative passages through electronic mediation in the postwar decades. I first attended individually to the musicians' formative years of development: in Chapter 1, I presented a media-minded reframing of Tudor's illustrious career as a virtuoso pianist between 1950 and 1960, arguing that the musician remade himself as a *techno-logical* performer—an optical "scanner"—in order to grapple with the demands placed upon him by the experimental and avant-garde music of John Cage, Karlheinz Stockhausen, and others; in Chapter 2, examining Pauline Oliveros's early activities in the Bay Area between 1958 and 1963, I called for a renewed understanding of her rapid evolution as a composer of electronic and experimental music, arguing that her encounters with magnetic tape, and her exchanges of agency with the medium, exerted a wide-reaching influence on her approach to music-making and her understanding of listening.

In Chapter 3, departing from Tudor and Oliveros's profound encounter with one another in 1963, and their shared participation in "Tudorfest" at the San Francisco Tape Music Center, I examined their activities of the early-to-mid Sixties separately and in the context of several collaborations, arguing that these key transitional years found both musicians seeking new models of "liveness" in electronic musical performance. I tracked some of Tudor's first attempts to acquire fluency in a new electronic vocabulary and retraced his path to *Bandoneon! (A Combine)* (1966)—his debut proper as an original composer; I meanwhile surveyed Oliveros's embrace of a new "theatricality" in her musical practice and its entwinement with the electronic, discussing her ambitions towards a new "orality" beyond notation, her move to the use of live tape-delay, and the culmination of these developments in her expansive collaborative performance *A Theater Piece* (1966). I argued that Tudor and Oliveros's live-electronic works of 1966 not only anticipated their

imminent move to embodied sonic practices, but also disarticulated the conventional roles and responsibilities of the performer, the composer, and the audience endemic to the musical *Werktreue* (work-concept), as Lydia Goehr theorizes it.

In Chapter 4, moving rapidly through Tudor and Oliveros's activities of the late Sixties and Seventies, I reconstructed their paths towards new models of embodied sonic practice, looking at the development of Tudor's *Rainforest* between 1968 and 1973, and Oliveros's *Sonic Meditations* (1971–73); I demonstrated that the evolution of these projects was contoured not only by the musicians' respective histories and prior experiences with media, but by their work with younger pupils and collaborators. Finally, I argued that by grounding the musical "work" in technological and techno-logical bodies in these decisive gestures of mediation, Tudor and Oliveros launched themselves beyond Goehr's "imaginary museum" and into art-world spaces, where they found a creative climate more than amenable to their practices.

In the Conclusion that follows, I first want to survey the consequences of this disciplinary breach, tracking Tudor and Oliveros's relationship with the new art-institutional phenomenon of "sound art" circa 1979–83. During this time, both figures appeared in museum exhibitions trumpeting the arrival of this new genre; here they featured alongside genre-crossing artist-musicians (for example, performance artist and experimental pop star Laurie Anderson, and percussionist-turned-installation artist Max Neuhaus, 1939–2009), as well as emerging sonic experimentalists more eager to embrace the hybrid label of "sound artist." I want to suggest that in the context of such exhibitions, Tudor and Oliveros functioned as key inter-generational conduits connecting a nascent sound art to the longer tradition of experimental and electronic music. I further assess the pair's influence by briefly examining their impact on friends and collaborators positioned further outside of music's categorical limits: I discuss Tudor's mentorship of video artist and *Rainforest IV* (1973)-collaborator Bill Viola, and Oliveros's close connection to Annea Lockwood, a central figure in first-

generation sound art. I end by taking a wide view of Tudor and Oliveros's cross-disciplinary legacy—one wholly alive in the present day—and by speculating on the theories and models of musical mediation that their practices have left us with.



Throughout this project, I have tried to reckon with Tudor and Oliveros's reciprocal exchange of influence and the significance of their friendship for the growth of their respective practices. While in assessing their collaborations and moments of mutual encouragement, I have discussed their resonances and alignments of interest, I have also repeatedly signaled the significant distinctions between their approaches to music and mediation. Before moving on, I want to briefly examine a moment in the late Seventies at which this play of similarity and difference was brought into especially instructive focus.

In January 1975, John Driscoll, Tudor's close collaborator and the major organizing force behind the *Rainforest IV* (1973) performance group, wrote Pauline Oliveros on Tudor's recommendation. Noting that members of the *Rainforest* crew would be on the West Coast in April 1976, and that Tudor would then be in California with Cunningham, Driscoll asked whether Oliveros might interested in hosting a *Rainforest* performance at UCSD.¹ This performance did not come to pass—at least in Driscoll's proposed timeframe. In November 1976, Tudor received a letter from UCSD's Center for Music Experiment confirming residency dates for the *Rainforest* performance group—now called Composers Inside Electronics (CIE). They were to work and perform at the CME between January 25 and February 7, 1977.² Oliveros scratched out the

¹ John Driscoll to Pauline Oliveros, January 20, 1975, Box 28, Folder 27, Pauline Oliveros Papers (hereafter Oliveros Papers), MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

² Correspondence confirming Center for Music Experiment residency, November 23, 1976, Box 20, Folder 8, David Tudor Papers (hereafter Tudor Papers), accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, California.

following note to Tudor on the bottom margin of the letter: “David — We will put you up and find places for the others.”³

It is remarkably fortunate that several recordings documenting CIE’s UCSD residency exist. And even more fortunate, they constitute a wealth of information regarding *Rainforest*, the activities of CIE members, and more. Transcribed, they amount to 20,000 words of material; and yet to date, these tapes have never been discussed by scholars of Tudor or Oliveros. While a full recording of a *Rainforest* demonstration on February 4, 1977 offers an especially revealing window onto the mechanics of the piece, there exists a much longer recording of an interview with CIE held immediately afterwards—an interview in which Oliveros participates intermittently. There is an especially illuminating moment towards the end of this tape when the interviewer, one Robert Gross, asks all of the individuals present to report on their current activities. For his part, Tudor speaks to his continued fixation on the figure of the “instrumental loudspeaker” and the “sound-producing capability of electronics.”⁴ “No one’s attacking the instrumentality of the loudspeaker,” he remarks. “It should be as different as the aboriginal instruments are one from the other. And once that happens, we’ll be in a lovely position, ‘cause then each person who begins to make sound will invent his own.”⁵

When Gross puts the question to Oliveros, she gives a considerably more abstract response that is partially truncated by the switching out of the tape reel, offering that she is interested in “the operating principles of groups” and the possibility of “harmoniz[ing] one group with one another.”⁶ Pressed further, she articulates her desire to effect a “tuning of souls,” and regarding her relationship

³ Correspondence confirming Center for Music Experiment residency, November 23, 1976, Tudor Papers.

⁴ “Interview of The Rainforest Group,” February 7, 1977, digitized reel-to-reel tape, 45:30, Center for Music Experiment Recordings Archives (hereafter CME Archives), UC San Diego Library, UC San Diego, La Jolla, CA, <https://library.ucsd.edu/dc/object/bb7304939s>.

⁵ “Interview of The Rainforest Group,” February 7, 1977, CME Archives.

⁶ “Interview of The Rainforest Group,” February 7, 1977, CME Archives.

to electronics, she remarks, chuckling, that what she really wants is to “[be] able to psychically influence the instrumentation.” “When it’s possible to do that,” she says, “then I’ll be interested again.”⁷ Loudspeakers and souls, signal-to-noise ratios and psychical influence: delivered in relatively close succession, these statements gesture, with privileged clarity, towards the divergence of Tudor and Oliveros’s paths in the Seventies, and towards the distinctions that had always separated their approaches to the electronic and the body. And indeed, one cannot help but notice, between Oliveros’s piecemeal responses, a moment of tense silence—even a tangible sense of skepticism—among the all-male cohort in the room. Eventually, however, the group slides back into laughter. The warmth returns. “I don’t know if anybody will ever listen to this tape gain,” Gross remarks just before the recording cuts off. Oliveros, laughing, gives the last word: “It’s a historical document.”⁸

1. Transductions (1979–1983)

Oliveros and Tudor’s path towards sonic embodiment, and towards the museum, was constituted by endless chains of mediation—by transductions. A *transducer*, Frederick V. Hunt tells us in his definitive *Electroacoustics: The Analysis of Transduction* (1954), is “any device or agency that serves the function of converting one form of energy into some other form.”⁹ According to this generalized definition, we can count, among the transducers featured in this narrative, Tudor’s contact microphones, phonograph cartridges, and of course, his (tactile) transducers; and Oliveros’s tape-heads and electrodes. (This is to say nothing of the musicians’ own eardrums, or of the radio receivers, microphones, and countless other components of electronic music’s infrastructure.) In Stefan Helmreich’s formulation, *transduction* thus occurs when “energy moves across or between

⁷ “Interview of The Rainforest Group,” February 7, 1977, CME Archives.

⁸ “Interview of The Rainforest Group,” February 7, 1977, CME Archives.

⁹ Frederick V. Hunt, *Electroacoustics: The Analysis of Transduction, and Its Historical Background* (New York: Acoustical Society of America, 1954 [1982]), 2.

media—from an antenna to a receiver, from an amplifier to an ear, from the lightness of air to the thickness of water.”¹⁰

Helmreich notes that “transduction” derives from the Latin *transducere*, “‘to lead across, transfer,’ out of *trans*, ‘across, to or on the farther side of, beyond, over’ + *ducer*, ‘to lead.’”¹¹ And following our account, in Chapter 4, of Oliveros and Tudor’s assimilation into the institutional fabric of the art world, we might consider transduction as more than just a technological principle: for our practitioners did indeed lead an embodied music *across* disciplinary divides, bridging the musical “work” and the artwork, the “imaginary museum” and the museum. Just as, for Sybille Krämer, there is no mediation without “incorporation”—the spirit becoming flesh—there is, for Helmreich, no transduction without the “modulat[ion] [of] . . . matter and meaning.”¹² And by carrying music across the breach, Oliveros and Tudor effected more than a passive change of venue: they rather participated, alongside many experimental peers, in a much larger metamorphosis, urging on the growth of sonic practices “reaching across (while also exceeding) sensory, cognitive registers.”¹³

By 1980, experimental music’s myriad transductions—its increased passages between media, institutions, and disciplinary discourses—had left its matter and meaning dramatically changed. They had generated complexly hyphenated practices, some of which left music altogether, but most of which at least taxed the vocabularies of critics, curators, and practitioners themselves, in much the same manner of Tudor’s *Rainforest IV* (1973) and Oliveros’s *Sonic Meditations* (1971–73). These practices found a welcome home in interdisciplinary venues like New York’s The Kitchen, the media- and performance- oriented space founded by video artists Steina and Woody Vasulka (1940–,

¹⁰ Stefan Helmreich, “Transduction,” in *Keywords in Sound*, ed. David Novak and Matt Sakakeeny (Durham, NC: Duke University Press, 2015), 222.

¹¹ Helmreich, “Transduction,” 222.

¹² Sybille Krämer, “Writing, Notational Iconicity, Calculus: On Writing as a Cultural Technique,” *MLN* 118, no. 3 (April 2003): 529, <https://doi.org/10.1353/mln.2003.0059>; Helmreich, “Transduction,” 222.

¹³ Helmreich, “Transduction,” 224.

1937–2019). The Kitchen and likeminded institutions (for example, New York’s Artists Space and Franklin Furnace) emerged as intermedia-friendly “alternatives” to museums and art galleries, welcoming artists straddling definitional lines (most notably, those separating “art” from “music”) and privileging the durational and the ephemeral. One early mainstay of such spaces was Laurie Anderson: Anderson, whose experimental pop single “O Superman” vaulted her to international recognition in 1981, staged playful and subversive “duets” in which she sawed along on the violin, all while *recorded* violin music issued from a speaker lodged in her mouth.¹⁴

But as we have seen in examining the institutional drift of Tudor’s *Rainforest* and Oliveros’s *Sonic Meditations* c. 1975–1980, category-defying experiments in sound had also begun to bleed beyond the walls of “alternative” spaces and extend into more conventional arts institutions. For example, in pivotal installation works, Maryanne Amacher (1938–2009) and Bill Fontana (1947–) had used cables and loudspeakers to transplant the noise and ambiance of the outside world into museums.¹⁵ In 1974, for a group exhibition at the Walker Art Center in Minneapolis, MN, Amacher planted a microphone in a Budget Rent-a-Car and routed the spectral sounds of footsteps and voices into one of the Walker’s indoor galleries [**Figure 1**]; In 1978, Fontana secreted microphones in resonant environments (including a storm drain and a boiler-room drainpipe) and transmitted foraged sounds into the National Gallery of Victoria’s Murdoch Court.¹⁶ In a similar vein, onetime percussion soloist Max Neuhaus had taken to producing site-specific sound works which, in a historical first, he dubbed “sound installations” beginning in the early Seventies.¹⁷ For a 1978 sound

¹⁴ Tom Johnson, “Laurie Anderson at the Holly Solomon Gallery” (February 28, 1977), in *The Voice of New Music: New York City 1972–1982: A Collection of Articles Originally Published in The Village Voice*, digital ed., (Eindhoven, Netherlands: Het Apollohuis, 1989), n.p., <https://www.charliemorrow.com/pdfs/TheVoiceOfNewMusic.pdf>.

¹⁵ Alan Licht, *Sound Art Revisited* (New York: Bloomsbury Academic, 2019), 56–57.

¹⁶ Licht, *Sound Art*, 57–58; Bill Fontana, *Sound Sculpture* (Melbourne: National Gallery of Victoria, 1976), published in conjunction with an exhibition of the same title, presented at the National Gallery of Victoria, March 1–26, 1976.

https://www.resoundings.org/PDF/Sound_Sculpture_Exhibition_Catalogue_National_Gallery_of_Victoria_1978.pdf.

¹⁷ Max Neuhaus, “A Max Sampler: Six Sound Oriented Pieces for Situations Other Than That of the Concert Hall,” in *Source: Music of the Avant-Garde, 1966–1973*, ed. Larry Austin and Douglas Kahn (Berkeley: University of California Press,

installation in the Museum of Modern Art's sculpture garden, Neuhaus attached "acoustic drivers" (quite possibly, tactile transducers) to a ventilation chamber, thus transforming it into a loudspeaker capable of generating extremely low frequencies. Neuhaus used the "subsonic resonances" to effect a "slight change" in visitors' aural perception of the space.¹⁸

What to do about these transductions and the practices they had engendered? What to do about "sound installations," sonic "transplants," Oliveros's "performance music," and Tudor's "electroacoustic environment"? And what to *call* these emergent practitioners? Was Laurie Anderson a musician, a performance artist, or a pop star? Hybrid practices can only go unnamed and uncontained for so long—so much do they hobble the machinery of criticism, curation, and the market; and to the musical establishment as well as the art world (which, as we saw in Chapter 4, was now busy assimilating sonic practices compatible with its own formal vocabularies), this activity must have seemed so much *noise* in need of domestication.

Art historian Douglas Kahn, as will be recalled from this dissertation's Introduction, has leveraged the shrewd term "musicalization" to describe the tactics whereby the 20th-century musical avant-garde continuously reached beyond the limits of "musical materiality" for "worldly sound" and "noise" with which musical practice could be rejuvenated (and the definition of "music" expanded ever more). As a strategy wielded by *practitioners*, "musicalization" reached its point of exhaustion when John Cage, claiming even inaudible and unintended ("silent") sounds for music's domain, ensured that "no audible sound existed outside music."¹⁹ Music critics, however, evidently

2011), 193–200; Bernhard Gál, "Updating the History of Sound Art: Additions, Clarifications, More Questions," *Leonardo Music Journal* 27 (2017): 79, https://doi.org/10.1162/LMJ_a_01023.

¹⁸ The Museum of Modern Art, "Max Neuhaus: A New Work (Underground)," press release, June 1978, https://www.moma.org/momaorg/shared/pdfs/docs/press_archives/5609/releases/MOMA_1978_0045_41.pdf; Max Neuhaus, "Lecture at the Seibu Museum Tokyo: Talk and question period" (1982), in *Inscription: Sound Works Volume 1* (Ostfildern, Germany: Cantz Verlag, 1994), 68–69. In his similar and well-noted work *Times Square* (1977), located in New York's eponymous commercial hub, Neuhaus installed a low, continuous drone beneath a subway grate at the end of a pedestrian traffic island. Licht, *Sound Art Revisited*, 54.

¹⁹ Douglas Kahn, "Introduction: Histories of Sound Once Removed," in *Wireless Imagination: Sound, Radio, and the Avant-Garde*, ed. Douglas Kahn and Gregory Whitehead (Cambridge, MA: The MIT Press, 1994), 3.

saw no “endgame” in Cage’s decisive gesture, for around 1980, when faced with an increasingly fractious and eclectic horizon of sonic practices, they brought musicalization out of retirement, gathering as many hybrids as possible under the banner “new music.”²⁰

“New music” had certain obvious investments, as well as a defined center of gravity: arguably a New York export, it was fundamentally linked to the “Downtown” pole of New York’s territorial split between “Uptown” and “Downtown” music (the former category representing the institutional avant-garde and stodgy deference to Europe, and the latter representing the freewheeling experimentalism of the lower Manhattan loft scene).²¹ However, at new music’s 1979 coming out festival at The Kitchen (“New Music New York”) and its 1980 reboot in Minneapolis, MN (“New Music America”), both of which featured Oliveros, the new supra genre was billed as an “expanded tradition” capable of encompassing everything under the sun: musical Minimalism, jazz, conceptualism, and site-specific sound installation, to name but a few of the component categories trotted out. A June 1980 write-up in the *Twin Cities Reader* dramatized the operation of musicalization unfolding in real time: “So if Rule Number One says that there aren’t any rules, then new music escapes definition. At the risk of sounding metaphysical, the boundaries on this music, and on NMA [New Music America], are virtually limitless.”²²

In spite of its advertised boundlessness, “new music,” as naked and anxious a power grab as Coca-Cola’s New Coke, could not wholly make sense of music’s transductions and their consequences. And amidst the mad scramble to contain sonic hybrids, the art world, which was growing noisier by the day, undertook its own containment operation designed to claim music’s problematic new bodies, “sites,” and “installations” for itself. This containment operation went by

²⁰ Kahn has memorably remarked that Cage “opened music up into an emancipatory endgame.” Douglas Kahn, *Noise, Water, Meat: A History of Sound in the Arts* (Cambridge, MA: MIT Press, 2001), 164.

²¹ Kyle Gann, *Music Downtown: Writings from The Village Voice* (Berkeley: University of California Press, 2006), xvi–xvii, 1–15.

²² Ken Goodman, “Twin Cities Hit Chords of Cooperation,” *Twin Cities Reader*, June 4, 1980, 80.

the name of “sound art.” Below, I want to briefly reconstruct the emergence of “sound art,” so termed, between 1979 and 1983, reuniting with Oliveros, Tudor, and their pupils and peers, and locating them relative to this capacious new label for cross-disciplinary sonic experimentation. While it is, as a stylistic genre or field of practice, every bit as constructed, artificial, and indeed, *tactical* as “new music,” “sound art” remains with us to this day, as do self-nominated “sound artists” working under Oliveros and Tudor’s influence. A grasp of sound art’s longer arc is crucial to an understanding of how our practitioners’ engagements with embodiment and mediation have rippled forward, finding new vessels in which to resonate.



Identifying points of origin or origination is always a troublesome business. And when one takes to the historical record with the intention of tracing “sound art” back to its supposed roots, one finds not a linear evolution unfurling from a single moment of conception, but rather a forking trail leading to various half-steps, stoppages, and detours. In recent years, the derivation of the *term* “sound art” has been the subject of a certain amount of squabbling, with commentators agreeing generally on a coinage date somewhere between 1975 and 1985 but diverging with respect to the originating agent: a variety of exhibitions, practitioners, and writers have been given historical priority.²³

Yet, regardless of the specifics, the term’s early, unstable appearances in the Seventies are of historical interest to us. For example, as Judy Dunaway has recently observed, 1974 saw the release of a text and art anthology titled the *Something Else Yearbook 1974* via the Something Else Press, a publishing imprint founded by Fluxus affiliate Dick Higgins; the cover of the yearbook, advertising the material contained inside, promised, variously, “poetry,” “things seen,” “notations,” and—up

²³ See, for example, Gál, “Updating the History of Sound Art,” 78–79; and Judy Dunaway, “The Forgotten 1979 MoMA Sound Art Exhibition,” *Resonance: The Journal of Sound and Culture* 1, no. 1 (2020): 25–27, <https://doi.org/10.1525/res.2020.1.1.25>.

top—“sound art.”²⁴ Inside, one could find not only works by artists Alison Knowles and John Giorno, and texts by Charles Bukowski (1920–1994) and William Burroughs (1914–1997), but also a score by Alvin Lucier and Oliveros’s own *Sonic Meditations*. It is meanwhile important to recognize that Max Neuhaus seems to have been one of earliest and most self-assured adopters of the term “sound art.”²⁵ In 1980, Neuhaus provided the following representative sound-bite to a newspaper covering his New Music America contribution: “Anyone can enter these pieces. They need no initiation. One doesn’t need education to deal with sound art.”²⁶

It will prove most valuable to glance across sound art’s early institutional history, for not only is this history more straightforward to reconstruct, but it is a history in which Tudor, Oliveros, and their collaborators directly figure. Almost certainly, the first museum exhibition bearing the title “Sound Art” took place at New York’s Museum of Modern Art (MoMA) in 1979.²⁷ Helmed by curator Barbara London, whose later MoMA exhibition “Soundings” (2013), discussed below, was inaugurated by an Oliveros performance, “Sound Art” (1979) featured three works by three artists—Maggi Payne (1945–), Julia Heyward (1949–), and Connie Beckley (1951–). Played off a Technics cassette deck in MoMA’s modest Auditorium gallery and presented in stereo sound, the featured works consisted of tape recordings alone.²⁸

The significance of London’s exhibition lies not only in its early claim on the genre, but in how the curator understood sound art. Working at MoMA since 1970, London had been an instrumental force behind the museum’s move to exhibit and acquire “video art,” an art form defined by artists’ use of video-recording technology—made newly accessible by the 1967

²⁴ Dunaway, “MoMA Sound Art Exhibition,” 25–26.

²⁵ Gál, “Updating the History of Sound Art,” 78–80.

²⁶ Jon Bream, “‘Concert’ Kicks off Festival: Sound Sculpts Conservatory Space,” *Minneapolis Star*, June 6, 1980, 17. Notably, Neuhaus eventually came to reject the term “sound art.” See Max Neuhaus, “Sound Art?,” liner notes for *Volume: Bed of Sound*, MoMA PS1, 2000, compact disc.

²⁷ Dunaway, “MoMA Sound Art Exhibition,” 25–27.

²⁸ Dunaway, 28.

introduction of Sony's battery-powered Portapak.²⁹ Many of the key practitioners and critical commentators that helped consolidate the video idiom in the early Seventies understood video art as a uniquely *media*-specific practice. Reflecting on video art in a 1976 anthology, Beryl Korot (1945–) and Ira Schneider (1939–), founders of the influential video magazine *Radical Software* alongside Phyllis Gershuny (now Segura), observed that the art form “represents an extension of the traditional context of art, and *also of media*—specifically, broadcast TV.”³⁰ London understood video art’s unique technological constitution well, and in an interview with the author, she recalled that she titled “Sound Art” (1979) in analogy to video art; such a gesture would, implicitly, at least, have nominated sound art as a creature of mediation.³¹

The theme of electronic mediation was more explicitly at issue in a large-scale exhibition organized in 1980 at Berlin’s Akademie der Künste. Helmed by René Block (1942–), a curator whose Galerie Block had played a crucial role in the circulation of experimental musical trends through Berlin in the Sixties and Seventies, “Für Augen und Ohren: Von der Spieluhr zum akustischen Environment” [“For Eyes and Ears: From the Music Box to the Acoustic Environment”] presented a sweeping historical survey of the “cross-lines” or “interrelationships” between music and the fine arts.³² Central to Block’s organizing premise was the contention that such inter-sensorial and interdisciplinary crossings had been made possible by early-twentieth-century “technical developments” and the reproductive “devices” (records, film, TV, and radio) that had emerged as

²⁹ Barbara London, “From Video to Intermedia: A Personal History,” in *Modern Women: Women Artists at the Museum of Modern Art*, ed. Cornelia H. Butler and Alexandra Schwartz (New York: Museum of Modern Art, 2010), 353–356.

³⁰ Beryl Korot and Ira Schneider, “Introduction,” in *Video Art: An Anthology*, ed. Beryl Korot and Ira Schneider (New York: Harcourt Brace Jovanovich, 1976), 3.

³¹ Barbara London, Zoom interview with the author, November 4, 2020.

³² Luca Cerizza, “The Gallerist: René Block and Experimental Music, 1965–1980 (Part I/III),” *Art-Agenda Review*, December 8, 2015, accessed February 25, 2022, <https://www.art-agenda.com/criticism/238065/the-gallerist-ren-block-and-experimental-music-1965-1980-part-i-iii>; Werner Düttman and Ulrich Eckhardt, preface, in René Block, et al., *Für Augen und Ohren: von der Spieluhr zum akustischen Environment: Objekte, Installation, Performances* (Berlin: Akademie der Künste, 1980), published in conjunction with an exhibition of the same title presented at the Akademie der Künste, Berlin, January 20–March 2, 1980, 5 (my translation).

“bearers of a new musical culture.”³³ “Through techniques of reproduction, music is de-emotionalized, demythologized, and depersonalized,” Block and Nele Hertling explain in the exhibition’s catalogue essay. “Musicians react to the emerging loss of direct contact with the listener and others through an intensified use of optical means: no longer is music merely played—it is staged.”³⁴ It is thus that in the halls of the Akademie der Künste, scores, sound installations, sounding sculptures, and “acoustical environments” by younger artists (Laurie Anderson, Bill Fontana), postwar innovators (John Cage, Earle Brown, Nam June Paik), and Fluxus affiliates (Dick Higgins, Alison Knowles, Joe Jones, 1934–1993) mingled with player-pianos, phonographs, reel-to-reel tape recorders, and early synthesizers. Given equal billing on the exhibition checklist, these latter devices were exhibited, quite literally, as works.

One figure featured in “Für Augen und Ohren” who served to bridge the generations present at the exhibition—and provided a striking case study of music’s transfiguration through mediation—was David Tudor. Traveling with Composers Inside Electronics members John Driscoll, Bill Viola, Ralph Jones (1951–), and Martin Kalve, Tudor brought *Rainforest IV*, and its menagerie of chirping, purring, and rattling objects, across the Atlantic.³⁵ The work was described, in the show’s checklist, as an “acoustic environment of hanging sounding objects, electronics, amplifiers, [and] loudspeakers.”³⁶ At the very beginning of the “Für Augen und Ohren” catalogue, within a dizzyingly complex family tree of experimental and avant-garde practitioners (as well as classical-musical forefathers, and composer-philosophers like Ferruccio Busoni), Block tellingly slotted Tudor, along with Bill Fontana, Max Neuhaus, and Maryanne Amacher, under a tree branch

³³ René Block and Nele Hertling, “Einführung,” in *Für Augen und Ohren*, 7 (my translation).

³⁴ Block and Hertling, “Einführung,” 7 (my translation).

³⁵ In keeping with their standard procedure while traveling, the CIE members likely scoured for some loudspeaker objects while on the ground in Berlin; however, a container of equipment did travel with the group by air freight, and a list of materials drawn up in Tudor’s hand reads amusingly like a hardware store inventory: “brass lampshade,” “aircraft cable,” “copper still,” “bag of c-clamps,” and “cardboard barrel” are among the many items cited. Undated materials list related to 1980 performance of *Rainforest IV* at the Akademie der Künste, Box 25, Folder 5, Tudor Papers.

³⁶ René Block, et al., *Für Augen und Ohren*, 306 (my translation).

labeled “Environmental Musik.” [Figure 2] However, looking back at “Für Augen und Ohren” decades later, Block accorded Tudor a far more significant role in the historical sweep of the show, signaling the musician’s importance to sound art’s “patrilineage”:

Through my own work, I was familiar with the developments in sound art since the 1900s. Besides working with artists of the Fluxus movement, I had strong connections to other “outsiders,” especially to a new generation of artists and composers, such as Terry Fox, Sarkis, Bernhard Leitner, Christina Kubisch, Bill Fontana, Laurie Anderson, Conny Beckley [*sic*], or Rolf Julius. From this perspective, I wanted to include the “fathers”—I would name Cage, David Tudor, and Earle Brown as such.³⁷

In 1983, back in the United States, Oliveros was herself featured in an exhibition designed to probe the origins, futures, and undefined corners of sound art. The show, titled “Sound/Art,” was organized by composer and guitarist William Hellermann (1939–), founder of the little-documented SoundArt Foundation; it appeared at New York’s Sculpture Center (May 1–30), and then at BACA’s DCC Gallery in Brooklyn (June 1–30). While it lacked the historical sweep of “Für Augen und Ohren” and that show’s overt *thematic* focus on electronic media, “Sound/Art” boasted a selection of works that almost uniformly relied, for their very materiality, on a complex infrastructure of transduction devices.

In his *Three Columns for America* (1976), performance and video artist Vito Acconci (1940–2017) presented a small wooden table lined with three sets of headphones—“a voice in each ear”; in a work titled *Amplified Money* (n.d.), composer and (self-identified) sound artist Richard Lerman (1944–) attached contact microphones to 1-, 5-, and 10-dollar bills, fashioning them into “handbuilt microphones”—presumably for use in performance; for his work *Triped* (1981), sculptor Keith

³⁷ Luca Cerizza, “The Gallerist: René Block and Experimental Music, 1965–1980 (Part II/III),” *Art-Agenda Reviews*, December 15, 2015, accessed February 25, 2022, <https://www.art-agenda.com/criticism/238088/the-gallerist-rene-block-and-experimental-music-1965-1980-part-ii-iii>. Upon first organizing “Für Augen und Ohren,” Block understood the exhibition as a genealogy of “intermedia”; however, speaking here, he would seem to regard it—as many now do—as an announcement of sound art’s presence on the world stage.

Sonnier (1941–2020) incorporated amplified radio into an extruded aluminum construction.³⁸ Oliveros appeared not once but twice in “Sound/Art.” She collaborated with Hungarian-born mixed-media artist Sari Dienes (1898–1992) on a “sound sculpture” titled *Talking Bottles & Bones* (n.d.)—a work which, in sketch form, strikingly recalls Tudor’s *Rainforest IV*—and staged one of a handful of performances organized in conjunction with “Sound/Art.” [Figure 3] Occupying a unique position, in “Sound/Art,” as a “pioneering composer” of considerable renown, Oliveros functioned as the show’s most direct conduit to the experimental musical tradition in which sound art had first taken root.³⁹

Sound art’s earliest institutional murmurings between 1979 and 1983, assessed in miniature here, were as inchoate and thematically conflicted as they were groundbreaking. It is, for example, notable that all three of the exhibitions described above relied, for their thematic justification, on links between hearing and *vision*, sound and *image*: the press release for London’s “Sound Art” found the curator remarking that “sound art stimulates the observer’s visual imagination”; Block’s “Für Augen und Ohren,” whose catalogue cover bore the taunting image of Man Ray’s *Indestructible Object* (1923/65), a metronome affixed with an unblinking eye, took visual/sonic cross-connections (eyes and ears) as its nominal focus [Figure 4]; and Hellermann’s “Sound/Art,” whose title placed an anxious slash between its two terms, was motivated in part by the curator’s belief that “hearing is felt as another form of seeing.”⁴⁰ Operative, here, is something like the visual arts’ answer to

³⁸ William Hellermann and Don Goddard, *Sound/Art* (New York, NY: The SoundArt Foundation, Inc.), published in conjunction with an exhibition presented at The Sculpture Center, New York, NY, May 1–30 1983, and at BACA/DCC Gallery, June 1–30, 1983, n.p.

³⁹ The phrase “pioneering composer” appears in Oliveros’s bio in the *Sound/Art* catalogue. The full bio reads thus: “Pauline Oliveros has worked at the forefront of new music composition, since the 1950’s, and today is considered one of the world’s most distinguished experimental composers. She has been the recipient of a Guggenheim Fellowship as well as several international prizes. The process of attention is of primary importance to Oliveros, who describes the creative process as ‘centering in the present.’ She dedicates the merit of her work to the benefit of all human beings.” Hellermann and Goddard, *Sound/Art*, n.p.

⁴⁰ The Museum of Modern Art, “Museum Exhibition Features Works Incorporating Sound,” press release, June 1979, https://assets.moma.org/documents/moma_press-release_327230.pdf?ga=2.230636892.1976245880.1645905186-2123555157.1638247058; Hellermann and Goddard, *Sound/Art*, n.p.

“musicalization,” and this “opticalization” (if so ugly a neologism can be offered) bathes sound art’s early-Eighties awakening in an uncertain cast. It is nevertheless important to examine such early exhibitions, and to attend to Tudor and Oliveros’s participation in them, for in “Für Augen und Ohren” and “Sound/Art” respectively, the practitioners filled a significant role: they were present not only as transducers of a disciplinary sort—figures who, in earlier years, had carried music across the breach into the museum—but also as *generational* transducers interfacing between experimental music’s longer legacy, and the emergence of a more assured, stylistically resolved sound art.

Among the representatives of this more youthful wave of sonic experimentalism were Tudor and Olivero’s pupils, collaborators, and friends. In the years following Chocorua (1973), and concurrent with his leading involvement in Composers Inside Electronics (CIE), John Driscoll found ways to synthesize his newly acquired knowledge of resonant phenomena and electronics with his preexisting interests in sculpture, constructing gallery installations incorporating resonating objects (including, in one 1986 work, a fishing pole extending out a window), and working with an engineer to prototype a “rotating loudspeaker instrument” capable of throwing sound more dynamically around architectural spaces.⁴¹ Already by 1980, fellow CIE member Bill Viola had established himself as a premiere video artist interested in the idiosyncrasies of perception, the rendering of “mental images,” and, indeed, resonance and voice; however, his immediate post-Chocorua trajectory was powerfully shaped by Tudor’s influence and patterned with works wedded to the developing idiom of sound installation as much as to video.⁴² Sometime after *Rainforest*’s first post-Chocorua performance, which Viola had arranged at Syracuse University’s Everson museum, the younger artist wrote Tudor with an expression of considerable gratitude, remarking, “[B]eing involved with [Rainforest] and meeting you has redefined a lot of things for me. . . . You’ve

⁴¹ John Driscoll, “Resonance: From the Architectural to the Microscopic,” *Leonardo Music Journal* 22 (2012): 27–28, https://doi.org/10.1162/LMJ_a_00088.

⁴² The phrase “mental images” is Viola’s own. “Interview of the Rainforest Group,” CME Archives.

completely changed my concept of sound, for one.”⁴³ While visiting UCSD with CIE in January–February 1977, Viola clarified, during the interview with the group, exactly *what* had changed:

I think for me the case of *Rainforest* has induced more of just a change in my certain set of experiences of sound. . . [W]hen I first met everybody in that workshop, I was kind of involved in just getting started building my own circuits, and coming out of that workshop with a synthesizer maybe, and doing a lot of tape-kinds [*sic!*] of [sound pieces]. And I was kind of discouraged and disappointed in my sound-work around that time, because it was like taped electronics sounds, and I wasn’t getting very much from it. . . And then when I started working with *Rainforest*, I was just able to understand sound as a *physical material*, you know? Like when you use it in an object, it’s very clear that sound is a *physical kind of thing*. I mean, you can understand that if you feel vibrations of sound in your body. . . I guess I never really understood that before, and that’s affected everything else I’ve done.⁴⁴

Registered in Viola’s words is a clear and viscerally felt understanding of the resonant bodies of this dissertation’s title. Coming out of the kind of sonic embodiment modeled by *Rainforest*, the artist had succeeded in channeling that understanding into his own practice. Just weeks before flying west, Viola had staged a solo showing at The Kitchen featuring an installation work titled *He Weeps for You* (1976). In the installation, which marked an important point of crystallization in Viola’s early practice, a video camera on a tripod is focused on the tip of a copper pipe extending downwards from the ceiling above; equipped with a close-up lens, the camera magnifies small drops of water as they balloon from the pipe spout at gradual, even intervals, and fall downward onto a drum wired for amplification. *Drop. . . Drop. . .* thus becomes *BOOM. . . BOOM. . .* The steady booms of the drum represent only part of *He Weeps for You*, but a significant part. **[Figure 5]** If Barbara London, who brought the work to MoMA just months before her 1979 “Sound Art” show, termed the work a “video-sound installation,” the work nonetheless relies, for its power, presence, and access to the gut (one critic describes its sound “mov[ing] through [them]”), on its grasp of sound’s tactile

⁴³ Bill Viola to David Tudor, c. 1974, Box 60, Folder 2, Tudor Papers.

⁴⁴ “Interview of the Rainforest Group,” CME Archives.

qualities—its status as a “physical kind of thing.”⁴⁵ Borrowing a term that is indeed Tudor’s own, Viola himself characterized the work as a “tuned space.”⁴⁶

The lessons Viola took from Tudor did not atrophy or slide into irrelevance as he solidified his reputation as a capital-v Video Artist in subsequent decades. “[Y]ou did teach me to hear with my eyes,” the artist once related to his early mentor, and indeed, Viola, who first learned to make environmental “field recordings” at Chocorua, carried Tudor’s influence into his treatment of sound *on video*.⁴⁷ In 1987, art critic and theorist Gene Youngblood could say this of Viola: “No one in the history of film or video has employed sound so brilliantly, integrated it so totally into the form and content of the narrative. . . What normally is regarded as background noise is for him foreground figure or object—positive rather than negative space.”⁴⁸ In 1990, in a text contributed to the edited anthology *Sound by Artists* (discussed, in this dissertation’s Introduction, for its status as a key pre-millennial document of sound art), Viola arrived at a sophisticated understanding of the sound-video relationship decades in the making, mounting a media-theoretical critique of the way video has been understood: “Technologically,” Viola states,

all video has its roots in the live. The vibrational acoustic character of video as a virtual image is the essence of its ‘liveness.’ Technologically, video has evolved out of sound (the electromagnetic) and its close association with cinema is misleading since film and its grandparent, the photographic process, are members of a completely different branch of the genealogical tree (the mechanical/chemical). The video camera, as an electronic transducer of physical energy into electrical impulses, bears a closer original relation to the microphone than to the film camera.⁴⁹

There is scarcely any room, here, to tease out the import and implications of Viola’s contention that video consists in the “liveness” of acoustical vibration (the quoted term should

⁴⁵ The Museum of Modern Art, “Projects: Bill Viola,” press release, March 1979, https://www.barbaralondon.net/wp-content/uploads/2019/12/1979-Bill-Viola_He-Weeps-for-You_Projects_press-release.pdf; Ann Sargent Wooster, “Calibration of Mysticism,” *Soho Weekly News*, January 27, 1977.

⁴⁶ Museum of Modern Art, “Projects: Bill Viola.”

⁴⁷ Bill Viola to David Tudor, n.d., Box 60, Folder 2, Tudor Papers.

⁴⁸ Gene Youngblood, “‘The Source of the Images Is Within’: The Videotapes of Bill Viola,” *MoMA* 45 (Autumn 1987): 2, <https://www.jstor.org/stable/4381027>.

⁴⁹ Bill Viola, “The Sound of One Line Scanning,” in *Sound by Artists*, ed. Dan Lander and Micah Lexier (Toronto, Ontario: Art Metropole, 1990), 44.

recall, for us, Tudor's mid-Sixties experiments in live-electronic music). However, it is of considerable interest that media theorist Wolfgang Ernst, one of the leading voices of contemporary "media archaeology," has drawn directly on Viola's words in his recent, provocative theorizations of the "sonicity" of electronic images and information.⁵⁰

One of Viola's co-contributors in *Sound by Artists* was the New Zealand-born sonic experimentalist named Annea Lockwood, and her contributions to the volume could not sit in starker contrast to Viola's reflections on the "vibrational character of video." One of her two project summaries describes a work titled *A Sound Map of the Hudson River*, commissioned originally by Hudson River Museum (Yonkers, NY) in 1982. Above a thin crop of a New York state map calling out locations and times ("Lake Tear of the Clouds June 19, 1982 2 p.m.", "Calamity Brook, a tributary of the Hudson June 18, 1982, 1 p.m."), Lockwood describes a process whereby, over the course of a year, she walked along the Hudson river making mono and stereo tape recordings, moving from its highest source stream (Feldspar Creek, in the Adirondacks) to Great Kills Beach on Staten Island.⁵¹ Lockwood released a CD recording of her "two-hour aural trace" in 1989, and in that release's liner notes, she issued this important clarifying statement: "Since 1970 I have recorded rivers in many countries, not to document them, but rather for the special state of mind and body which the sounds of moving water create when one listens intently to the complex mesh of rhythms and pitches."⁵²

It is by no coincidence that Lockwood's description of her long-running *River Archive* project (ca. 1970–), of which *A Sound Map of the Hudson River* represents just one tributary, carries the distinct

⁵⁰ Wolfgang Ernst, *Sonic Time Machines: Explicit Sound, Sirenic Voices, and Implicit Sonicity*, Recursions: Theories of Media, Materiality, and Cultural Techniques (Amsterdam: Amsterdam University Press, 2016), 29. Regarding media archaeology and its derivation from Kittlerian media theory, Alexander Rehding, "Discrete/Continuous: Music and Media Theory after Kittler: Introduction," *Journey of the American Musicological Society* 70, no. 1 (2017): 225–226, <https://doi.org/10.1525/jams.2017.70.1.221>.

⁵¹ Annea Lockwood, "A Sound Map of the Hudson River," in *Sound by Artists*, 220–221.

⁵² Annea Lockwood, quoted in liner notes, *A Sound Map of the Hudson River*, Lovely Music, Ltd. CD 2081, 1989 and 2003, compact disc, <http://www.lovely.com/albumnotes/notes2081.html>.

echoes of Oliveros's language, for Lockwood had been in close touch with Oliveros since 1970.⁵³ It was at this time that Lockwood mailed off a letter to San Diego articulating her appreciation of Oliveros's music and her writing, which she had encountered in *Source* magazine (where, we will recall, Oliveros the 1971 batch of her *Sonic Meditations*, 1971–73).⁵⁴ Lockwood was then living in England, though she would move to the United States in 1973 and secure a teaching post at New York's Hunter College.⁵⁵ Lockwood's initial May 1970 letter to Oliveros is stunning, so precisely does it drill into the core of the latter musician's developing philosophy. Indeed, while by this time, Oliveros had not begun her *Sonic Meditations*, Lockwood would seem to closely anticipate their conceptual program and model of sonic embodiment:

Thought my hearing was probably very primitive and needed sharpening up so I stopped building sounds altogether and started just listening. Now, more and more I seem happy just to listen—not really wanting to modulate them in any way, not at all to use them as ‘materials,’ content just to listen. Does that seem very passive to you? . . . [H]ow far could one get in tracing the effects set up in one’s body, by various sounds? It’s as if listening/hearing is a whole physical scene, like dancing, set up between your brain and body, and the sounds coming into it, with all sorts of transformations going on.⁵⁶

Just as Viola implicitly grasped the nature of *Rainforest*'s embodiment—namely, its making *plastic* of sound—Lockwood fundamentally understood Oliveros's approach to embodiment, which hinged on the transformation of listening and sounding into a physical *performance*, or an unfolding “bio-theater.” (“It’s as if listening/hearing is a whole physical scene, like dancing. . . .”) That Lockwood arrived at this understanding before Oliveros *herself* brought this thinking to its fullest realization in practice is nothing short of extraordinary. In 1973, by which time Lockwood and Oliveros had corresponded regarding the *Sonic Meditations*, and by which time, indeed, Lockwood had performed them herself with friends, the latter musician penned meditations of her own: a *Morning Meditation*, and two *Water Meditations*. [Figure 6] These works hew closely to the Oliveros's

⁵³ Martha Mockus, *Sounding out: Pauline Oliveros and Lesbian Musicality* (New York: Routledge, 2008), 62–63.

⁵⁴ Annea Lockwood to Pauline Oliveros, May 9, 1970, Box 17, Folders 2–5, Oliveros Papers NYPL.

⁵⁵ Mockus, *Sounding Out*, 62–63.

⁵⁶ Lockwood to Oliveros, May 9, 1970.

blueprint, and indeed, one of the *Water Meditations*, in a direct citation of *Sonic Meditation VI* (“Sonic Rorschach”), instructs readers to seek out a natural “white noise” source (“a place where the river cascades through falls, a weir, a gorge”).⁵⁷ As Martha Mockus observes, however, Lockwood’s works sharpen the most radical implications of the *Sonic Meditations* in that they *only* solicit listening; while a number of the *Sonic Meditations*—certainly, the most consequential—demand only a performance of active listening, many others involve some form of sounding, calling, in most cases, on the voice.⁵⁸

That Lockwood, unlike Oliveros, has been explicitly and with consistency been regarded as a “sound artist”—the former has indeed adopted the term “sound art” for certain, but not all, of her works—owes perhaps to her divergent deployment of embodied listening.⁵⁹ Several of Oliveros’s *Sonic Meditations* called for the use of colored lights, or specified performance environments, but generally, they privileged spatial adaptability and a simplicity of means over site-specificity and framing elements. In contrast, Lockwood’s work of the Seventies made increasing use of more elaborate installations and set-ups in performance spaces, and on occasion, more pointedly incorporated an “intermedia” or multimedia component. *World Rhythms* (1975), for example, is a ten-channel live improvisation that literally surrounded audiences with ten loudspeakers and bathed them in the sounds of pulsars, earthquakes, rivers, peepers, and breathing, among other noises.⁶⁰ Meanwhile, in *Play the Ganges Backwards One More Time, Sam* (1974), another product of Lockwood’s *River Archive* project, Lockwood presented her field recordings alongside color slides. [Figure 7] But if it is true that Lockwood inched more towards the idiom of the “sound environment” or “sound installation” exemplified by *Rainforest*, it is equally true that she extended the poetics of pure corporeal performance embedded in the *Sonic Meditations*. In October 1974, the *Village Voice* reported

⁵⁷ Annea Lockwood, *Morning Meditation* and *Water Meditations* (1973), Box 24, Folder 26, Oliveros Papers.

⁵⁸ Mockus, *Sounding Out*, 62–63.

⁵⁹ Licht, *Sound Art Revisited*, 2.

⁶⁰ *World Rhythms* (1975) instructions, Box 17, Folders 2–5, Oliveros Papers NYPL.

that in a work called *Tripping*, presented by The Kitchen, Lockwood bussed a group to Long Island's Jones Beach, distributed cotton ear plugs, and asked her assembled listeners to simply "find [their] own music."⁶¹

Do Lockwood and Viola, with their self-described "sound installations," "sound works," and, in Lockwood's case, "sound art," get us any closer to that latter genre? While they no doubt received the signals that Oliveros and Tudor transduced and carried them forward, modulating music's matter and meaning still further, they remained complexly affiliated. (This is particularly true of Viola, a "video artist" despite himself.) They could not be *reduced* to sound art. Certainly, the persistence of "musicalization" on the part of critics, institutions, and practitioners had something to do with this. Dan Lander's introduction to *Sound by Artists*, the 1990 volume to which Lockwood and Viola both contributed, laid out the situation concisely, suggesting that after sound art's brief, provisional emergence circa 1979–83, its temporary victory against "new music" had been rolled back. These are the words that first prompted Douglas Kahn to adopt the term "musicalization," and though they are now thirty years old, they still, to this day, ring true:

The desire to compile this anthology was driven by the noticeable lack of information and critical analysis regarding an art of sound. Although there has been an abundance of activity centered around explorations into sonic expression, there is no sound art movement, as such. . . . The terms experimental music and sound art are considered to by some to be synonymous and interchangeable. In fact, it is difficult to identify an art of sound precisely because of its historical attachment to music. . . . If a sound liberation is to occur it will mean confronting the meaning(s) of the noise we produce. . . .⁶²

2. Theories and models (to the present)

It has been one of this dissertation's stated goals to connect Tudor and Oliveros's media experimentation and formulations of sonic embodiment to the tangled roots of sound art. And while the long, tyrannical reach of "musicalization" makes any such genealogical reconstruction

⁶¹ Tom Johnson, "Annea Lockwood's 'Tripping,'" *The Village Voice*, October 17, 1974.

⁶² Dan Lander, "Introduction," in *Sound by Artists*, 10–14.

frustrating and painful, I have suggested that circa 1979–83, Oliveros and Tudor found themselves acting as generational transducers interfacing, or mediating, between experimental music’s longer legacy, and sound art’s uncertain future. I have likewise suggested that even before this moment, certain of the musicians’ collaborators, friends, and pupils honed the implications of the work, confidently taking their places in the disciplinary breach that works like *Rainforest* and the *Sonic Meditations* (1971–73) had opened up. When sound art did decisively arrive in the new millennium, “full-born from the hip” (Kahn), Tudor and Oliveros did, again, find themselves drawn into the art-institutional fold (the former posthumously, and the latter in person).⁶³

On the very literal cusp of the 2000s, New York’s Whitney Museum of American Art mounted “Part II” of its sweeping two-pronged exhibition “The American Century: Art & Culture 1900–2000,” and in conjunction with the exhibition, experimental musician and (yes) sound artist Stephen Vitiello (1964—) transformed the museum’s Kaufman Astoria Studios Film & Video Gallery into a “listening room,” piping, from its speakers, a generous representation of the “history of experimental sound pieces in America.”⁶⁴ Pieces by Tudor and Oliveros—the former’s *Rainforest* (the first Cunningham iteration, 1968), and the latter’s electronic work *I of IV* (1966)—circulated through the gallery, along with Annea Lockwood’s *A Sound Map of the Hudson River* (1989 recorded release), Terry Riley’s early “Sonics” piece *Mescalin Mix* (1960–62), John Cage’s *Williams Mix* (1952), and too many other pieces to count.⁶⁵

Oliveros and Tudor’s sounds kept circulating. In 2009, John Driscoll, Phil Edelstein, and Matt Rogalsky of Composers Inside Electronics created a “self-running installation version” of

⁶³ Douglas Kahn, “Digits on the Historical Pulse: Being a Way to Think About How So Much Is Happening and Has Happened in Sound in the Arts,” 2002, accessed February 26, 2022, <http://www.mediaarthistory.org/refresh/Programmatic%20key%20texts/pdfs/Kahn.pdf>.

⁶⁴ “The American Century: Part II of The American Century,” *Whitney Magazine*, Fall 1999–Winter 2000, 12.

⁶⁵ “I Am Sitting In A Room: Sound Works by American Artists: 1950–2000,” Hi-Beam, accessed February 26, 2022, <http://www.hi-beam.net/org/whitney/jan00.html>.

Rainforest for Laboratorio Arte Alameda in Mexico City, distinguishing it from the Chocorua version of the work (*Rainforest IV*, 1973) by dubbing it *Rainforest V*.⁶⁶ This culminating transformation eased *Rainforest's* assimilation into museum spaces—this time beyond the boundaries of set performance times—and in 2019, as discussed in my Introduction, the work arrived at the Museum of Modern Art (MoMA). In 2013, Oliveros also arrived at MoMA, carrying her Roland-V accordion to the museum’s outdoor sculpture garden and taking a seat. In a performance titled *What's the Score?*, she improvised live before an audience, instructing her listeners to “score” any sounds heard during the piece’s unfolding (noises, notes, clusters) by representing them on notecards with graphics, words, and drawings. Following the performance, Oliveros gathered her audience’s notecards, explaining that she would compose a new piece using the notated sounds.⁶⁷ With its solicited participation and, per one critic, its “cybernetic loop” of creative feedback, *What's the Score?* constituted a techno-logical anticipation of Oliveros’s *Deep Listening Room* at the 2014 Whitney Biennial.⁶⁸ And whereas that latter work functioned as an exhibition finale, *What's the Score?* celebrated the opening of “Soundings: A Contemporary Score,” MoMA’s “first major exhibition” of artists across disciplines working with sound as a material, medium, or point of conceptual departure. The show was curated by Barbara London, who thirty-four years before, had graced the museum with her “Sound Art” (1979). As I write this conclusion, *Rainforest* and Oliveros’s *Sonic Meditations* and related works continue to proliferate through museums, asserting their ongoing relevance to sound art’s histories (both revisionist and actual).⁶⁹

⁶⁶ “Rainforest V,” Composers Inside Electronics, accessed February 26, 2022, http://composers-inside-electronics.net/rainforest/RAINFOREST_V.html.

⁶⁷ “Soundings: A Contemporary Score exhibition @ MOMA, NYC. . . ,” Ideologic, July 30, 2013, accessed February 26, 2022, <https://bit.ly/3tcWUfR>.

⁶⁸ Richard Leslie, “Review: *Soundings: A Contemporary Score*,” CAA Reviews, May 14, 2015, accessed February 26, 2022, <http://www.caareviews.org/reviews/2189#.YhtD0-7M1qs>.

⁶⁹ As of my writing, Tudor and CIE’s *Rainforest V* remains on exhibition at the Arter Museum in Istanbul, Turkey. “David Tudor and CIE, Inc.: Rainforest V (variation 3),” Arter Museum, accessed February 26, 2022, <https://www.arter.org.tr/en/exhibitions/rainforestvariation3>. On February 19, 2022, Pauline Oliveros’s *Tuning Meditation* (1971) was performed at the Hammer Museum in Los Angeles. “The Tuning Meditation by Pauline Oliveros

This continued attention to Tudor and Oliveros's respective practices within the art institution is of course confirmation of this thesis and demands engagement in the present narrative. But with these final words, I want to extend beyond the question of the musicians' own reception in a welcoming art world. I want to turn, instead, to the sustained resonance of the models of embodiment they formulated in the Seventies, in the barn at Chocorua, and in campus laboratories and "consciousness-raising" sessions. These models, and the theories of musical mediation that they encode, have remained subject to close analysis, study, and emulation—and this is because they radically rewrite what it means to make and mediate music, and what it means to listen.⁷⁰

While I have examined these theories and models in *practice*, as operating through and within the embodied subjects (technological and techno-logical) of *Rainforest* and the *Sonic Meditations*, Tudor and Oliveros also encoded their theories in writing. The words Tudor left us with are brief—but they are beautiful and crystalline. As You Nakai explains, in October 1976, Tudor and the *Rainforest* "performance group" were invited for a one-week residency Festival d'Automne à Paris, an annual interdisciplinary arts festival. It was this engagement that first prompted Tudor and John Driscoll to consider official names for their performance group, and eventually, they landed on "Composers Inside Electronics."⁷¹ The meaning behind this name is made clearer when one reads the program note Tudor penned for CIE's performance series at Paris's Palais Galliera. The short text, which Tudor titled "The View From Inside" [Figure 8], reads thus:

The realm of electronics, entered into in the spirit of discovery, can give the musician a new world. Electronic components & circuitry, observed as [instrumentally] individual & unique [instruments] rather than as servomechanisms, [will] more and more reveal their personalities, directly related to the particular musician involved with them. The deeper this process of observation, the more the components seem to require & suggest their own

with IONE," Hammer Museum, accessed February 26, 2022, <https://hammer.ucla.edu/programs-events/2022/tuning-meditation-pauline-oliveros-ione>.

⁷⁰ In a relevant reflection on what he terms "music-theoretical instruments," Alexander Rehding has written on the "epistemic aspects" of instruments, or their ability to encode knowledge about the "musical systems in which they operate." Alexander Rehding, "Instruments of Music Theory," *Music Theory Online* 22, no. 4 (December 2016): 4, <http://www.mtosmt.org/issues/mto.16.22.4/mto.16.22.4.rehding.php>.

⁷¹ You Nakai, *Reminded by the Instruments: David Tudor's Music* (New York: Oxford University Press, 2020), 300–303.

musical ideas, arriving at that point of discovery, always incredible, where \wedge^{music} is revealed from ‘inside,’ rather than from ‘outside.’⁷²

In November 1978, two years after Tudor and CIE’s Paris residency, composer Julio Estrada (1943–) invited Oliveros to participate in an International Studies Seminar on Musical Creation and the Future at Universidad Nacional Autónoma de Mexico. Prior to the seminar, Estrada asked Oliveros for a title for a presentation she was to give; Oliveros recalls that her “unhesitating answer was Software for People.”⁷³ While never in her talk does Oliveros define “software for people,” or even suggest what this phrase might mean, one passage offers an instructive clue:

I believe that humanity has been forced to a new frontier by the accelerating rate of change instigated by technology. This frontier is the exploration of consciousness: all forms of consciousness and especially human consciousness. No matter how diverse the lifestyles or music, a common denominator might be found in the study of sensory and attention processes which enable humans to perceive organize, interpret, and interact with the intelligence that is music. It is no longer sufficient to dwell solely on the music; the perceiver must be included. The analysis, understanding and possible expansion of such sensory and attention processes, (as distinguished from the content or results), with and without the aid of technology, will greatly influence the future of music. I believe that through the exploration of (human) consciousness we will reach a new understanding of what music can be, and howe can, and do, interact with it.⁷⁴

In these two statements, respectively, we find two conceptions of a music mediated, and two orientations towards listening. In “The View From Inside,” Tudor speaks of music, of sound, born within the components and circuitry of electronics, treated not as servomechanisms—as automata—but as “individuals” with voices, with agency, and with “ideas.” This is not a vision of technological determinism, of “personalities” preordained by the grain of machinery, because Tudor never believed in such an unyielding grain, always preferring to “find out what electronic equipment can do which is not really programmed into it.”⁷⁵ Theorized, here, is music *suggested* by media to a primal,

⁷² David Tudor, “The View From Inside” (1976), Box 19 Folder 12, Tudor Papers.

⁷³ Pauline Oliveros, “Software for People” (1978), in Pauline Oliveros, *Software for People: Collected Writings 1963-1980*, 2nd ed. (Kingston, NY: Pauline Oliveros Publications, [1984] 2015), 177.

⁷⁴ Oliveros, “Software for People,” 180.

⁷⁵ David Tudor, interview by Bruce Duffie, April 7, 1986, OHV 241 s-t, transcribed tape recording, Major Figures in American Music, Oral History of American Music (OHAM), Irving S. Gilmore Library, Yale University, New Haven, CT, https://archives.yale.edu/repositories/7/archival_objects/3185382.

techno-logical body, but not dictated, and these suggestions, for Tudor, are in every case “particular.” They are cast off like sparks in each specific, situated encounter between a human maker and technologies taken as bodies. And inasmuch as these suggestions are not woven into the fabric of chips and circuits, they must be closely listened for, from an ear positioned “inside,” not out.

In “Software for People,” Oliveros speaks of music, of sound, considered from the perspective of the embodied perceiver or listener—herself treated as a medium. Oliveros’s listener possesses sense, perception, and consciousness, but these capacities and faculties are not static—they can (and must) be programmed, molded, and enhanced. Listening, Oliveros would seem to suggest, is neither given nor passive, but rather active and tunable—a process to be honed, developed, and extended ever outward. And if the ears, she would seem to say, are a kind of hardware, they determine nothing for us alone; both with technology’s evolving affordances, and the “software” that is meditation and “consciousness raising,” they can be synchronized with a changing outside, and made to suggest music never before heard.

Tudor and Oliveros’s words point us in two different directions: towards two “insides.” And in recent decades, artists and musicians have found much to discover in these interiors. Tudor’s “inside view” of technology, and his insistence upon rubbing electronics against the grain, has continued to exert a noted influence in sound art and experimental music concerned with media as agents of surprise and “glitch.” Nods to Tudor have filtered through the work and writing of Nicolas Collins (1954–), who has long delighted in the hacking apart and chaotic rewiring of CD players, radios, Speak & Spell toys; Jessica Rylan (1974–), who has oriented her skills as a circuit-bender and builder of synthesizers towards both sound installations and jarring noise music; and Robin Rimbaud, or Scanner (1964–) who, having first earned his alias in the Nineties for his use of police scanners in live performance, has progressed from explorations of “cellular noise” and “radio

hiss” to site-specific installations probing the resonances of historical buildings.⁷⁶ It is all-too fitting that sound artist Christina Kubisch (1948–) has cited Pauline Oliveros as an influence, for in works like her landmark *Electrical Walks* (2003–), which equip wandering listeners with headphones that transduce electromagnetic frequencies (the cast-off warbles of lightning activity, power lines, GPS systems, and ATMS), the extension, or reprogramming, of listening is directly at issue.⁷⁷ Oliveros’s example would meanwhile seem an unlikely yet significant precondition for practices such as Florian Hecker’s (1975–), whose multichannel sound installations and recorded works, long informed by contemporary psychoacoustic research, have endeavored to probe “the limits and possibilities of human hearing.”⁷⁸

Tudor and Oliveros’s models of sonic embodiment, and the theories of musical mediation that they encode, will continue to animate contemporary practices across disciplines, equally informing engagements with the noisy agency, animacy, and alien life of electronic media, and with the expanding reach of the listening ear, understood as a device subject to retuning and rebooting. In certain respects, as we have seen, the two bodies or “insides” that Tudor and Oliveros leave us with—one technological, and the other techno-logical—could not be more different. Unraveling two radically distinct horizons of media-theoretical possibilities, they direct us towards different sites of investigation, intervention, and reinvention. But it is no coincidence that these bodies would seem, just as clearly, to reflect and enfold one another. Born in part from a friendship, and from a

⁷⁶ See, respectively, Caleb Stuart, “Damaged Sound: Glitching and Skipping Compact Discs in the Audio of Yasunao Tone, Nicolas Collins and Oval,” *Leonardo Music Journal* 13 (2003): 49–50, <https://doi.org/10.1162/096112104322750782>; Tara Rodgers, “Jessica Rylan,” in *Pink Noises: Women on Electronic Music and Sound* (Durham, NC: Duke University Press, 2010), 139–155; and Robin Rimbaud [Scanner], “Modulisme 003: Scanner,” interview by Modulisme, 2009, accessed February 26, 2022, <https://modular-station.com/modulisme/session/3/>.

⁷⁷ Christina Kubisch, “‘The Sound Can Touch You Directly’: Christina Kubisch on Electronic Sound Art,” interview by Caitlin Woolsey, November 23, 2020, The Clark: Podcast, accessed February 26, 2022, <https://www.clarkart.edu/research-academic/podcast/season-2/christina-kubisch>.

⁷⁸ Stefan Helmreich, *Sounding the Limits of Life: Essays in the Anthropology of Biology and Beyond*, Princeton Studies in Culture and Technology (Princeton, NJ: Princeton University Press, 2015), 173.

sustained play of resonance, they constitute two halves of the same hybrid subject whose ears are open and always listening.

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- . Interview by Jack Vees and Pauline Oliveros. December 6, 1995. OHV 241 k-l. Transcribed tape recording. Major Figures in American Music. Oral History of American Music (OHAM). Irving S. Gilmore Library, Yale University, New Haven, CT.
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Thielen, D.E. Dynamic Transducer with Wall Mounted Diaphragm. 3,430,007. Sacramento, CA, filed March 16, 1966, and issued February 25, 1969.

Illustrations

Introduction

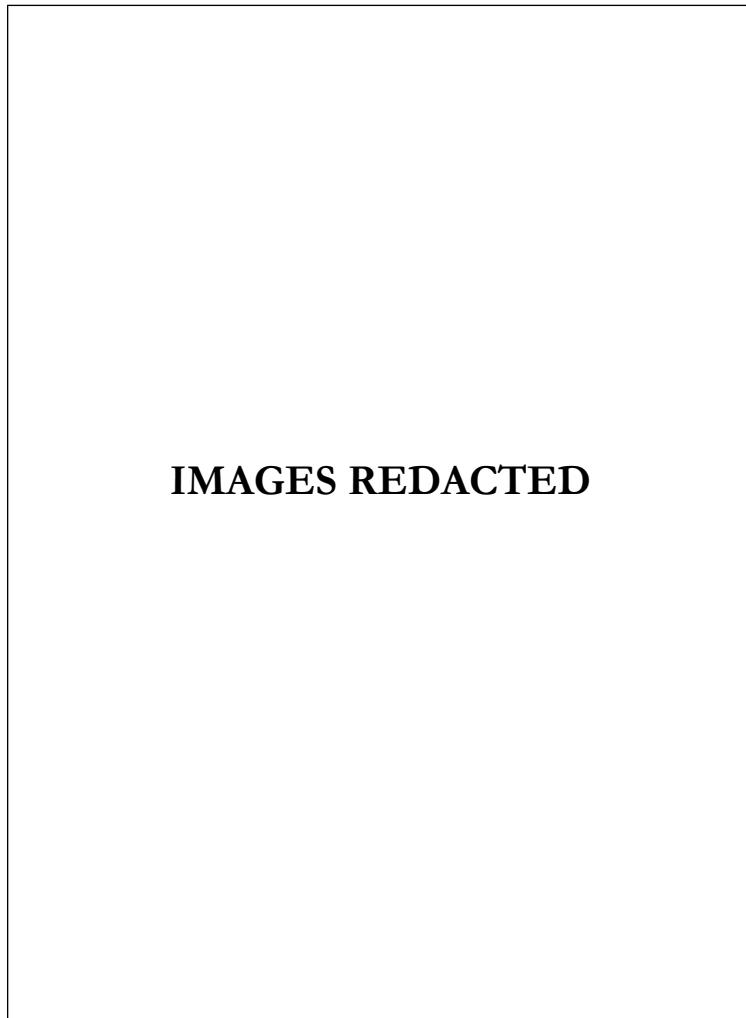


Figure 1. Installation views of the Museum of Modern Art (MoMA) exhibition “David Tudor and Composers Inside Electronics Inc. Rainforest V (variation 1),” October 21, 2019–January 5, 2020. IN2423.2. Photograph by Heidi Bohnenkamp.

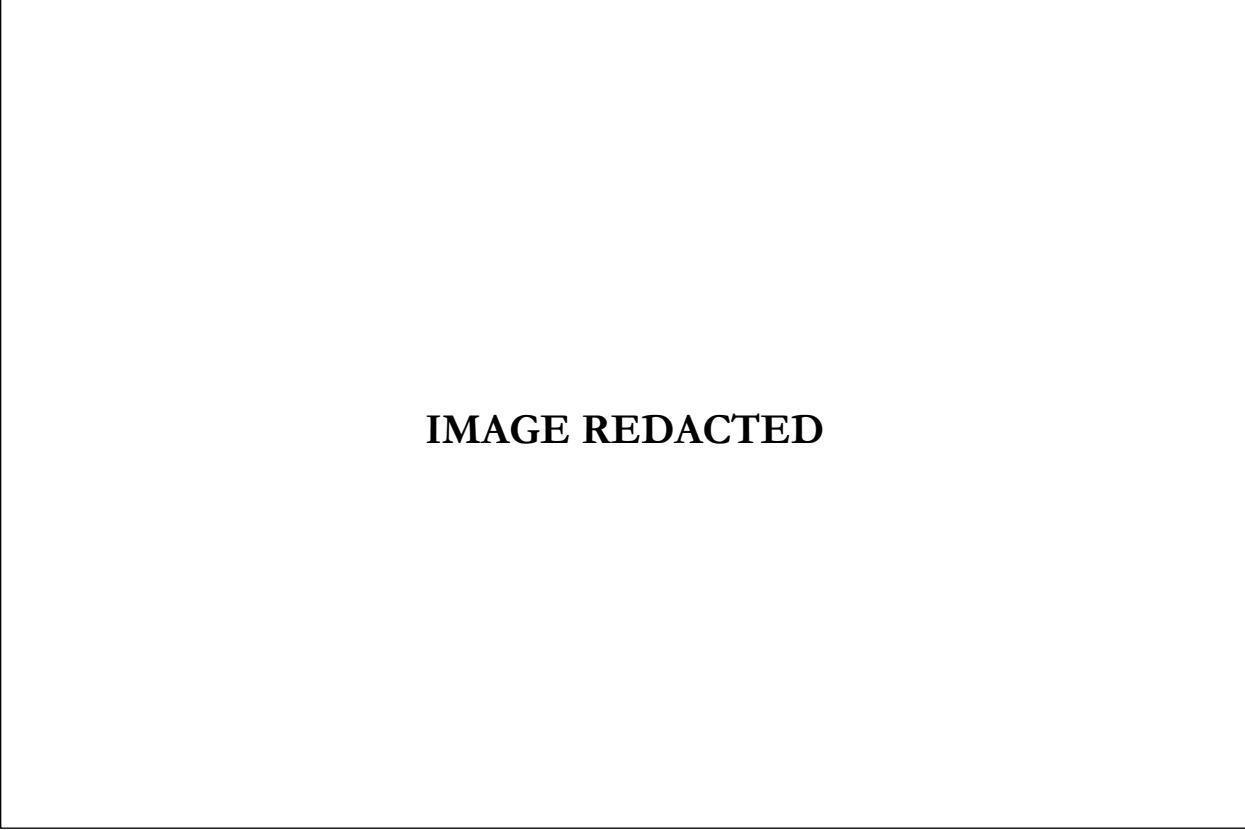


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Figure 2. Pauline Oliveros performs in her *Deep Listening Room* (2014) at the 2014 Whitney Museum of American Art Biennial. Photograph by Paula Court

Chapter 1

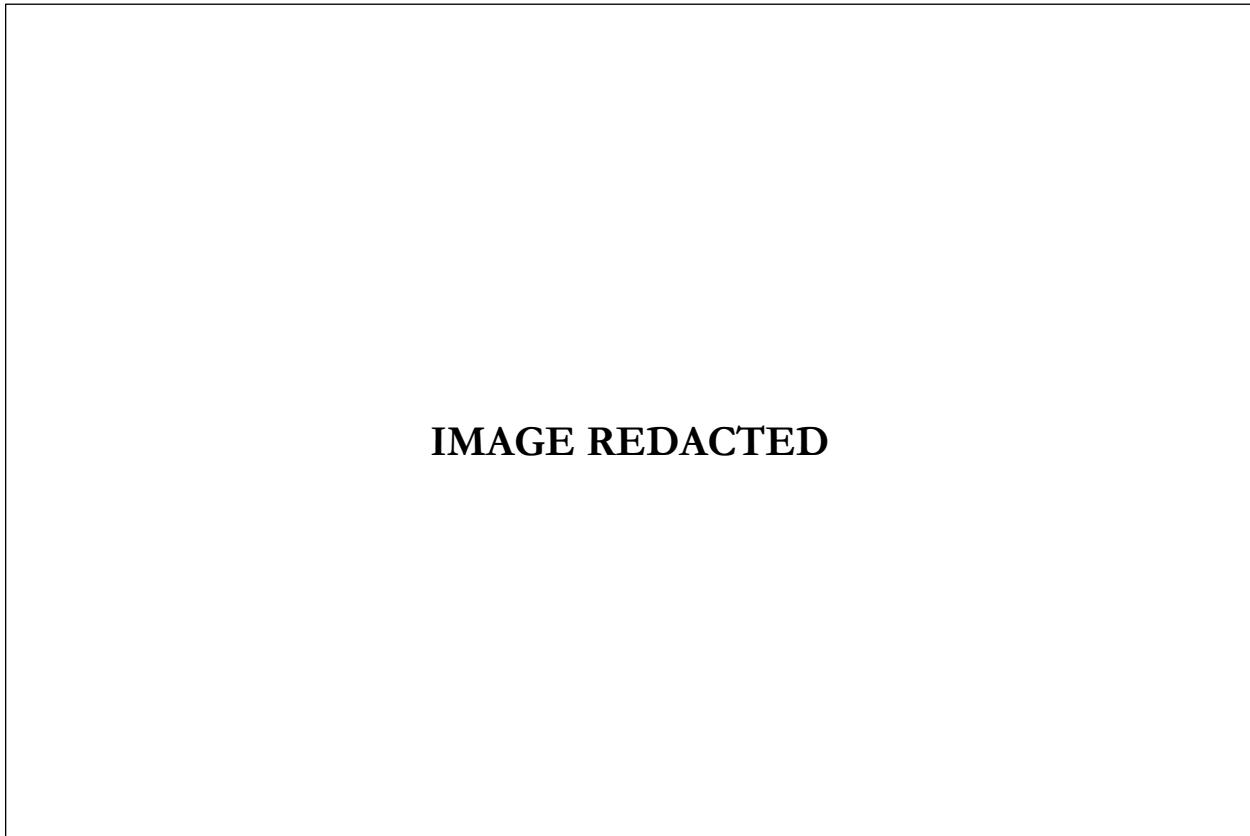


Figure 1. An excerpt from the extensive score for Cage's *Williams Mix* (1952), reproduced in James Pritchett, *The Music of John Cage* (Cambridge: Cambridge University Press, 1996), 91. Per Pritchett: “The arrows crossing some of the sounds represent the direction of cross-grain tape splicing.”

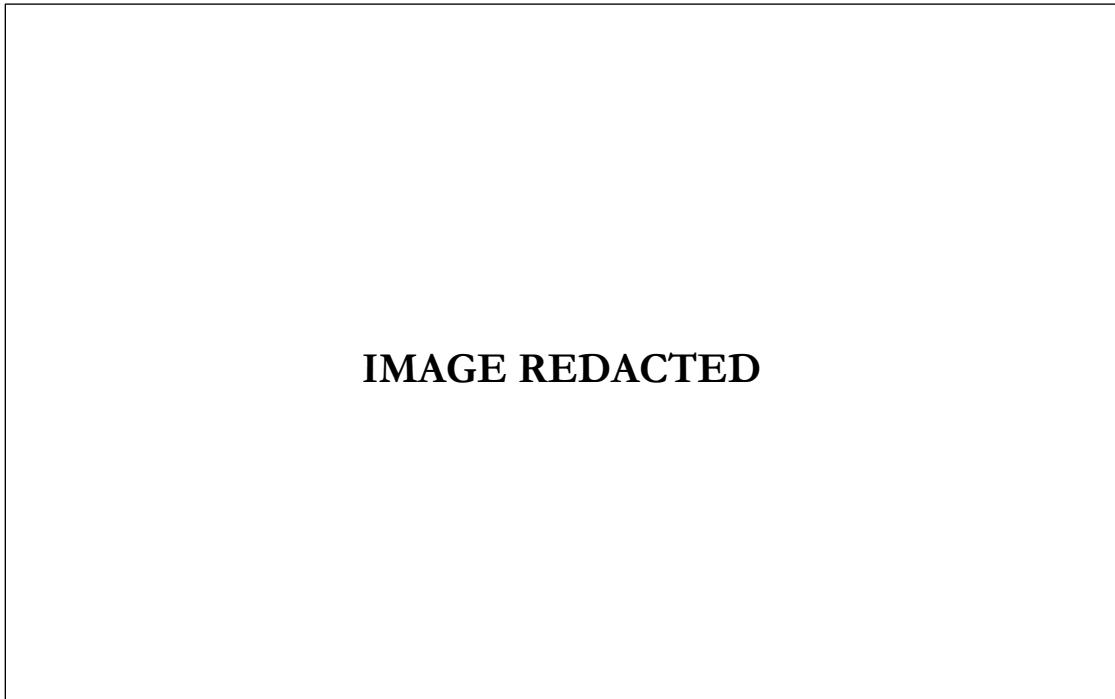


Figure 2. Cage's magnetic tape score for filmmaker Herbert Matter's *Works of Calder* (1950). Reproduced in Richard H. Brown, *Through the Looking Glass: John Cage and Avant-Garde Film*, the Oxford Music/Media Series (New York: Oxford University Press, 2019), 109.

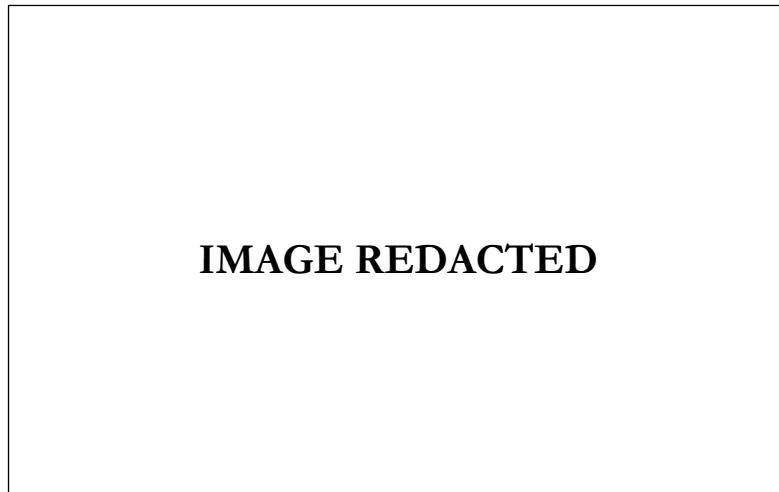


Figure 3. Martin Iddon's mapping of the tempo changes in the first rhythmic cycle of *Music of Changes* (1951), with space-time equivalencies specified. Martin Iddon, *John Cage and David Tudor: Correspondence on Interpretation and Performance*, Music since 1900 (Cambridge: Cambridge University Press, 2013), 37.

$$(5) \frac{a^2 \times b}{c} = x$$

$$\frac{47.8^2 \times .00807}{5.35} = 3.45$$

$$1 + 2 \times 2 - 1 - 1 - 2 = 1$$

Or

$$\frac{b}{c} \times a^2 = x$$

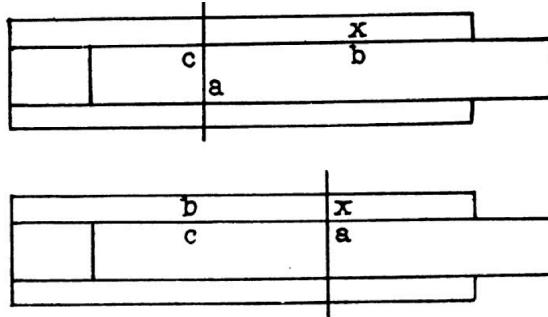


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Figure 4. Top: A diagram of “slide rule settings” as it appears in John Jesse Clark’s *The Slide Rule and Logarithmic Tables* (1921). John Jesse Clark, *The Slide Rule and Logarithmic Tables, Including a Ten-place Table of Logarithms: A Concise and Accurate Reference Work on the Application of the Slide Rule and Logarithmic Tables to Practical Problems* (Chicago: F.J. Drake & Co., 1921), 61. Bottom: The diagram recopied in one of Tudor’s notebooks datable to the early Fifties. Box 107, F2, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

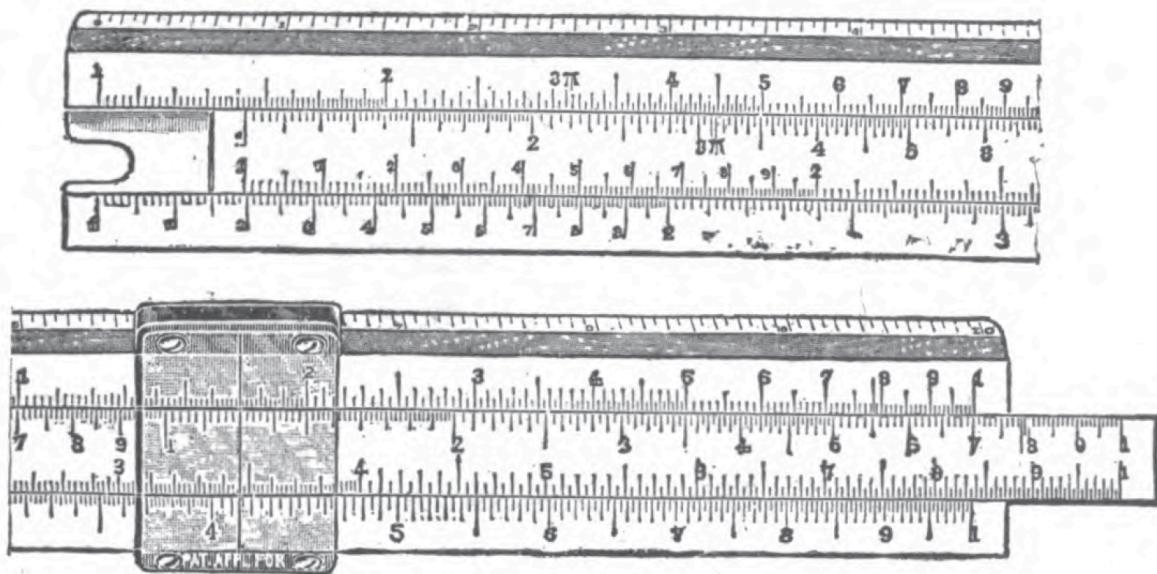


Figure 5. A “Mannheim” slide rule of the sort Tudor likely owned. Illustration reproduced in John Jesse Clark, *The Slide Rule and Logarithmic Tables, Including a Ten-place Table of Logarithms: A Concise and Accurate Reference Work on the Application of the Slide Rule and Logarithmic Tables to Practical Problems* (Chicago: F.J. Drake & Co., 1921), 25.

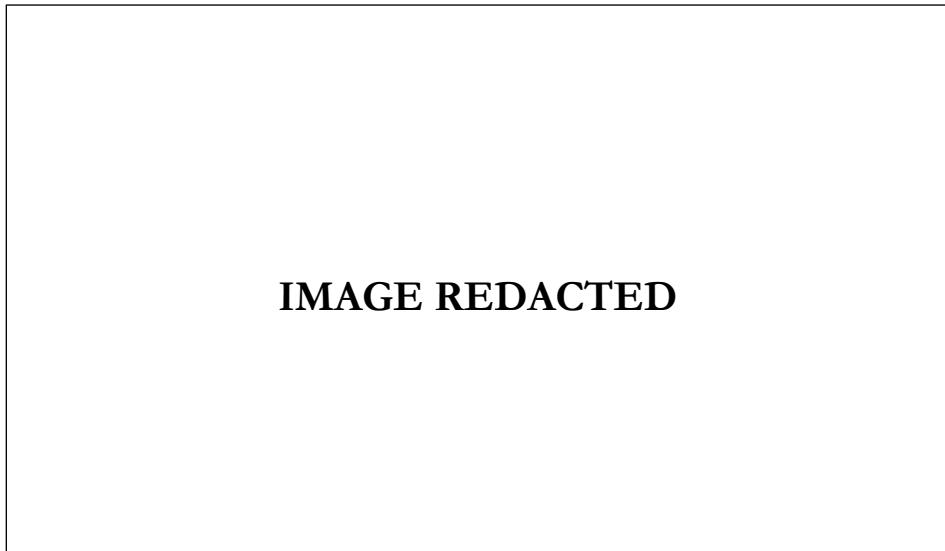


Figure 6. A sketch for Stockhausen's *Gruppen* (1955–57) graphing “orchestral thickness” (x-axis) and “attack density” (y-axis). Reproduced in Jennifer Iverson, “Statistical Form Amongst the Darmstadt School,” *Music Analysis* 33, no. 3 (October 2014): 347, <https://doi.org/10.1111/musa.12037>.

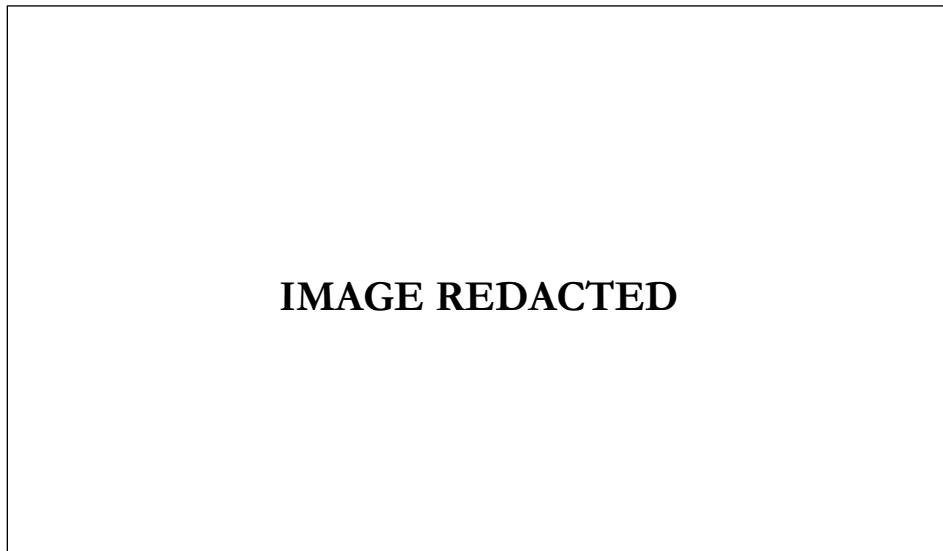


Figure 7. An excerpt of Stockhausen’s published score (1965) for *Klavierstück VI* (1954) depicting the “graded line” indicating tempo modulations for the performer. Reproduced in Eric Smigel, “Alchemy of the Avant-Garde: David Tudor and the New Music of the 1950s” (PhD diss., University of Southern California, 2003), 100.

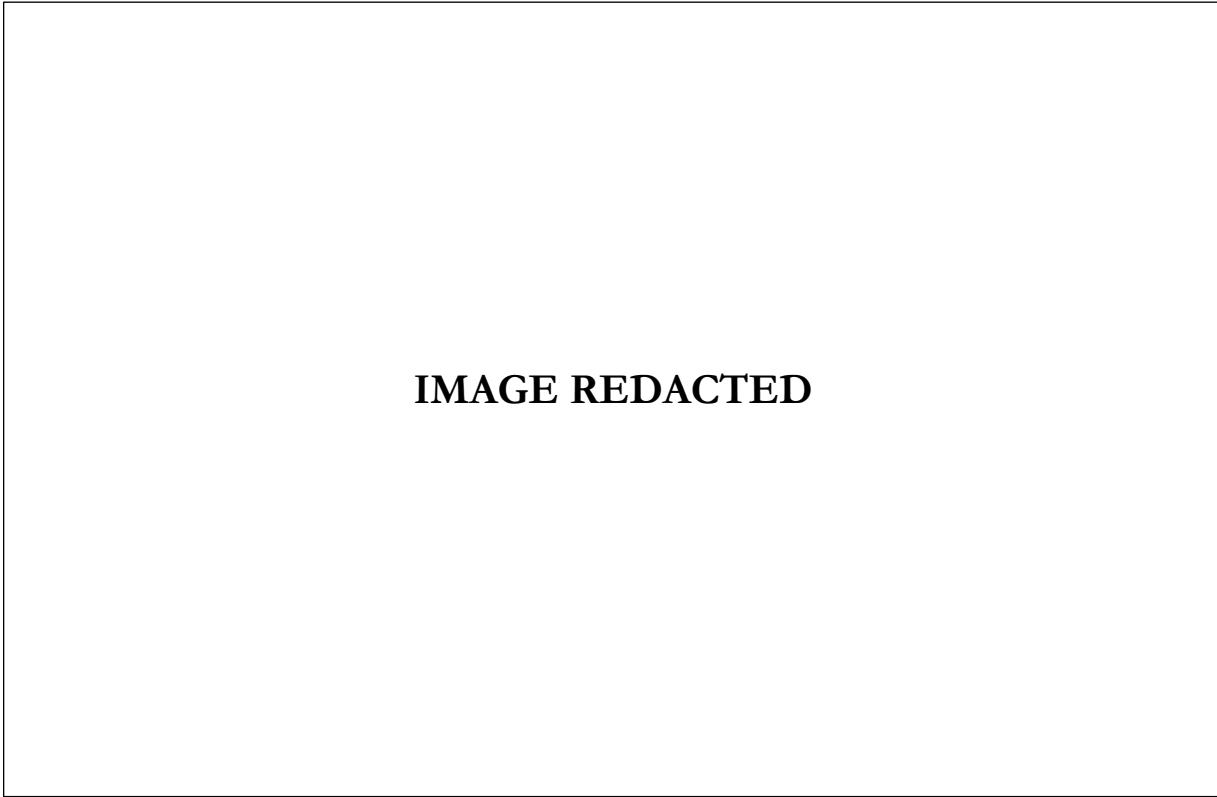


Figure 8. A page from Earle Brown's score for *Octet I* (1952–53). Sound channels are indicated on the y-axis at left; the x-axis indicates time. “Octet I,” Earle Brown Music Foundation, accessed September 6, 2021, <https://earle-brown.org/work/octet-i/>.



IMAGE REDACTED

Figure 9. Earle Brown's graphic score for *December 1952* (1952) (original manuscript). Reproduced in Rebecca Y. Kim, ed., *Beyond Notation: The Music of Earle Brown* (Ann Arbor: University of Michigan Press, 2017), 6.



IMAGE REDACTED

Figure 10. Earle Brown's score for *November 1952* (1952). Reproduced in Jane Alden, "From Neume to Folio: Mediaeval Influences on Earle Brown's Graphic Notation," *Contemporary Music Review* 26, nos. 3–4 (June/August 2007): 324.

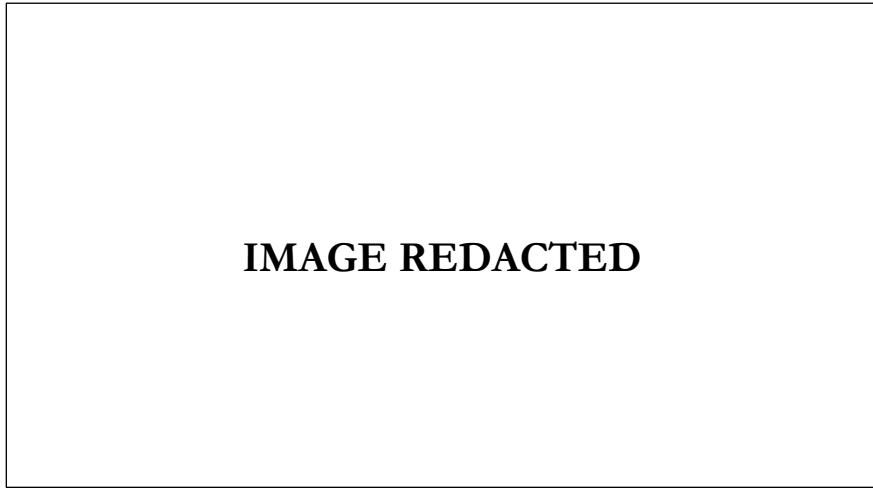


Figure 11a. Page 2 of Christian Wolff's score for *For Pianist* (1959). Box 13, Folder 4, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

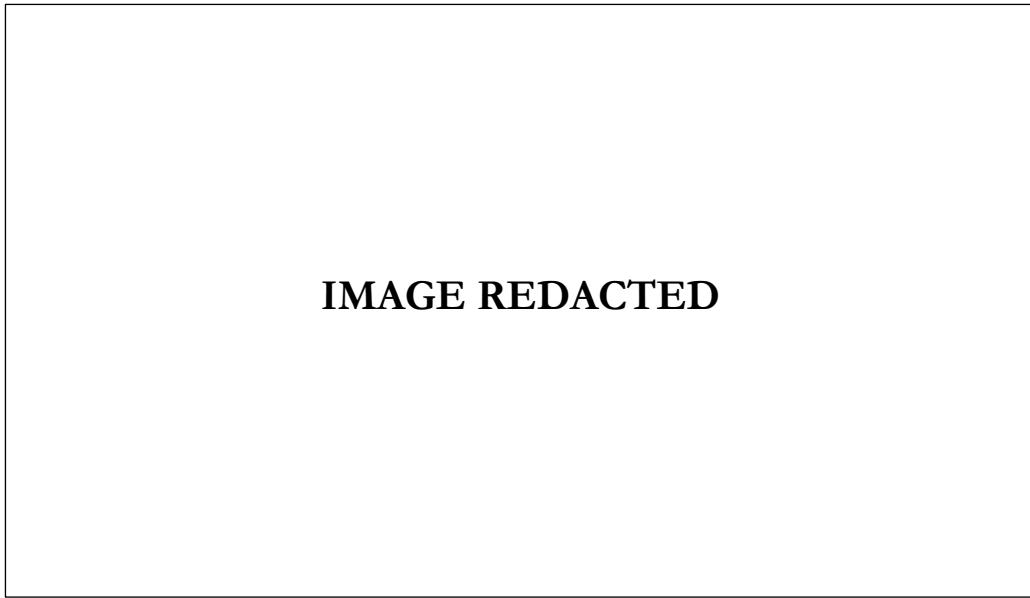
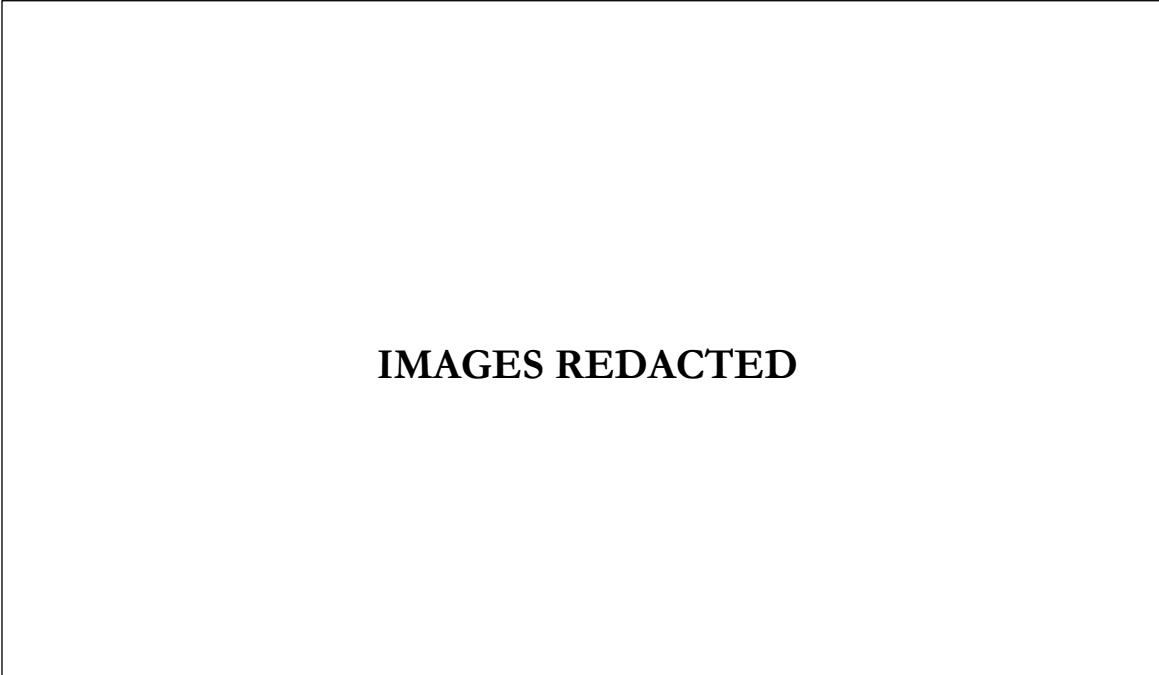


Figure 11b. A diagram illustrating the “flow of control” between a main FORTRAN II program and two subprograms. “The main program calls for subprogram A, and subprogram A calls for subprogram B. Reproduced in International Business Machines Corporation, *Reference Manual: FORTRAN II for the IBM 704 Data Processing System* (New York: International Business Machines Corporation, 1958), 5.



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Figure 12. Page 2 of Tudor's realization score for Wolff's *For Pianist* (1959), reproduced in You Nakai, *Reminded by the Instruments: David Tudor's Music* (New York: Oxford University Press, 2020), 69. One of Tudor's manipulable tabs appears in the bottom detail.

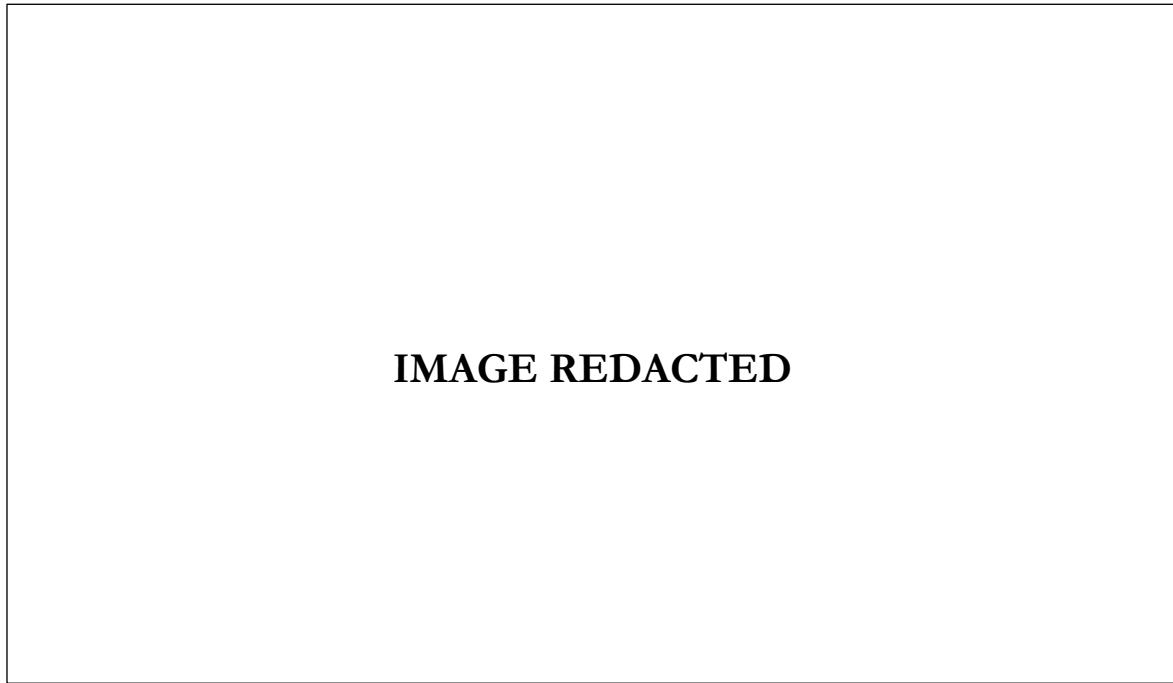


Figure 13. Jean de Bosschère, *L'Automate*, 1926. Reproduced alongside Artaud's text "L'Automate personnel" in *Cahiers d'Art* 2, no. 3 (1927).

Chapter 2

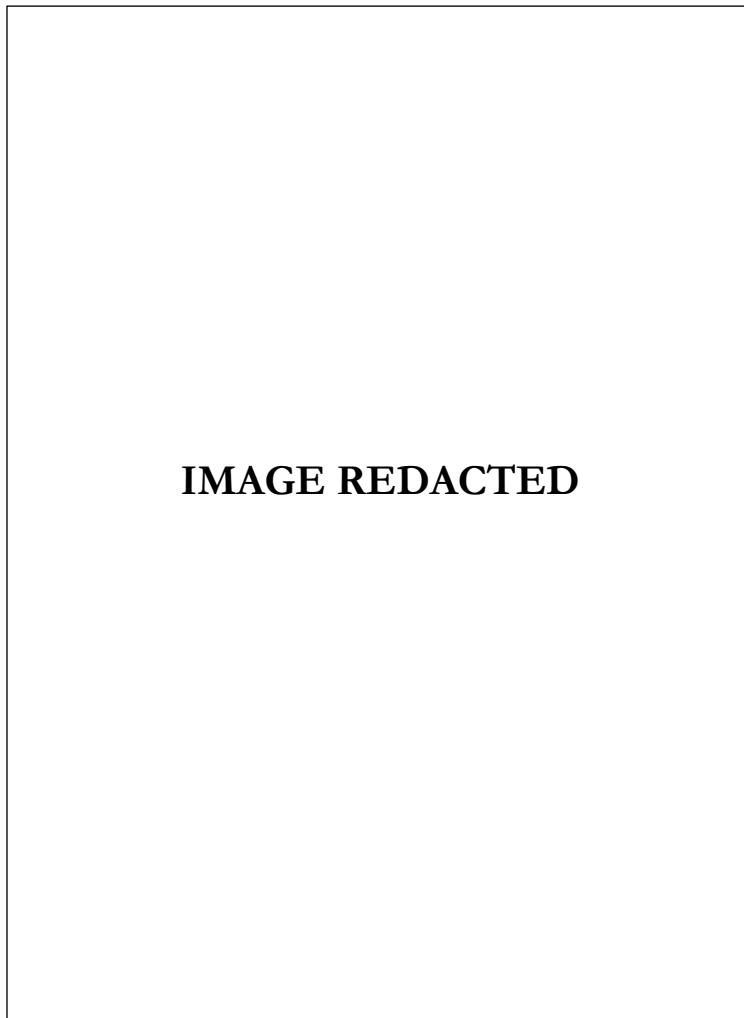


Figure 1. The Silvertone wire recorder advertised in the 1947 Sears Christmas Wish Book. Sears, Roebuck and Co., Sears 1947 Christmas Book (Minneapolis, MN: Sears, Roebuck and Co., 1947), 247, <https://bit.ly/3vsk7eY>.

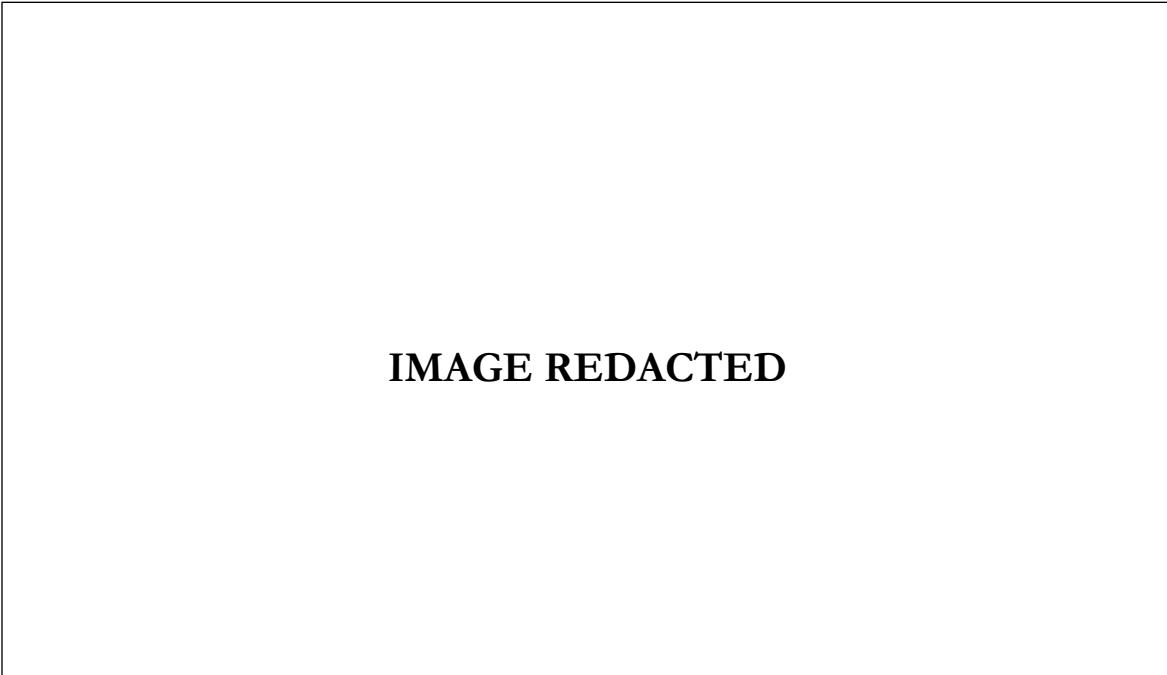


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Figure 2. Ed Gerlach's jazz band at the University of Houston is profiled in *The Houston Post*. Oliveros appears at far left, performing on the French horn. Kathleen Bland, "Song Arrangement Classroom Jumps," *The Houston Post*, February 25, 1953, 8.

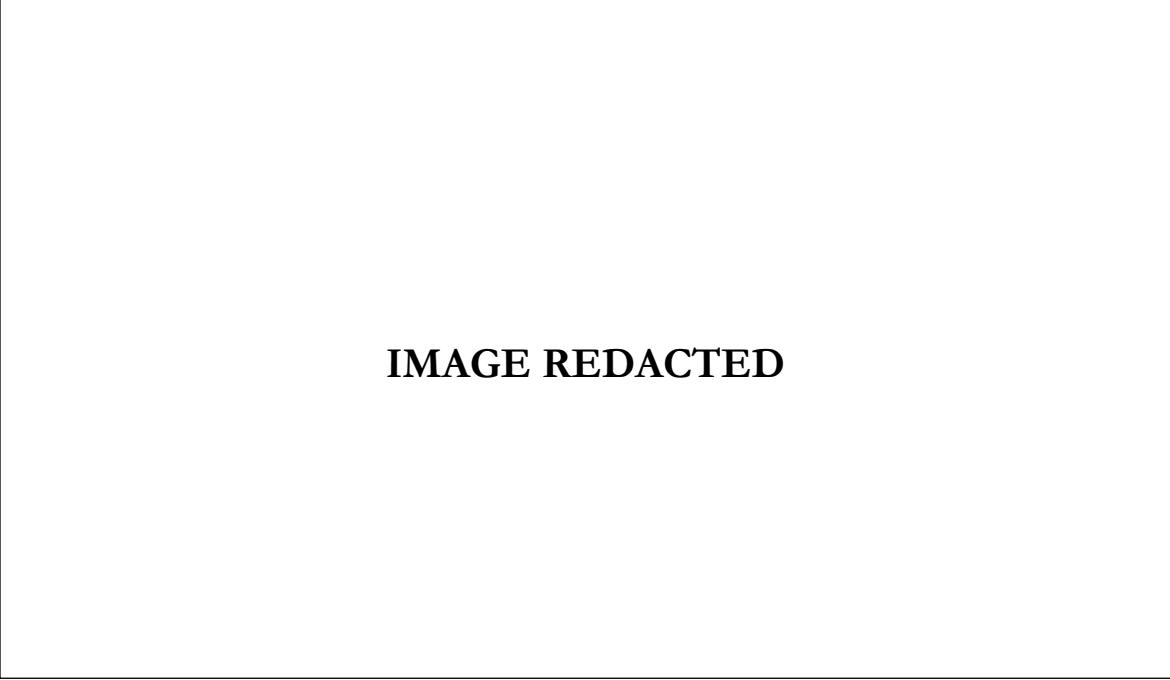


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Figure 3. The Magnetophon is demonstrated at an Institute of Radio Engineers meeting on May 16, 1946. Jack Mullin appears third from left. Reproduced in John Leslie and Ross Snyder, “History of the Early Days of Ampex Corporation,” *Journal of the Audio Engineering Society* (December 17, 2010): 3, https://www.aes.org/aeshc/docs/company.histories/ampex/leslie_snyder_early-days-of-ampex.pdf.

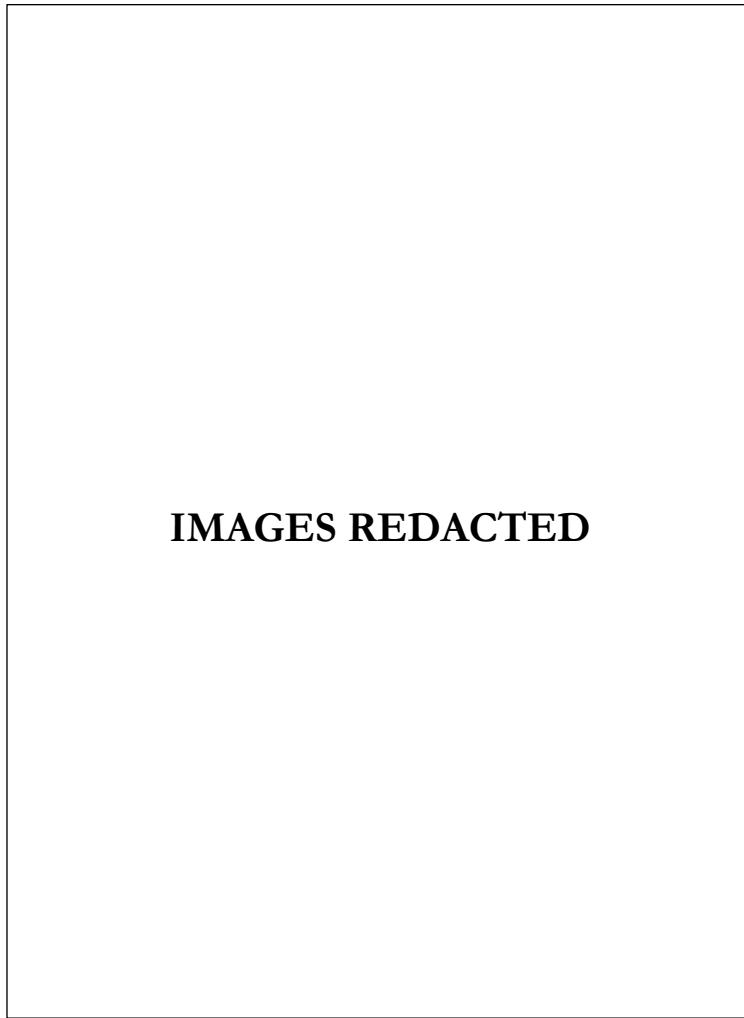


Figure 4. The Ampex 200A as pictured in its informational brochure (top), and its instruction manual (bottom). Ampex Electric Corporation, Ampex Model 200a brochure (San Carlos, CA: Ampex Electric Corporation, 1948), <https://bit.ly/3Mh3ny5>; Ampex Electric Corporation, Ampex Model 200a instruction book (San Carlos, CA: Ampex Electric Corporation, 1948), <https://bit.ly/3Esgdqt>.

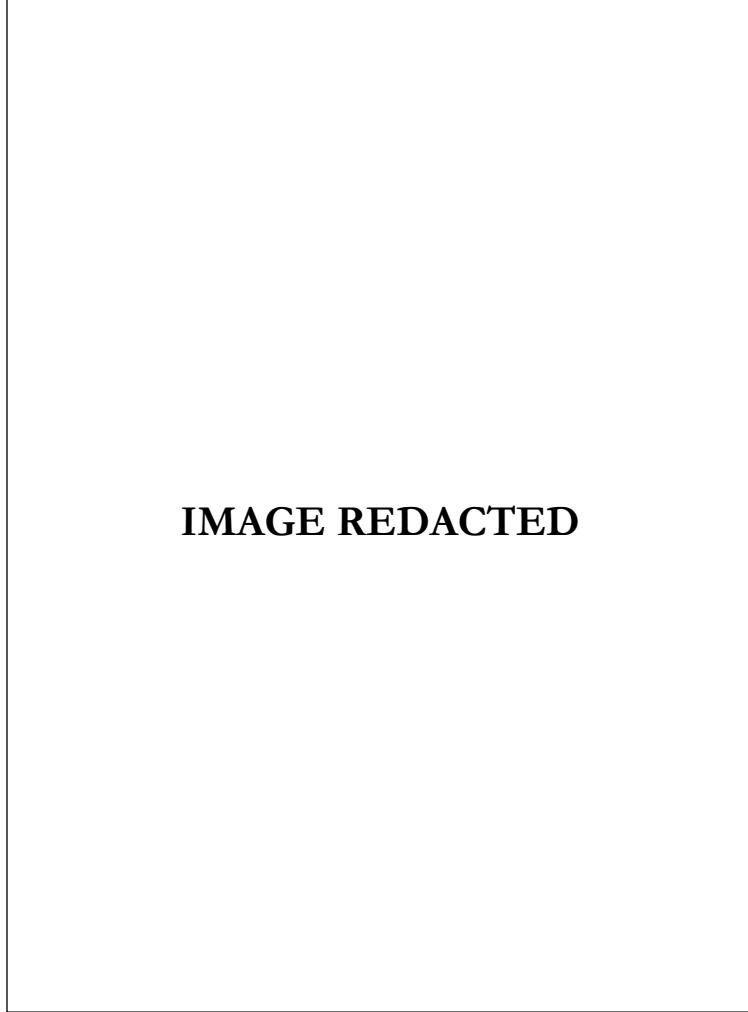


Figure 5. The 200A brochure advertises the model as the “great new unit that put the Crosby show on tape.” Ampex Electric Corporation, Ampex Model 200a brochure (San Carlos, CA: Ampex Electric Corporation, 1948), <https://bit.ly/3Mh3ny5>.

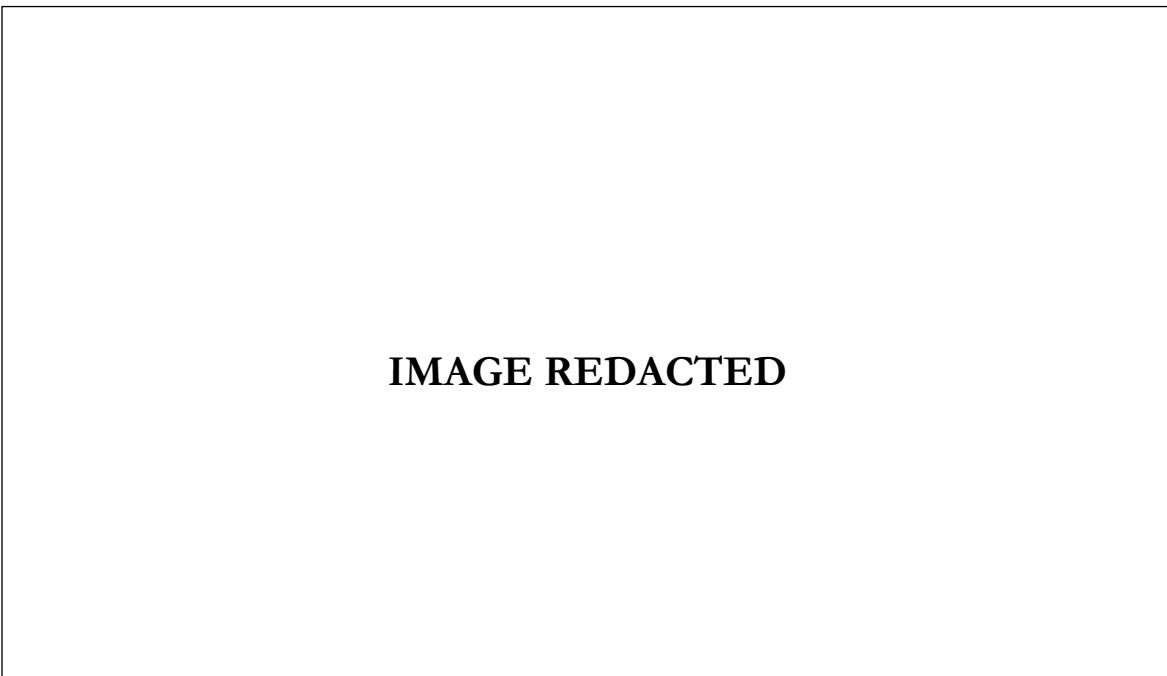


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Figure 6. Works by Pauline Oliveros and Robert Erickson are featured on the program for the May 18, 1954 Composers' Workshop recital at San Francisco State College. Box 13, Folder 19, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.



IMAGE REDACTED

Figure 7. Oliveros correlates songs (recorded to tape) and film sequences in worksheets associated with her “4-H Leader” soundtrack (1958). “Four-H Leader,” 1958, Box 3, Folder 19, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

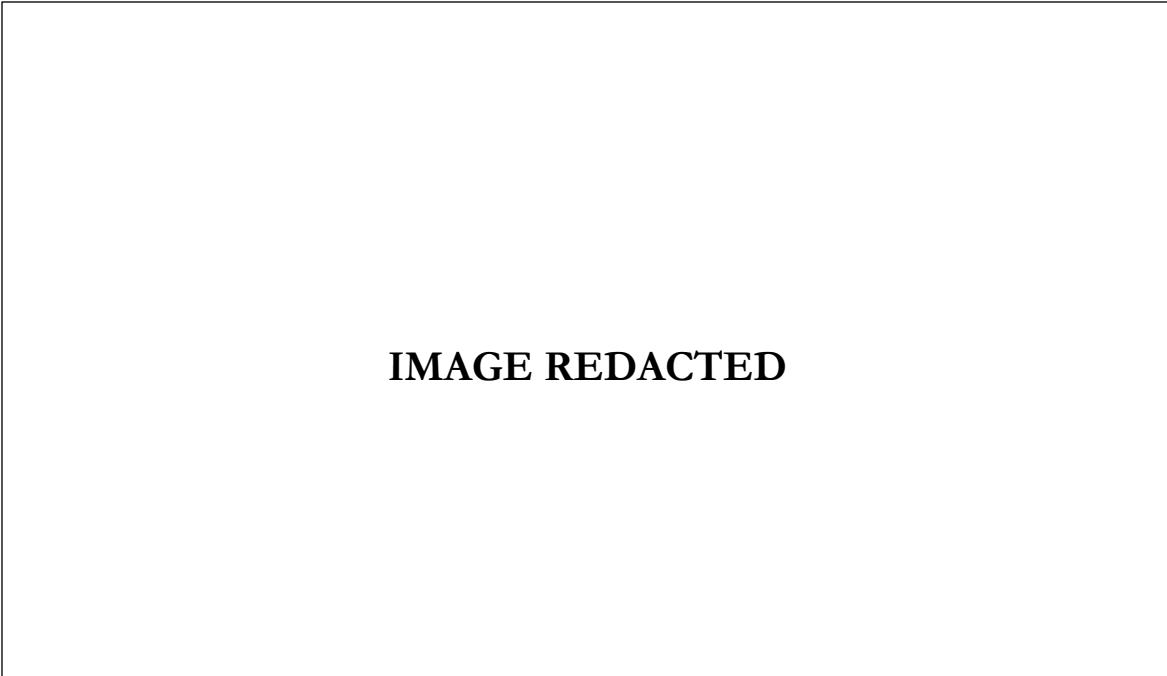


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Figure 8. Lines of narration are flagged as musical cues (with timestamps) in Oliveros's notes for her *Art of the Woodcut* soundtrack (1961). “Art of the Woodcut,” 1961, Box 1, Folder 3, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

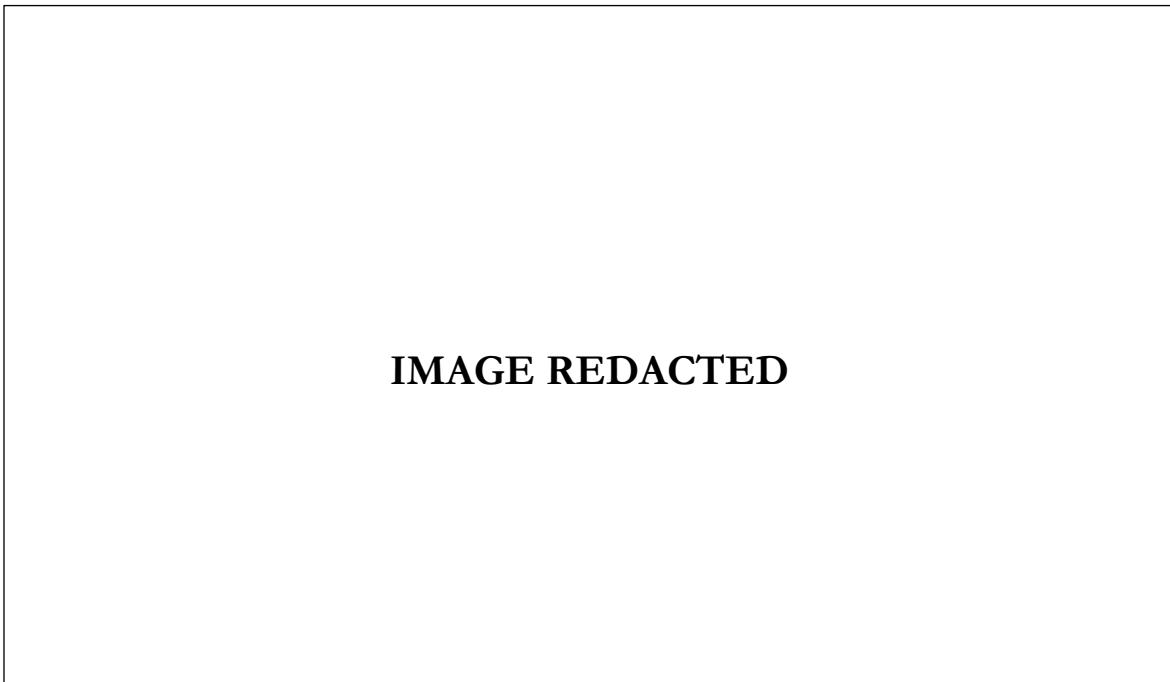


Figure 9. Oliveros and Sender are pictured, with a wide array of instruments, in a *San Francisco Examiner* article advertising the debut Sonics show. They appear to be seated in Sender's attic studio at the San Francisco Conservatory of Music. Mildred Schroeder, "THIS Is a Birthday Serenade to Beethoven?", *San Francisco Examiner*, December 15, 1961, 25. Photograph by Ray Moore.

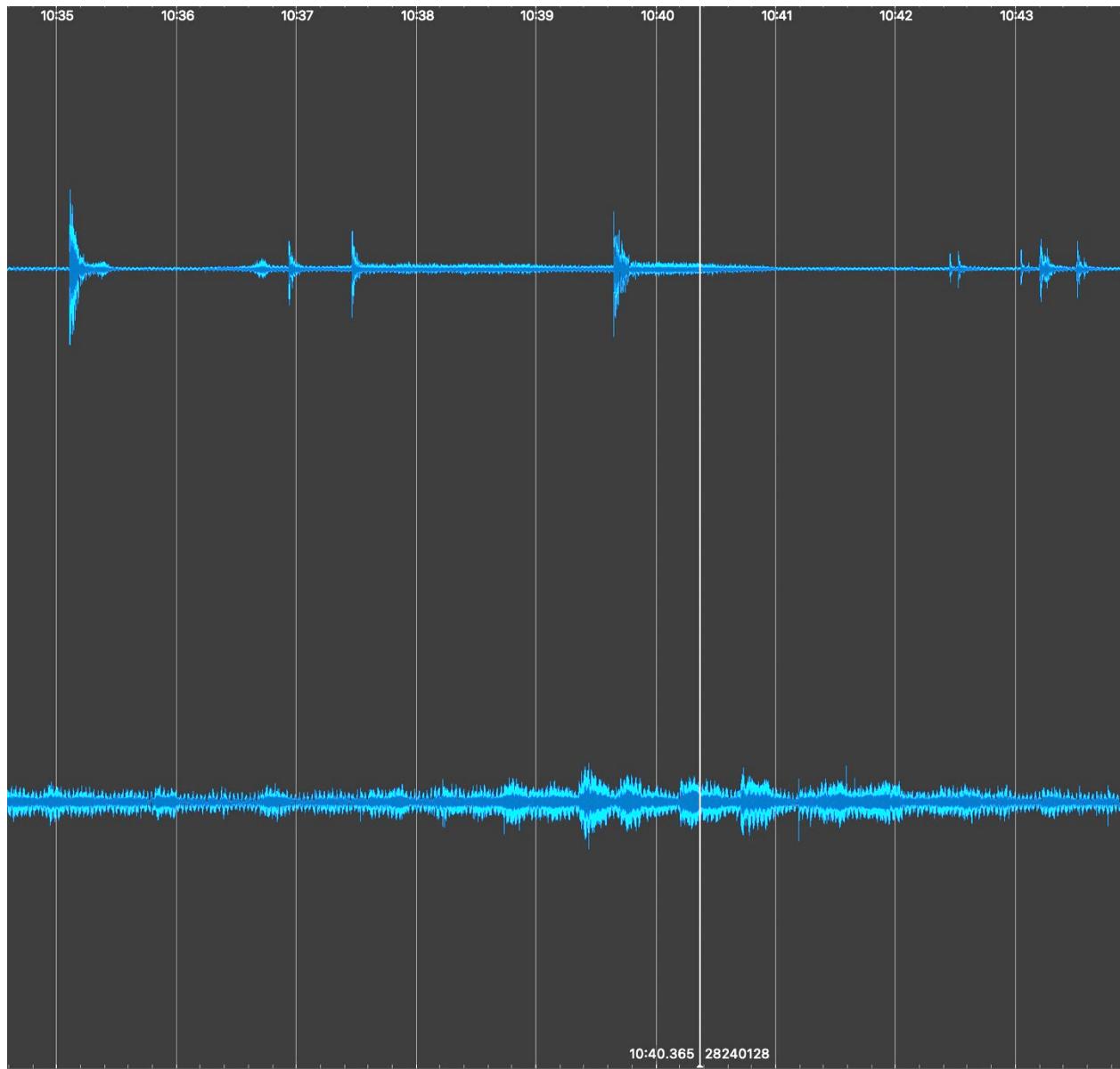


Figure 10. A waveform analysis of *Time Perspectives* (1961); the left stereo channel appears at top, and the right channel at bottom. The segment featured runs from approximately 10:35 to 10:44. Analysis/image by author.

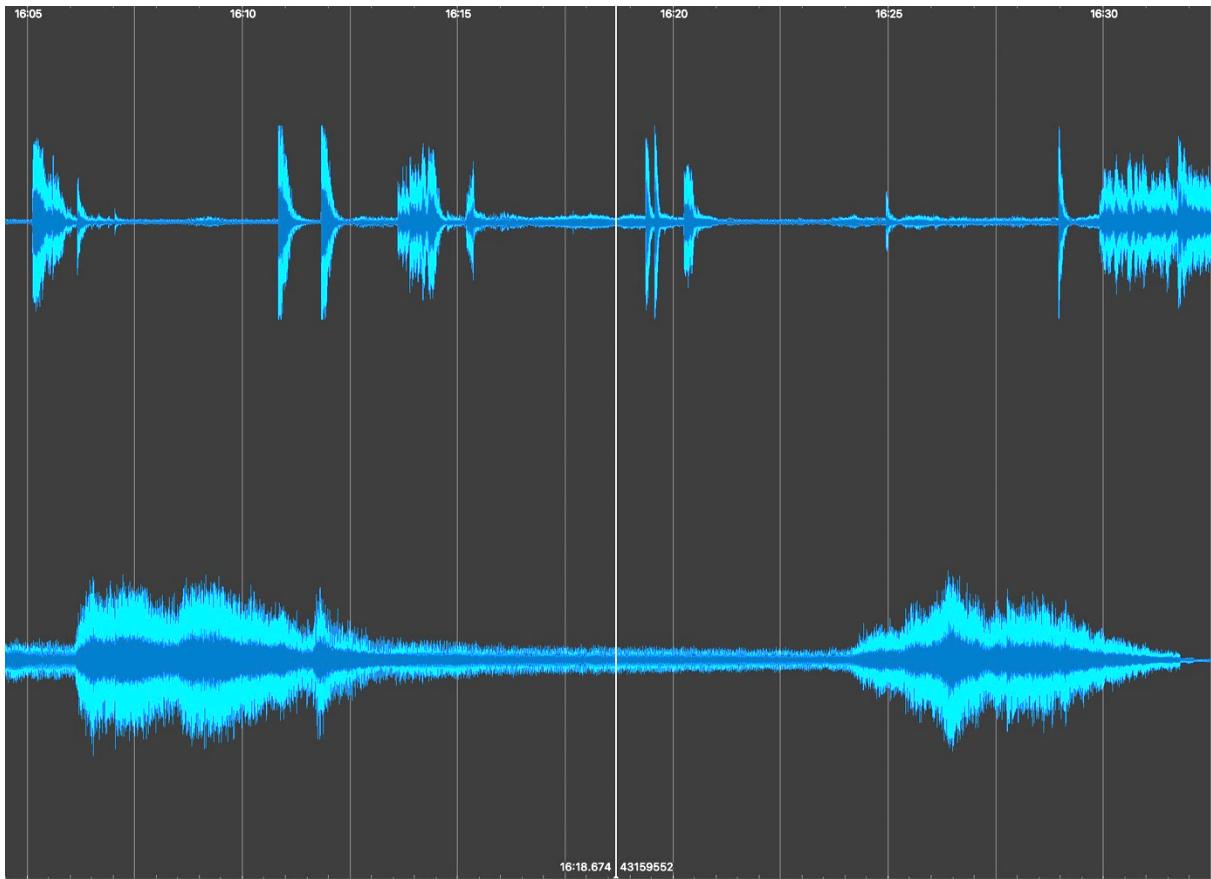


Figure 11. A waveform analysis of *Time Perspectives* (1961); the left stereo channel appears at top, and the right channel at bottom. The segment featured runs from approximately 16:05 to 16:33. Analysis/image by author.

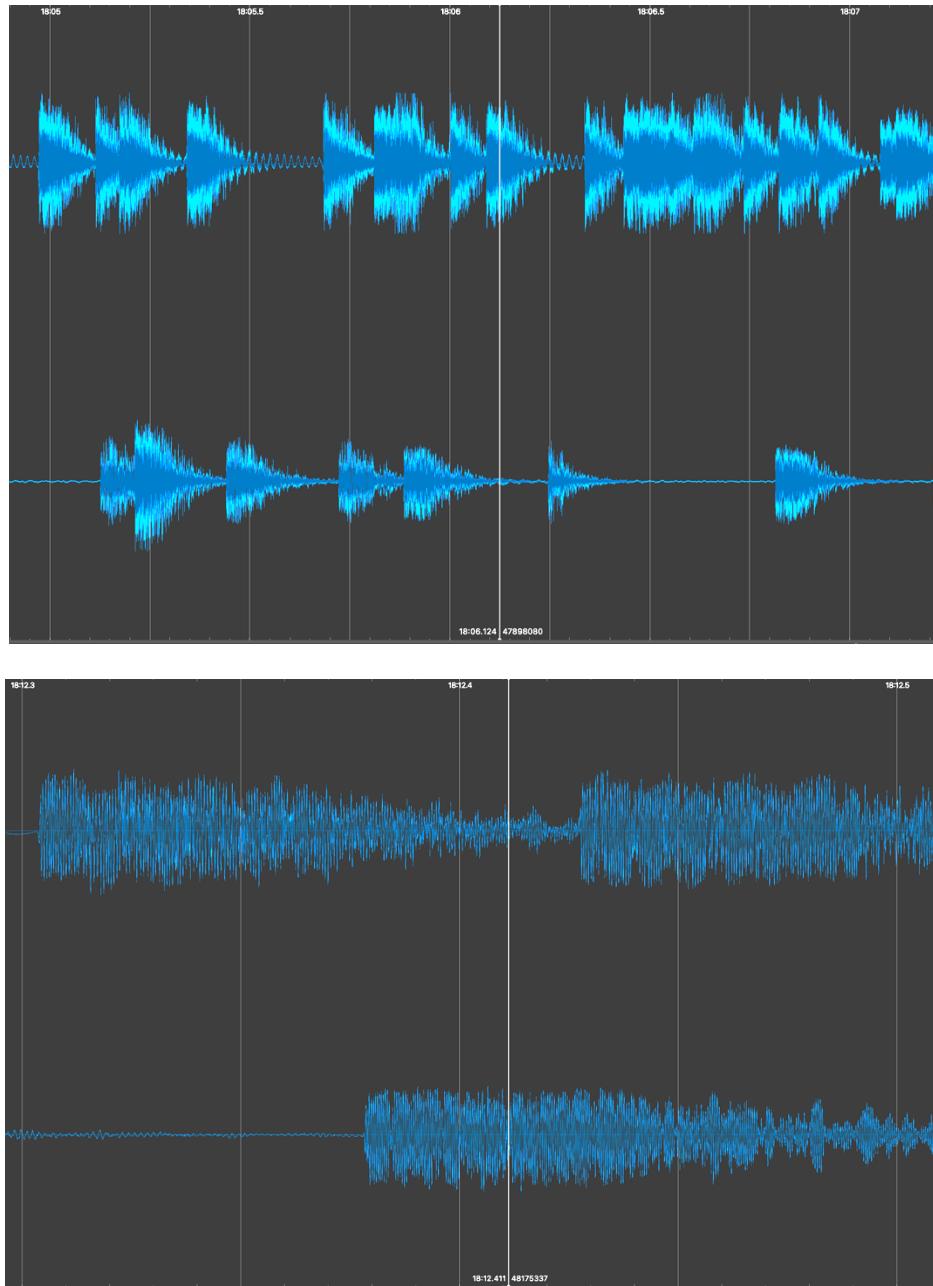


Figure 12. A close staggering of attacks appears around the 18-minute mark of *Time Perspectives* (1961); the waveforms at top and bottom show this staggering at two different temporal scales. Analysis/image by author.

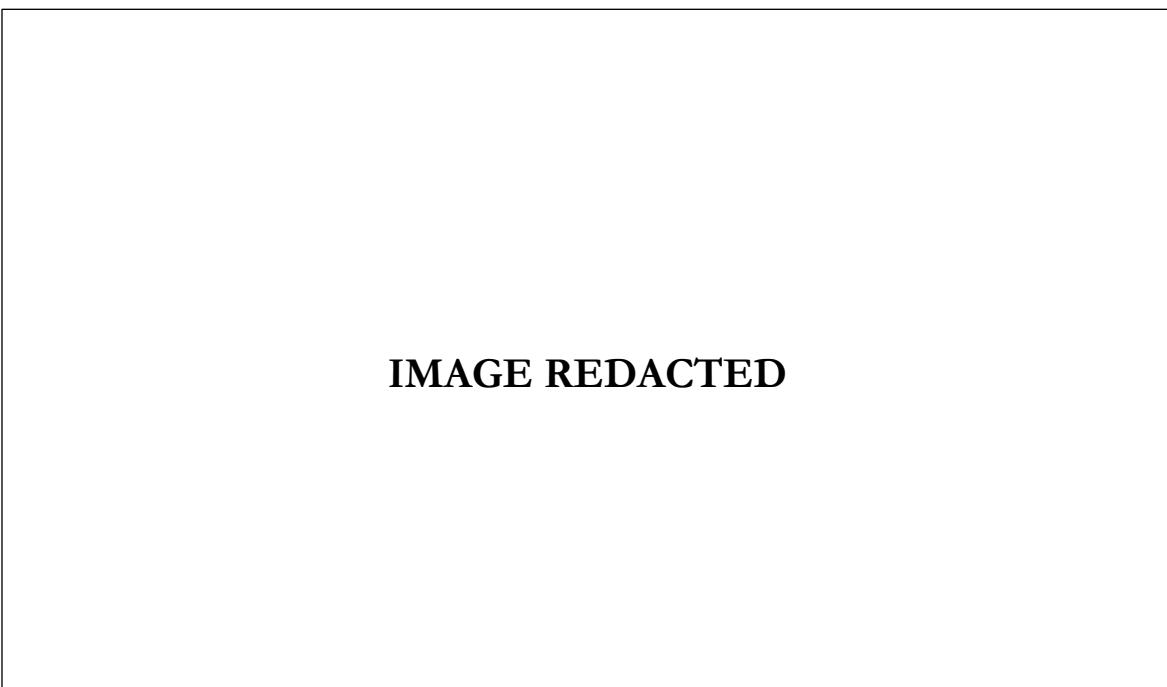


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Figure 13. A schematization of a tape-delay set-up using just one reel-to-reel recorder and a segment of tape spliced, end-to-end, into a loop. Gustave Ciamaga, “The Tape Studio,” in *The Development and Practice of Electronic Music*, ed. Jon H. Appleton and Ronald C. Perera (Englewood Cliffs, NJ: Prentice-Hall, 1975), 104.

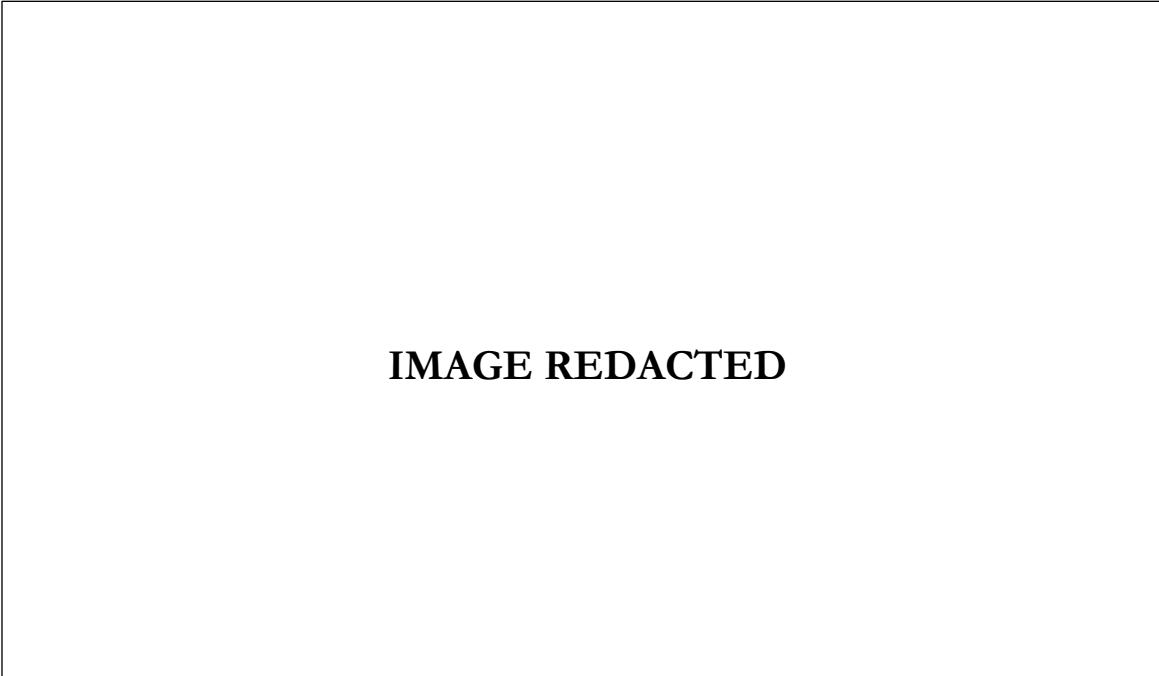


IMAGE REDACTED

Figure 14. A schematization of a tape-delay set-up using two reel-to-reel recorders and a mixer (not pictured). A tape feeds from the supply reel on Machine 1, passes the recording head, and continues to the playback head on Machine 2 before reaching the take-up reel. The signal is passed from the playback head back to the recording head using the mixer, and the process is repeated. Gustave Ciamaga, “The Tape Studio,” in *The Development and Practice of Electronic Music*, ed. Jon H. Appleton and Ronald C. Perera (Englewood Cliffs, NJ: Prentice-Hall, 1975), 107.



IMAGE REDACTED

Figure 15. Milton Babbitt appears beside the RCA Mark II synthesizer in the pleasant isolation of the Columbia-Princeton Electronic Music Center facilities, February 19, 1966. Photograph by William Gedney. William Gedney Photographs and Writings, Archives & Manuscripts, Duke University Libraries, Durham, NC, <https://idn.duke.edu/ark:/87924/r4707zr29>.

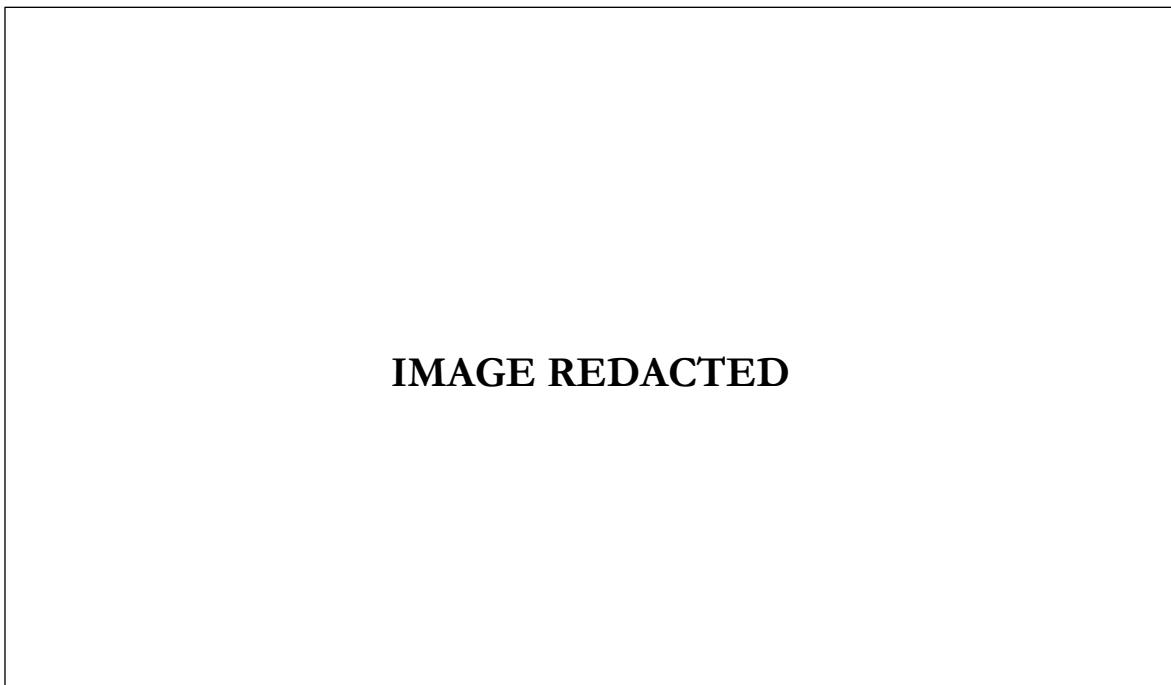


Figure 16. Performing directions for Oliveros's *Sound Patterns for Mixed Chorus* of 1961–62 (Darmstadt: Edition Tonos, 1964). Box 6, Folder 19, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego.

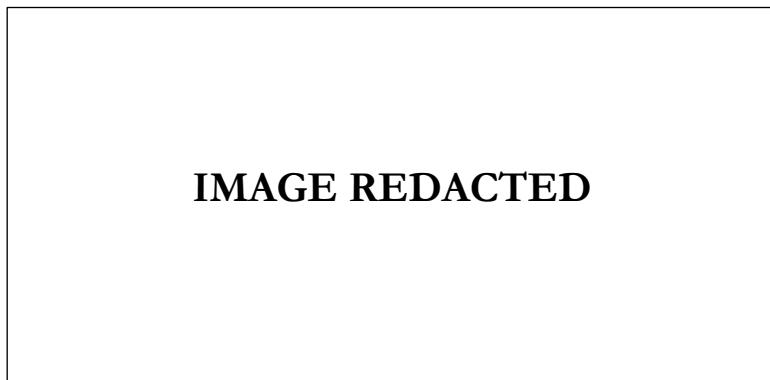
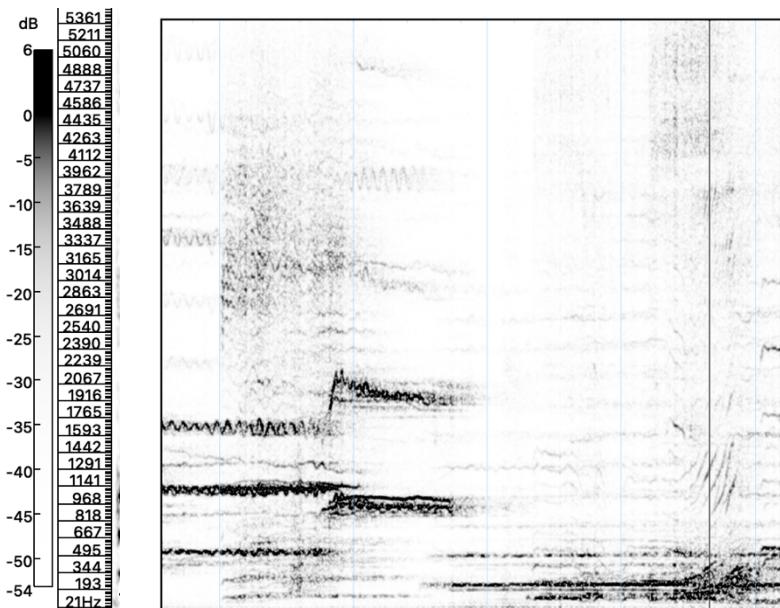


Figure 17: Top: a spectrographic analysis of Oliveros's *Sound Patterns*, as performed by the Brandeis University Chamber Orchestra on the *Extended Voices* LP (Odyssey 32-16-0156, 1967). Frequency in Hz (y axis) is graphed against time (x axis). The frequency scale pictured appears at left, alongside a key to the visualization of amplitude (represented by darkness of shading). The twelve-second segment pictured runs from approximately 2:01 to 2:13. Bottom: measures 29 to 32 of *Sound Patterns* (Darmstadt: Edition Tonos, 1964). Box 6, Folder 19, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego. Image/analysis by author.

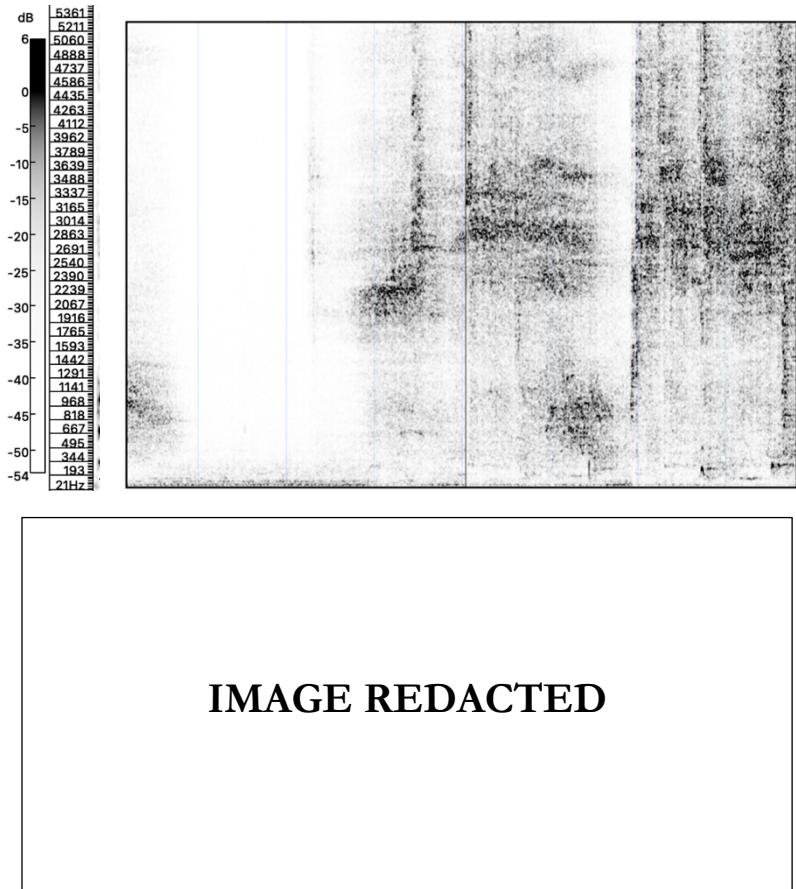


Figure 18: Top: a spectrographic analysis of Oliveros's *Sound Patterns*, as performed by the Brandeis University Chamber Orchestra on the *Extended Voices* LP (Odyssey 32-16-0156, 1967). Frequency in Hz (y axis) is graphed against time (x axis). The frequency scale pictured appears at left, alongside a key to the visualization of amplitude (represented by darkness of shading). The nineteen-second segment pictured runs from approximately 3:28 to 3:47. Bottom: measures 50 to 53 of *Sound Patterns* (Darmstadt: Edition Tonos, 1964). Box 6, Folder 19, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego. Image/analysis by authors.

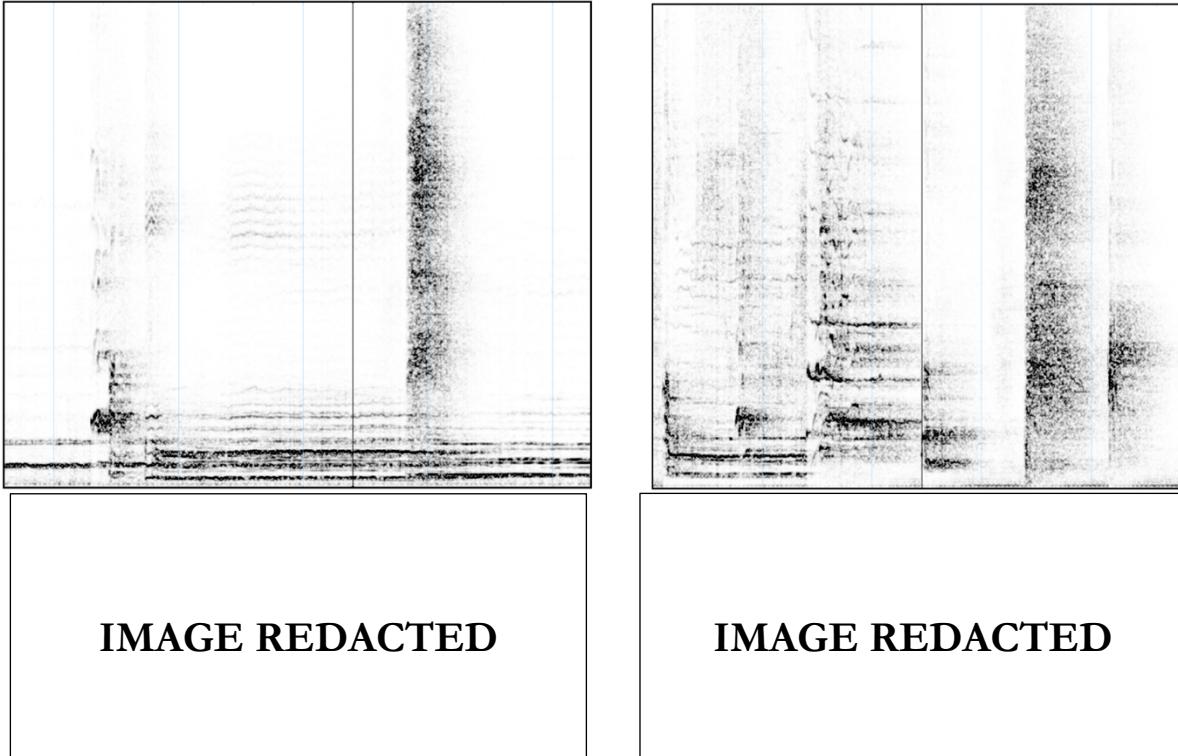


Figure 19: Two examples of punctuating plosives. At left, in measure 39 of *Sound Patterns*, the soprano and alto deliver a “pow” in the middle of a low drone (overlapping “ōōn’s” in the tenor and baritone registers); at right, in measure 56, a unison “pow” and a tongue cluck conclude the work. Plosives appear in both spectrograms as cleanly delineated “walls” of broadband noise; the fast blockage and release of air accounts for this spectral patterning. Image/analysis by author.

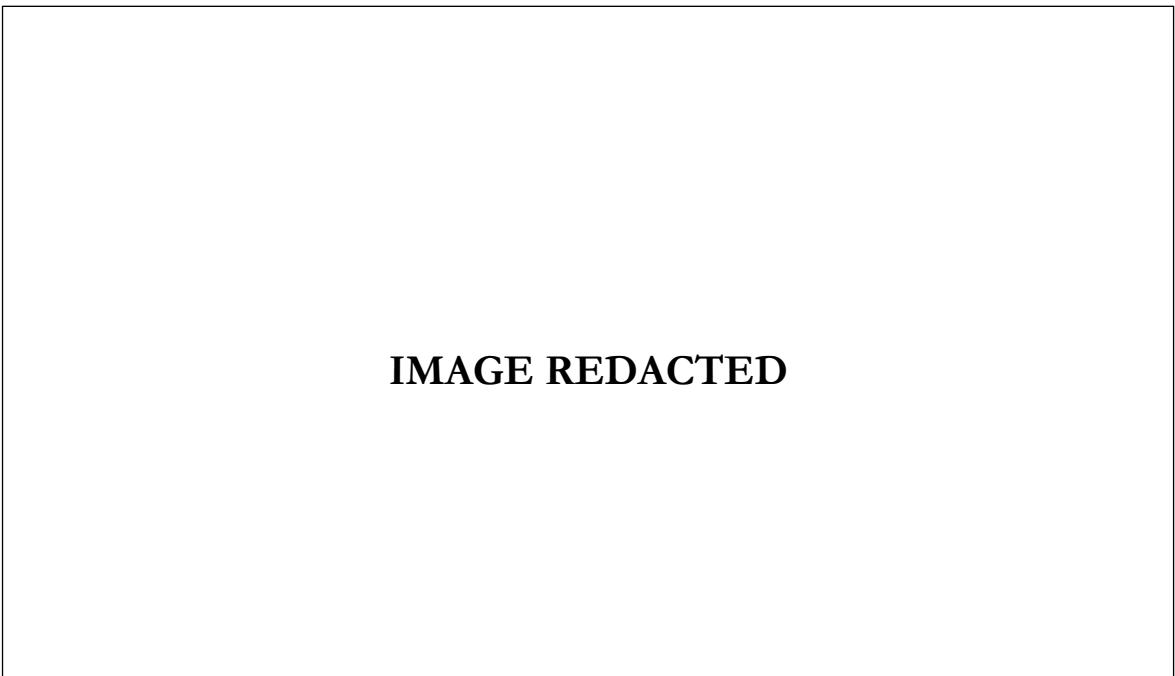


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Figure 20: Elizabeth Harris, caught up in loops, twirls in a metal mobile in the February 1964 staging of *Seven Passages* at Marines' Memorial Theater in San Francisco. Photograph by Carolyn Mason Jones. Box 10, Folder 19, Pauline Oliveros Papers, JPB 94-5, Music Division, The New York Public Library, New York, NY.

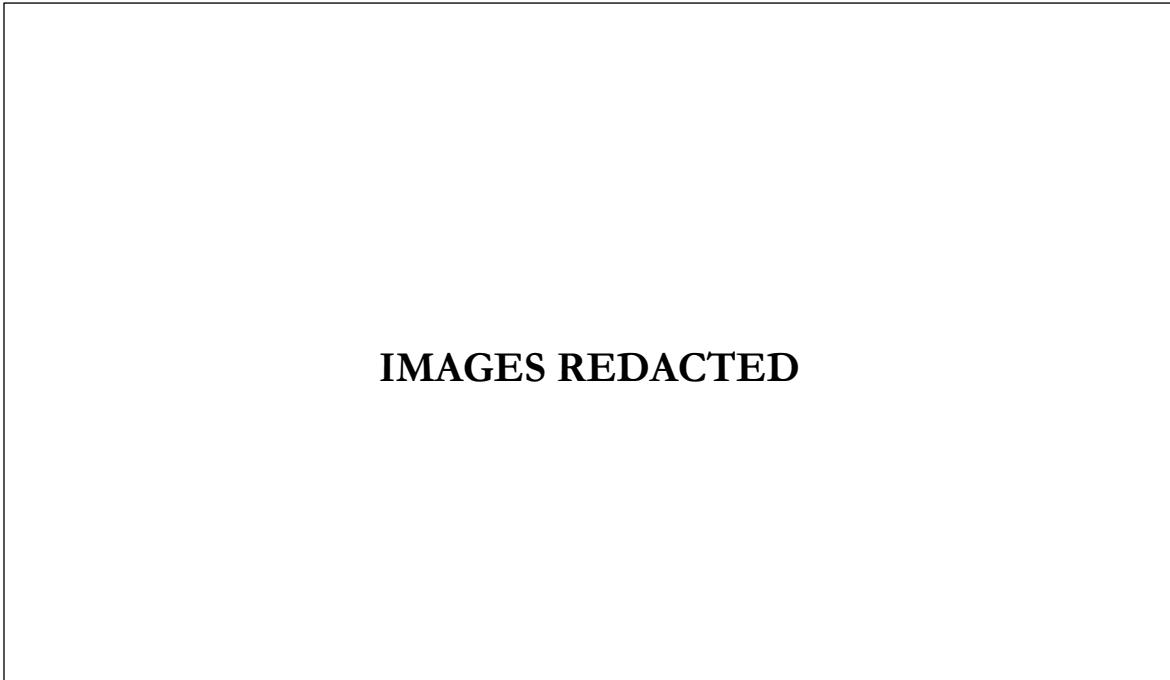


Figure 21: Top: a detail of the foldout map/score for *City Scale* (1963), drawn by Tony Martin, and published in the Winter 1965 issue of *TDR* (*Tulane Drama Review*, now *The Drama Review*). Ramon Sender, Anthony Martin, and Ken Dewey, “City-Scale,” *The Tulane Drama Review* 10, no. 2 (Winter 1965): 186a, <https://doi.org/10.2307/1125244>. Bottom: a preparatory sketch in Ken Dewey’s papers indicates Oliveros’s planned involvement in the performance. Box 33, Folder 8, Ken Dewey Collection, T-Mss 1991–010, Billy Rose Theatre Division, The New York Public Library, New York, NY.

Chapter 3

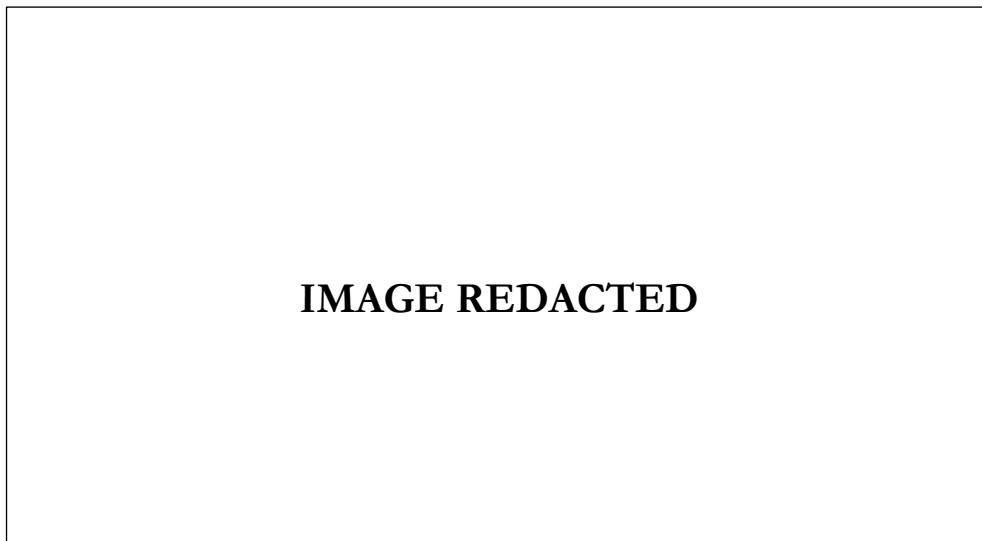


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Figure 1. Notations BJ and BT from the *Solo for Piano* in John Cage's *Concert for Piano and Orchestra* (1957–58); reproduced in James Pritchett, *The Music of John Cage* (Cambridge, UK: Cambridge University Press, 1996), 121.

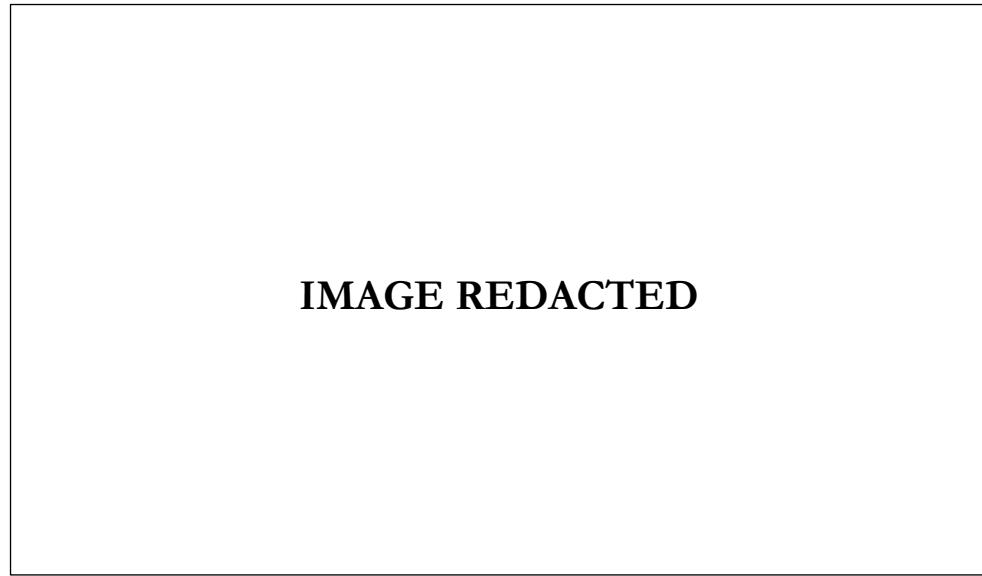


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Figure 2. Reproduction of superimposed transparencies from John Cage's *Music Walk* (1958); reproduced in James Pritchett, *The Music of John Cage* (Cambridge, UK: Cambridge University Press, 1996), 127.

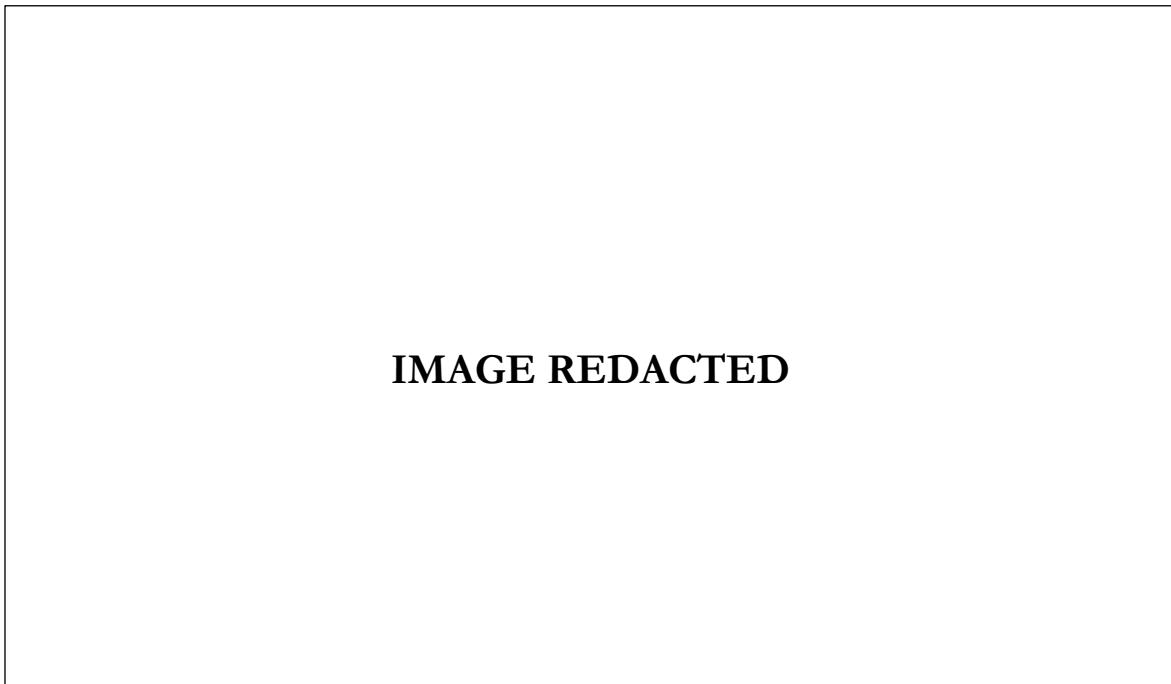


Figure 3. The first page of one of David Tudor's realization scores for John Cage's *Music Walk* (1958), undated. Reproduced in William Fetterman, *John Cage's Theatre Pieces: Notations and Performances*, Contemporary Music Studies, v. 11 (Amsterdam: Harwood Academic Publishers, 1996), 56.

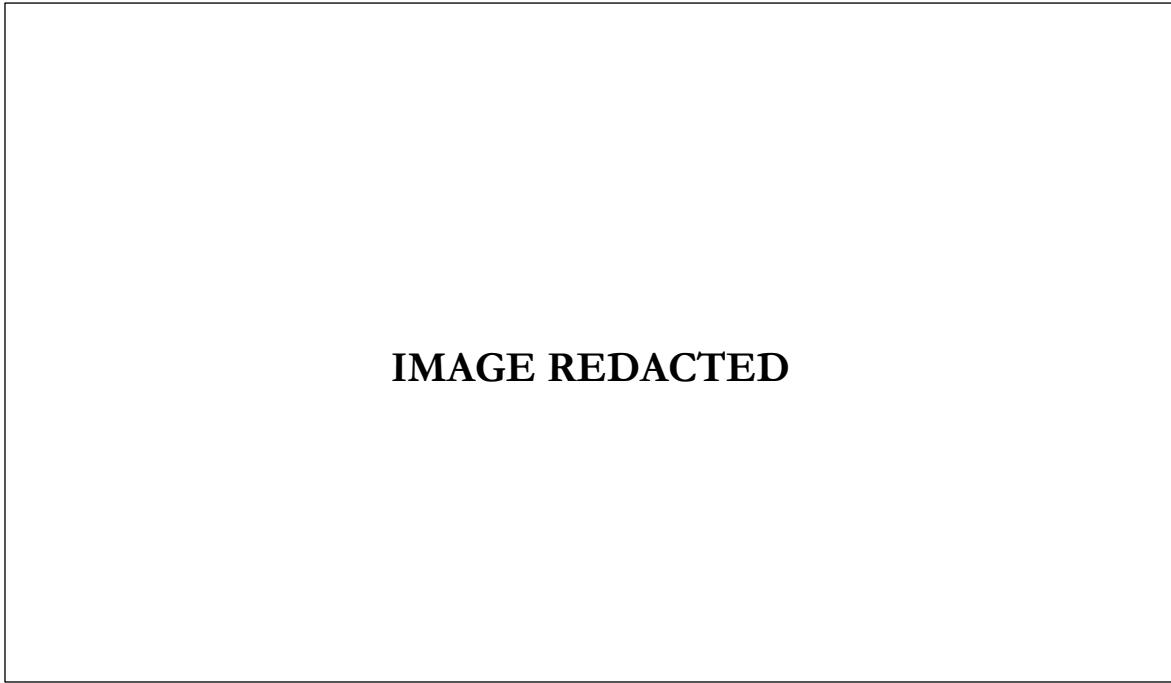


Figure 4. Unlabeled sketch of floorplan in Tudor's hand, presumably for Tudorfest realization of John Cage's *Music Walk* (1958), 1964, Box 15, Folder 25, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

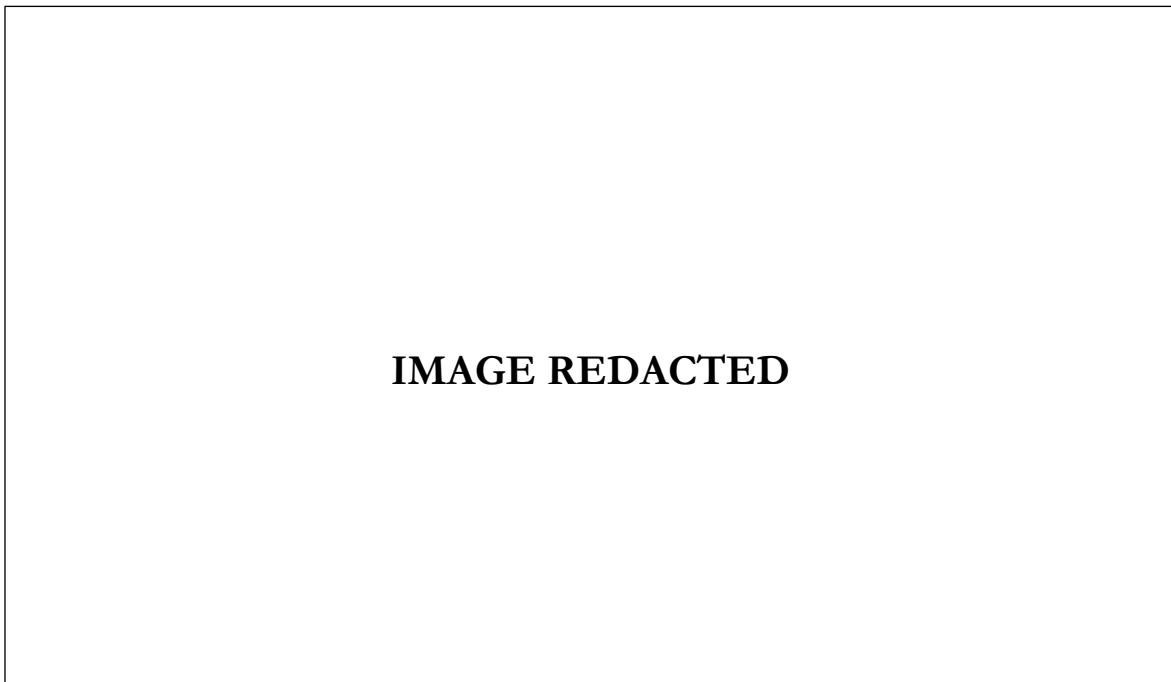


Figure 5. George Brecht, *The Lamp Events*, Event Score (Summer 1961), Box 5, Folder 23, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

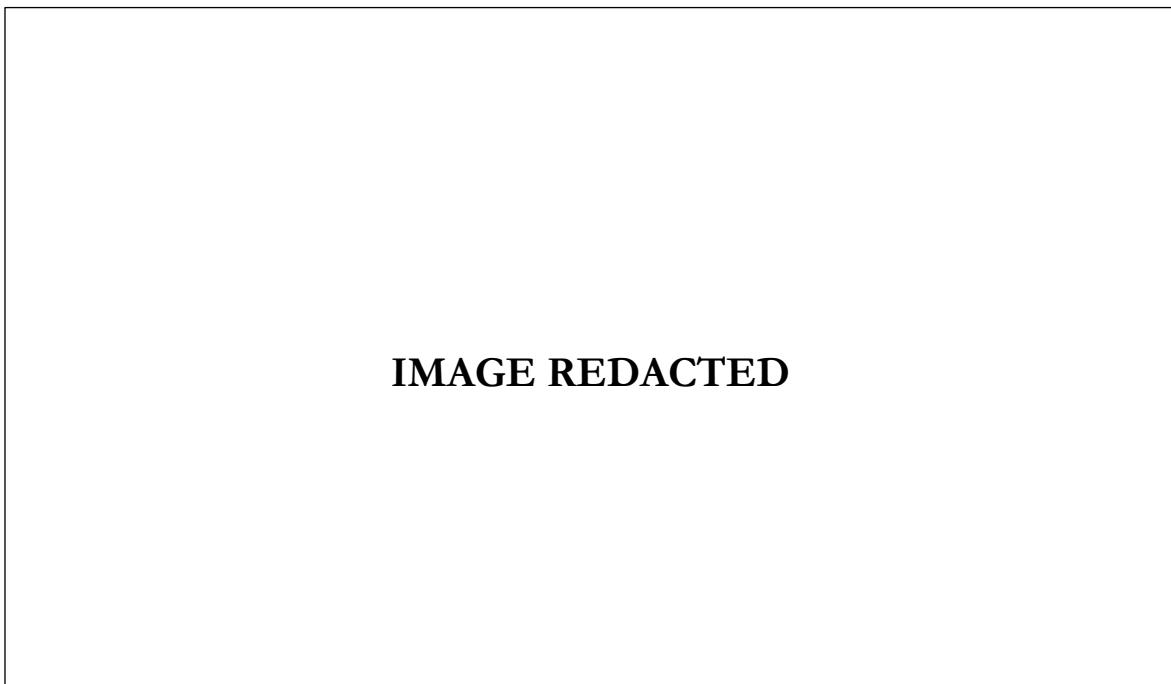


Figure 6. First page of score for George Brecht's *Card-Piece for Voice* (Summer 1959), Box 5, Folder 23, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

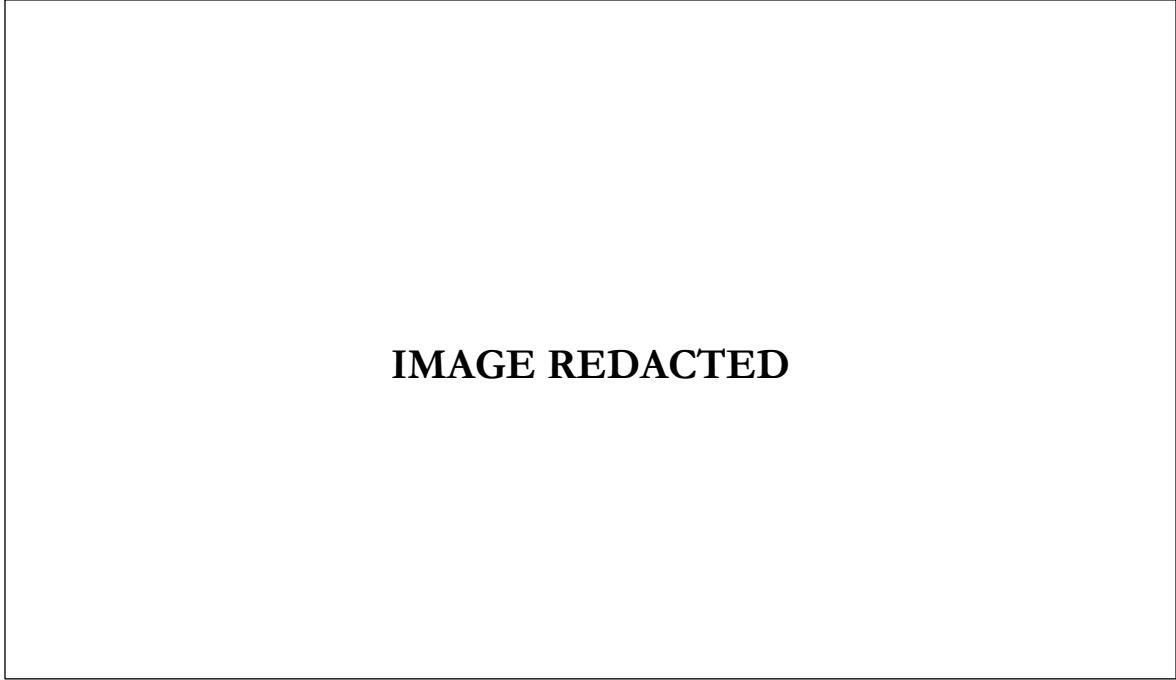


Figure 7. Score for Toshi Ichiyangi's *Music for Piano #4 for David Tudor* (December 1960). Ray Wilding-White, "David Tudor: 10 Selected Realizations of Graphic Scores and Related Performances," Box 19, Folder 2, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

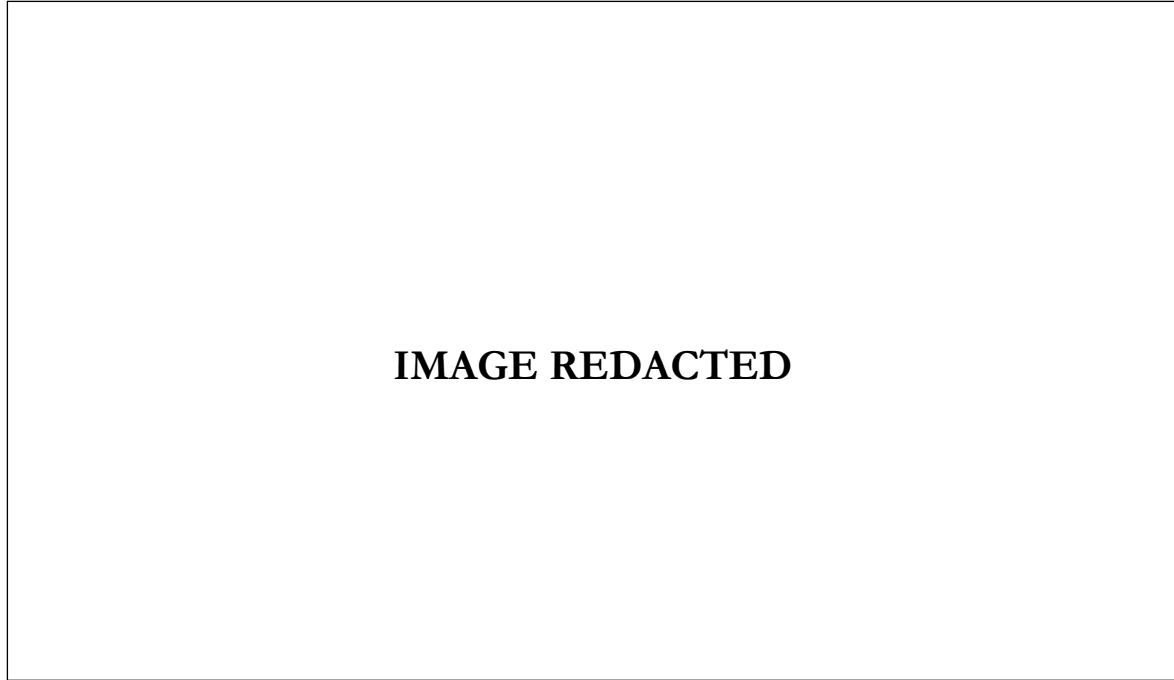


Figure 8. Assorted materials used in a realization of John Cage's *Cartridge Music* (1960). Photograph by Earle Brown. Undated. Reproduced on inner sleeve of *John Cage • Christian Wolff*, Time Records S/8009, 1963, vinyl LP.

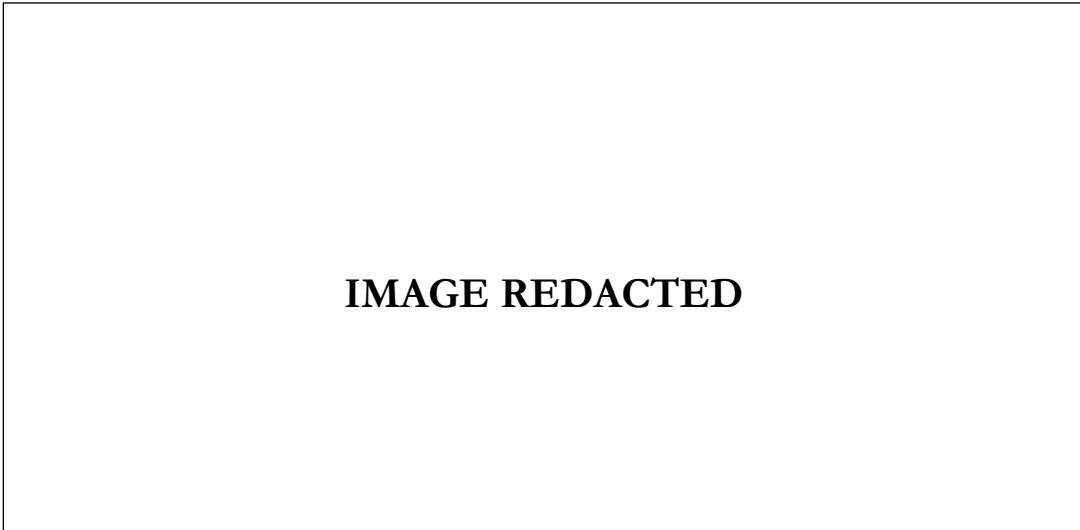


Figure 9. Superimposed transparencies for John Cage’s *Cartridge Music* (1960). Actions and the timing thereof are dictated by the intersection of the snaking dotted line with the biomorphic shapes, and the clockface. Reproduced in David W. Bernstein, “John Cage’s Cartridge Music (1960): ‘A Galaxy Reconfigured,’” *Contemporary Music Review* 33, no. 5–6 (2014): 559.

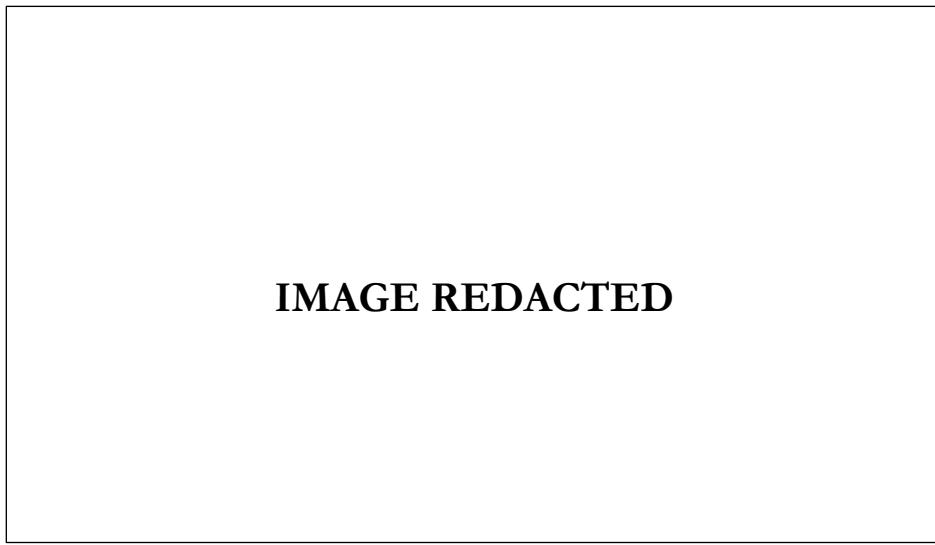


Figure 10. Schematic outlining David Tudor’s distribution of transducers in a July 1967 realization of John Cage’s *Variations II* (1961). Reproduced in Frank Hilberg, *David Tudor’s Konzept des “Elektrifizierten Klaviers” und seine Interpretation von John Cages Variations II (1961)* (Saarbrücken: Pfau, 1996), 21.

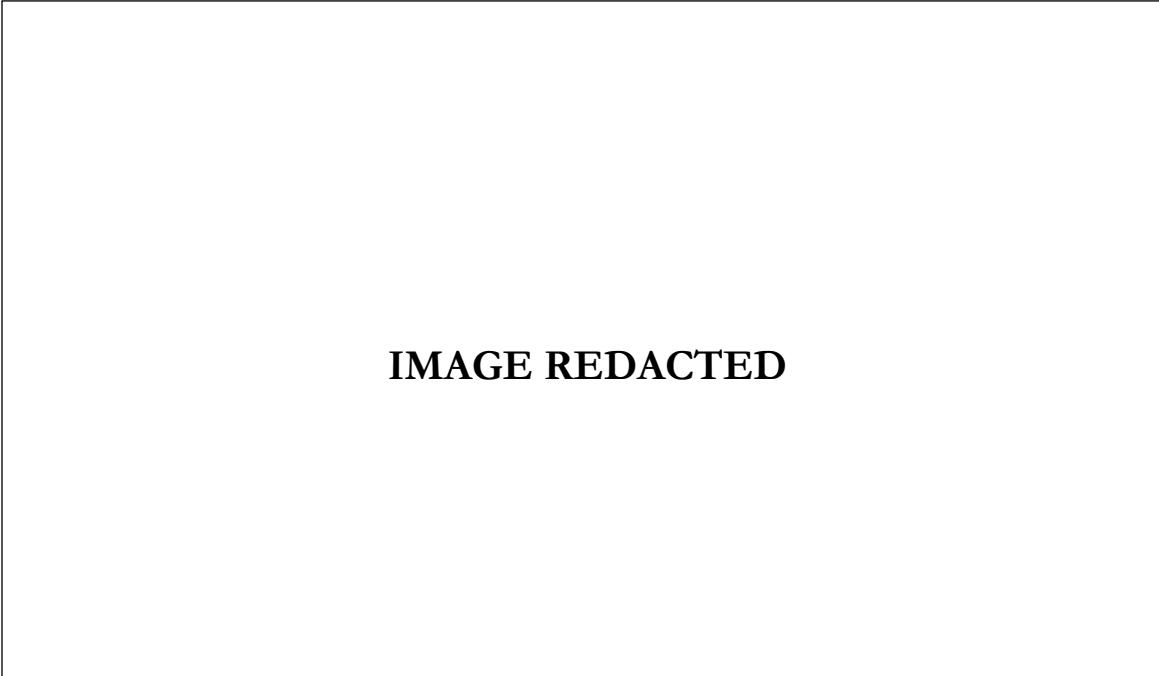
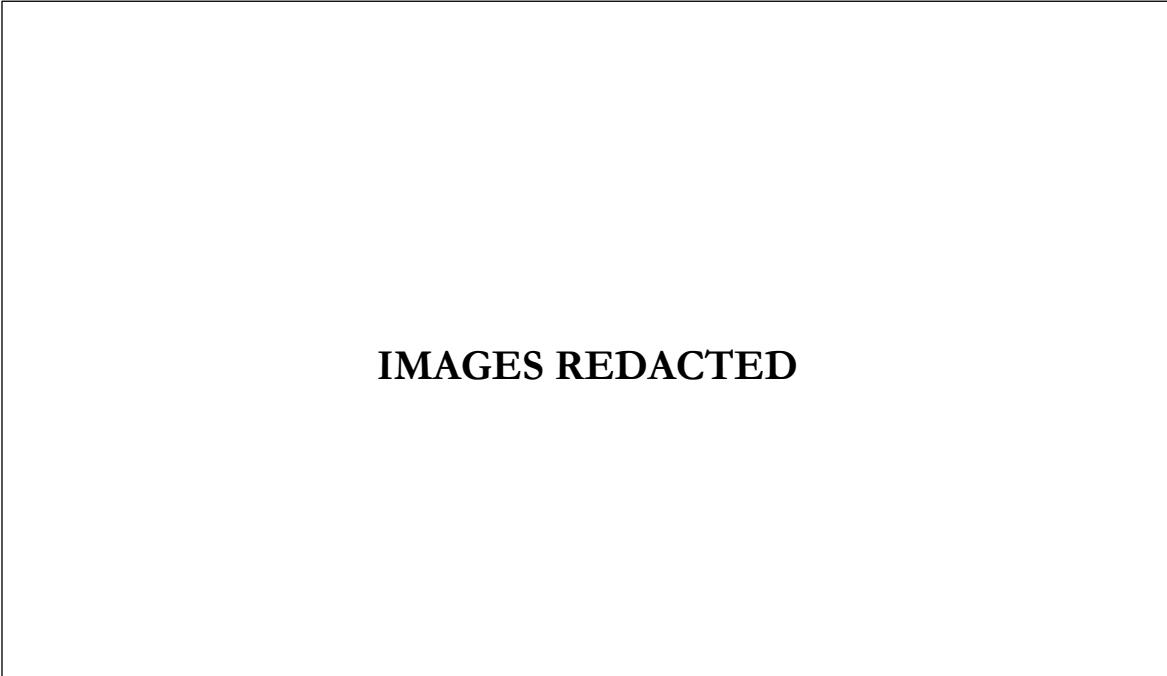


IMAGE REDACTED

Figure 11. Pauline Oliveros, David Tudor, and Ahmed performing Oliveros's *Duo for Accordion and Bandoneon with Possible Mynah Bird Obbligato* (1963–64) at the San Francisco Tape Music Center on the occasion of “Tudorfest”; piece staged March 30 and April 6, 1964. Choreographer Elizabeth Harris, who constructed the rotating see-saw used in the performance, stands beside Tudor. Uncredited photograph reproduced in *San Francisco Examiner*, March 26, 1964, 49. Box 10, Folder 8, Pauline Oliveros Papers, Special Collections & Archives, University of California, San Diego, La Jolla, CA.



IMAGES REDACTED

Figure 12. Top: Robert Rauschenberg at work on his *First Time Painting* (1961), produced before a live audience as part of *Homage to David Tudor*, presented by Rauschenberg, Jasper Johns, Jean Tinguely, and Niki de Saint Phalle at the American Embassy in Paris, France, June 1961. Bottom: David Tudor performs John Cage's *Variations II* (1961) live at *Homage to David Tudor*; Rauschenberg is visible in the background. Photographs by Shunk-Kender. Box 33, Folder 1, Photograph Collection, RRFA 09, Robert Rauschenberg Foundation, New York, NY.

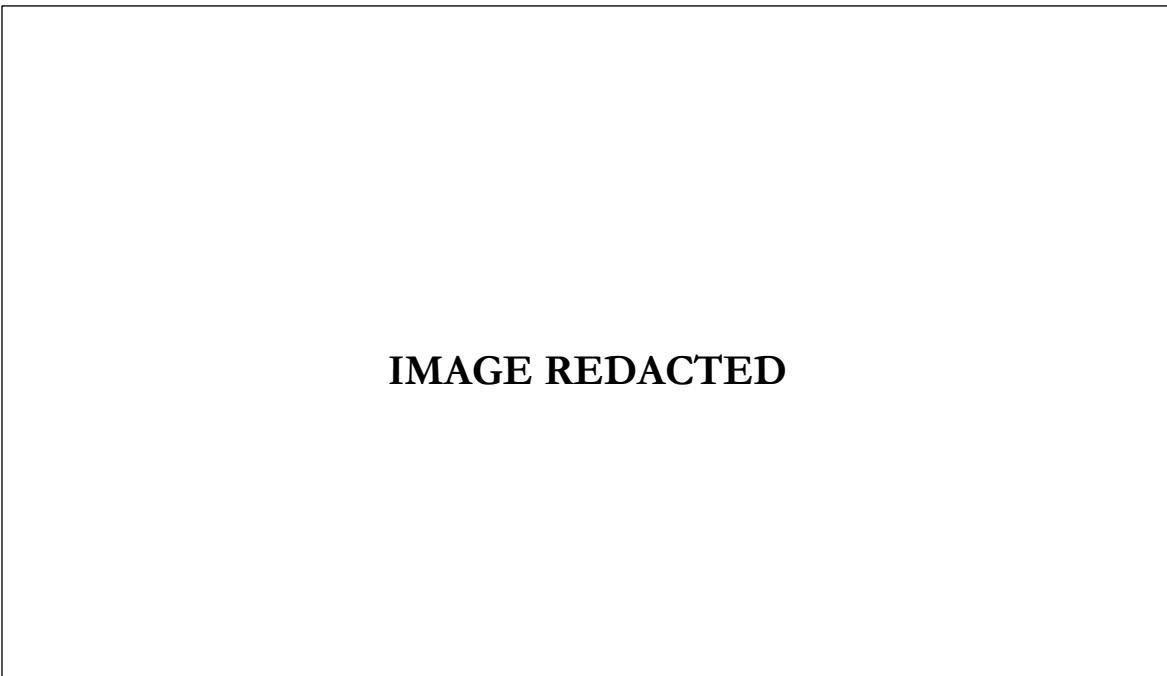


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Figure 13: Robert Rauschenberg descends a rope in *Elgin Tie* (1964) at “Five New York Evenings,” Moderna Museet, Stockholm, Sweden, September 13, 1964, photograph by Hans Malmberg, “Elgin Tie,” Robert Rauschenberg Foundation Art & Archives, accessed April 18, 2022, <https://www.rauschenbergfoundation.org/art/archive/elgin-tie>.

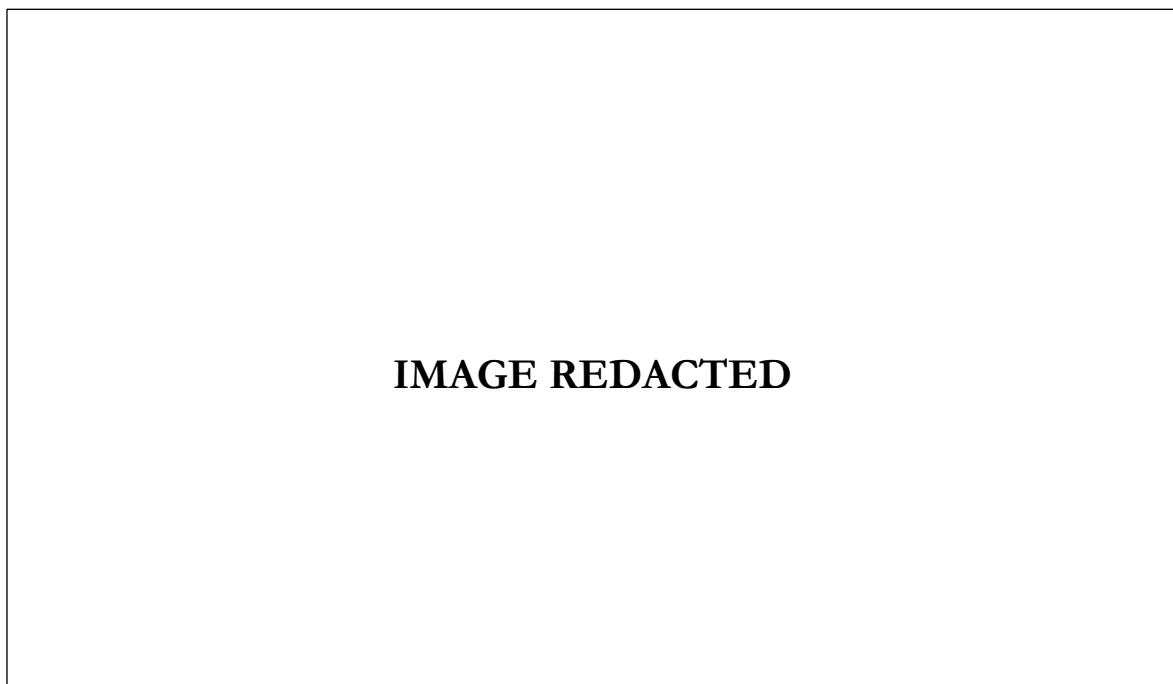


Figure 14. Contact sheet offering views of audience at Robert Rauschenberg's *Elgin Tie* (1964). Horn loudspeaker visible behind audience. Photographs by Hans Malmberg [?]. Box 68, Folder 9, Photograph Collection, RRFA 09, Robert Rauschenberg Foundation, New York, NY.

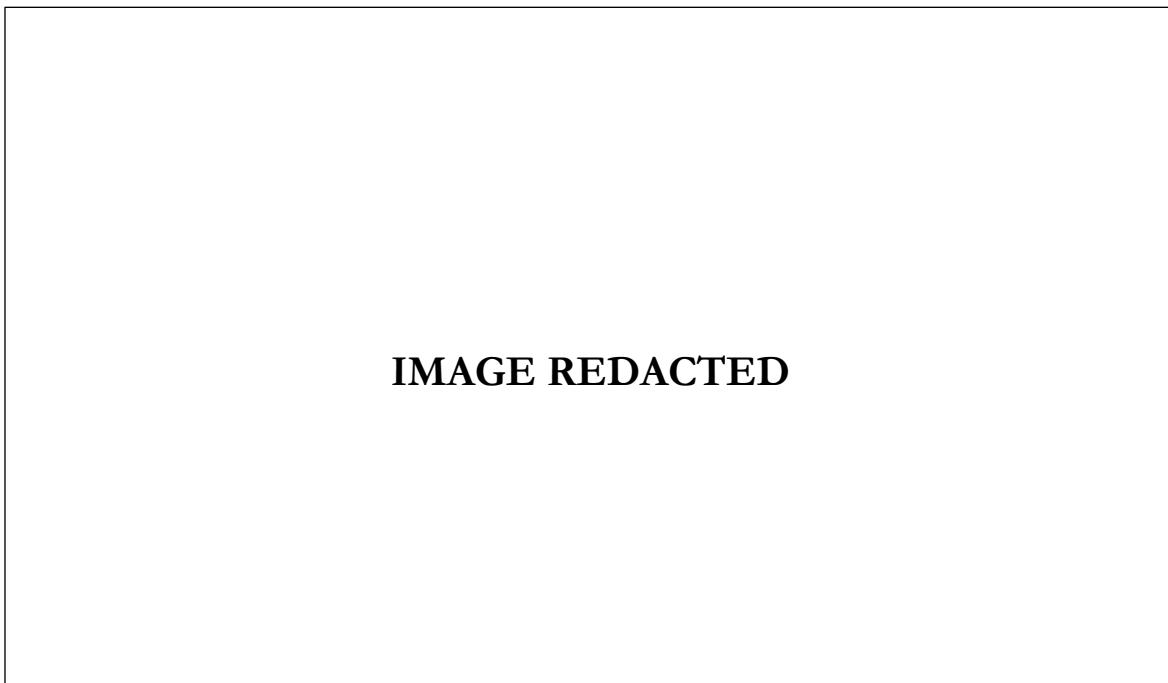


Figure 15. John Cage giving the premiere performance of *0'00"* (1962) at the Sogetsu Art Center in Aoyama, Tokyo, October 24, 1962. Visible wires indicate that contact microphones were attached to Cage's glasses, his cigarette holder, and the score for *0'00"*—executed live in performance.

Photograph by Yasuhiro Yoshioka. Reproduced in John Cage, *John Cage Shock Vol. 3*, EM Records EM1106CD, 2012, compact disc.

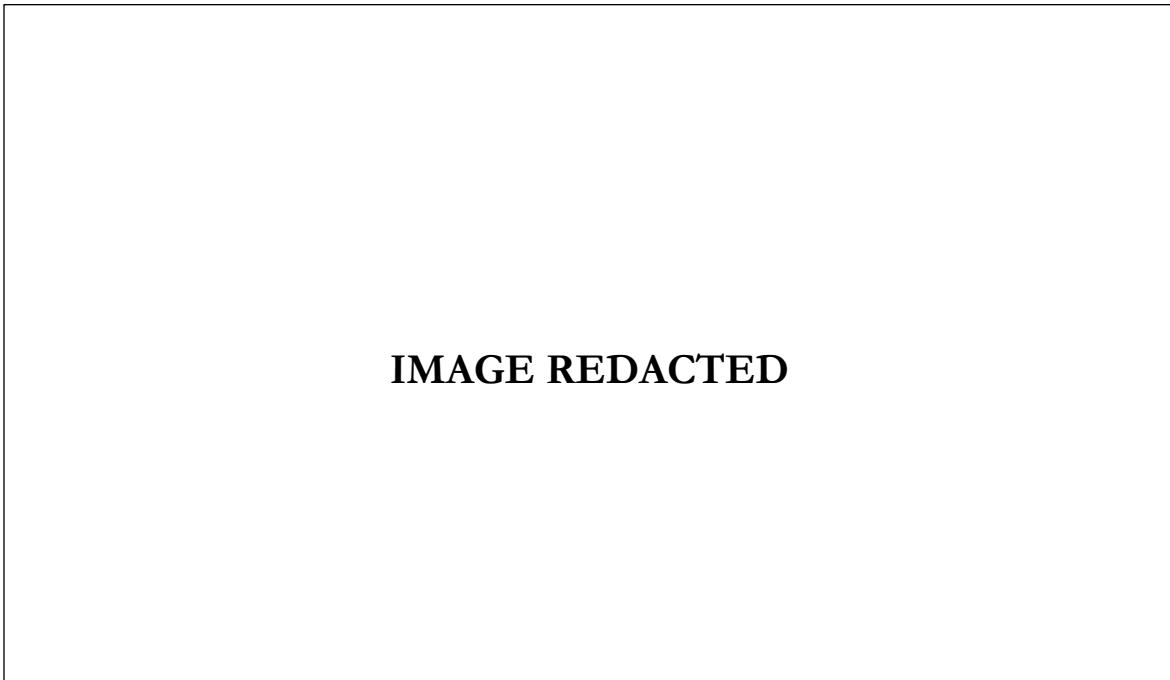


Figure 16. One of David Tudor's undated realization scores for John Cage's *Cartridge Music* (1960). Box 6, Folder 8, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

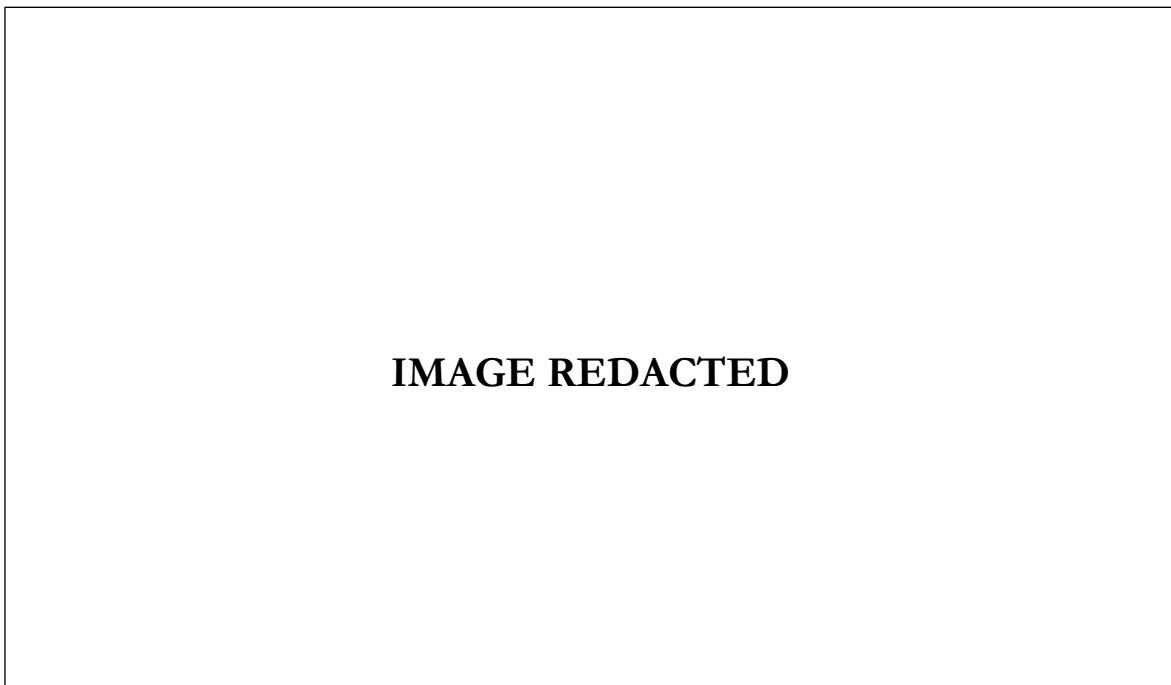


Figure 17. One of David Tudor's strips of "nomographs" used as a realization score for John Cage's *Variations II* (1961). Box 8, Folder 7, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

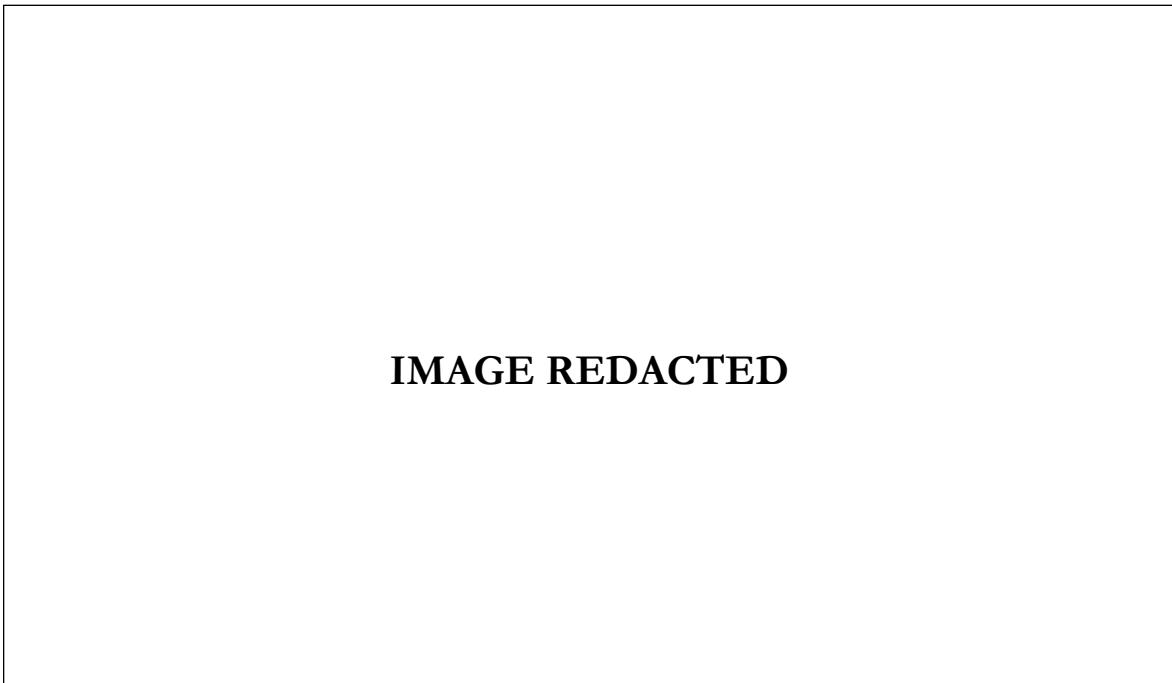


Figure 18. Crop of staging diagram for Pauline Oliveros's *Pieces of Eight* (1965), reproduced in 1973 revision of score. Box 5, Folder 1, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

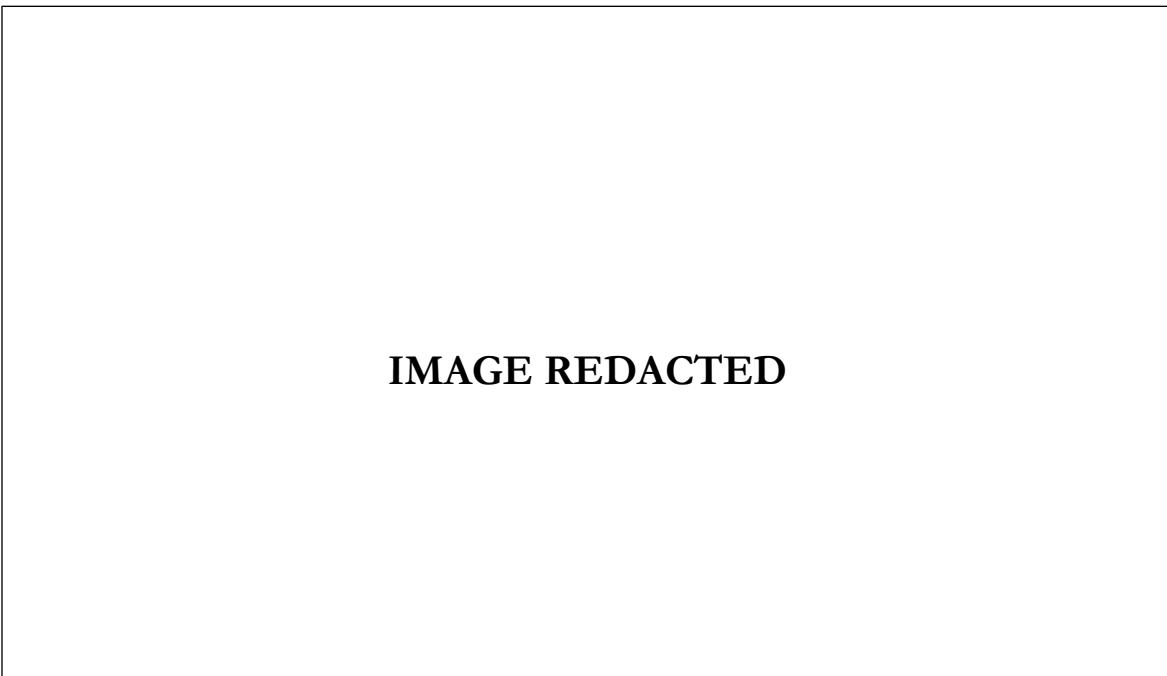


IMAGE REDACTED

Figure 19. A photographic detail of the papier-mâché bust of Ludwig van Beethoven as it appeared in a Spring 1972 performance of Pauline Oliveros's *Pieces of Eight* (1965). Photograph by Fred Lonidier. Box 5, Folder 4, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

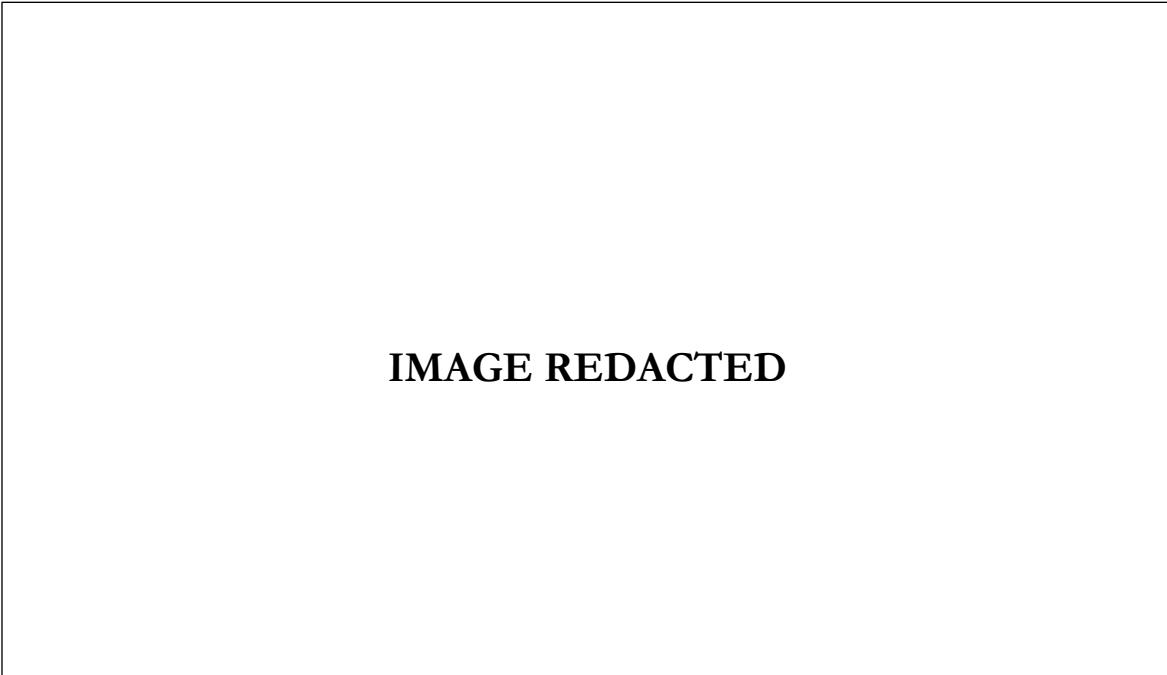


IMAGE REDACTED

Figure 20. Excerpt of prose notation for Pauline Oliveros's *Pieces of Eight* (1965), 1973 revision of score. Box 5, Folder 1, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

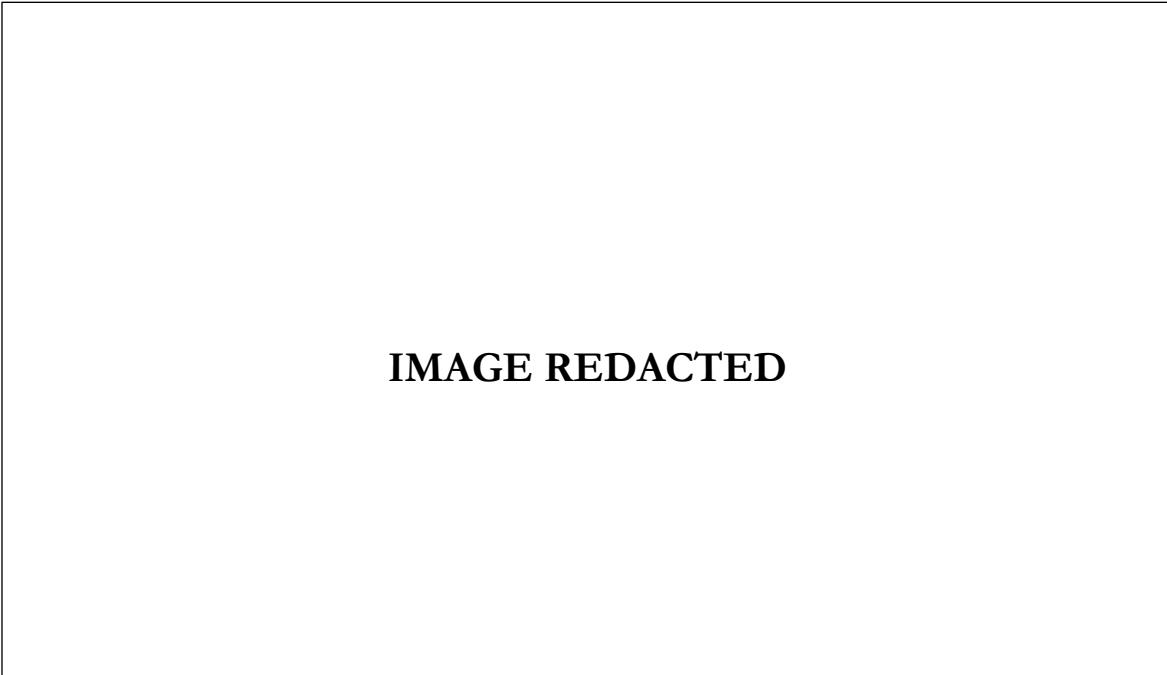


IMAGE REDACTED

Figure 21. A block diagram of the two-recorder delay configuration used in Pauline Oliveros's *Light Piece for David Tudor* (1965). Reproduced in Pauline Oliveros, *Software for People: Collected Writings 1963–1980*, 2nd ed. (Kingston, NY: Pauline Oliveros Publications, [1984] 2015), 42.

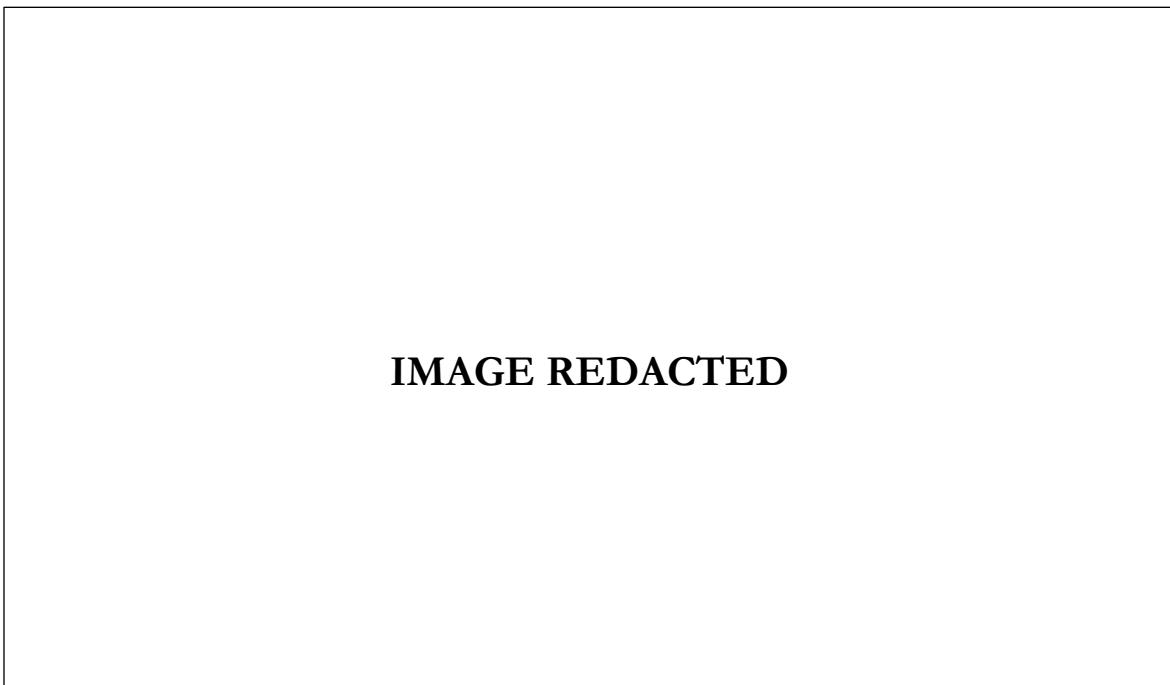


Figure 22. Gordon Mumma (left) and Robert Ashley (right) at work in their electronic studio in Ann Arbor, Michigan, ca. 1960. Photograph by Mary Ashley. Reproduced in Gordon Mumma, *Cyber sonic Arts: Adventures in American New Music*, ed. Michelle Fillion, Music in American Life (Urbana: University of Illinois Press, 2015), 20.

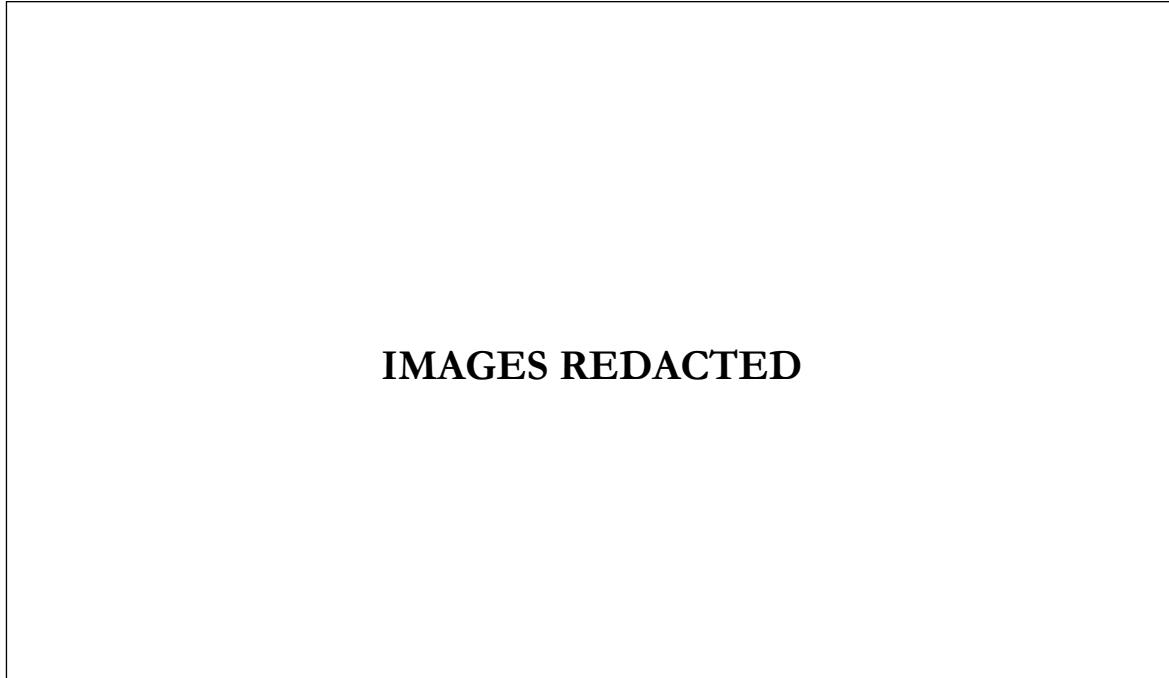


Figure 23. John Cage's *a posteriori* score (top) and David Tudor's *a posteriori* block diagram (bottom) for Cage's *Variations V* (1965). Ray Wilding-White, “David Tudor: 10 Selected Realizations of Graphic Scores and Related Performances,” Box 19, Folder 2, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

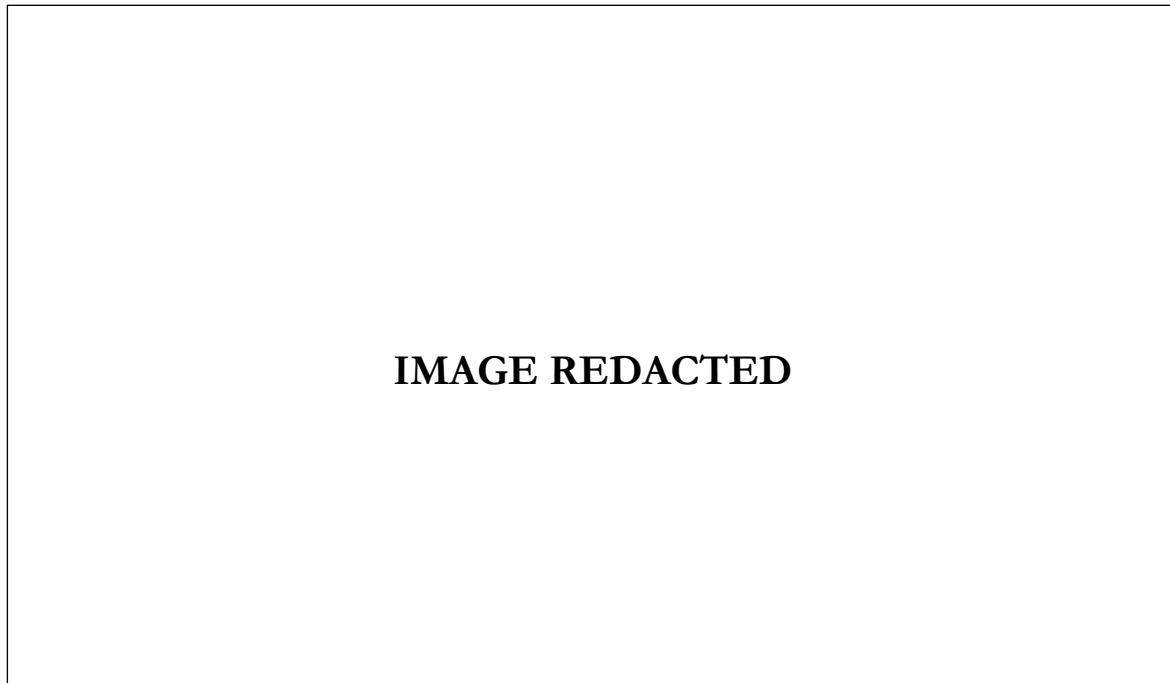


Figure 24. A sample page from Pauline Oliveros's “*Theater Piece* notebook,” 1966. Box 6, Folder 24, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

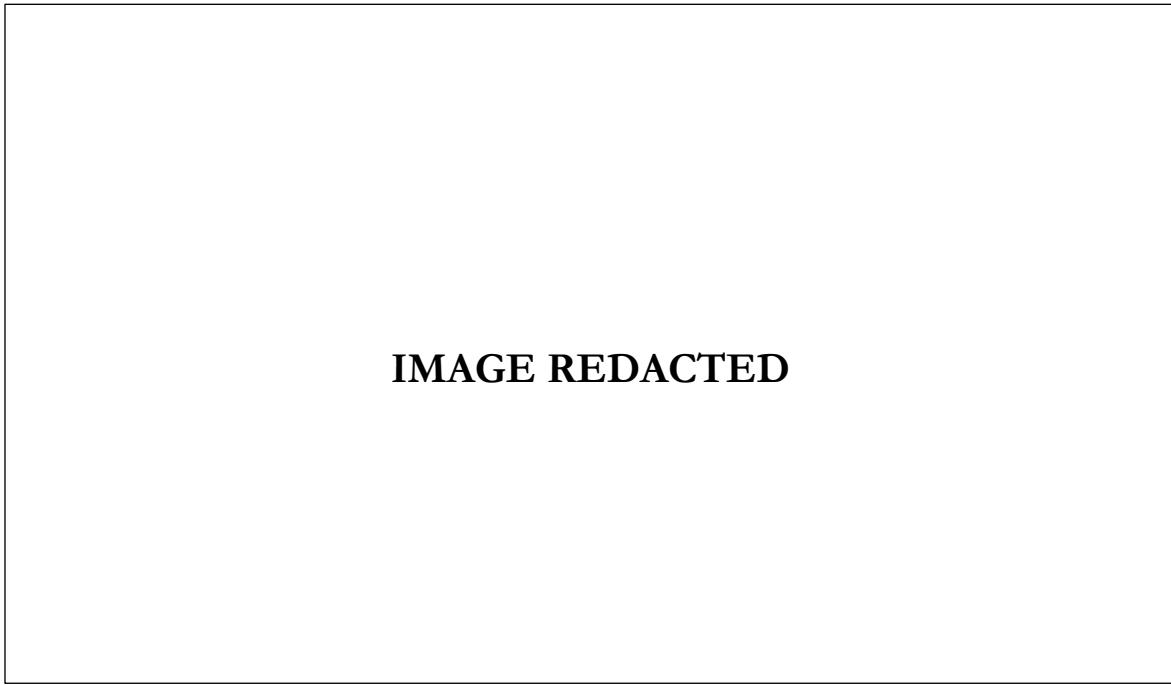


Figure 25. A track sequence for *Rock Symphony* (1966). Box 5, Folder 14, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, CA.

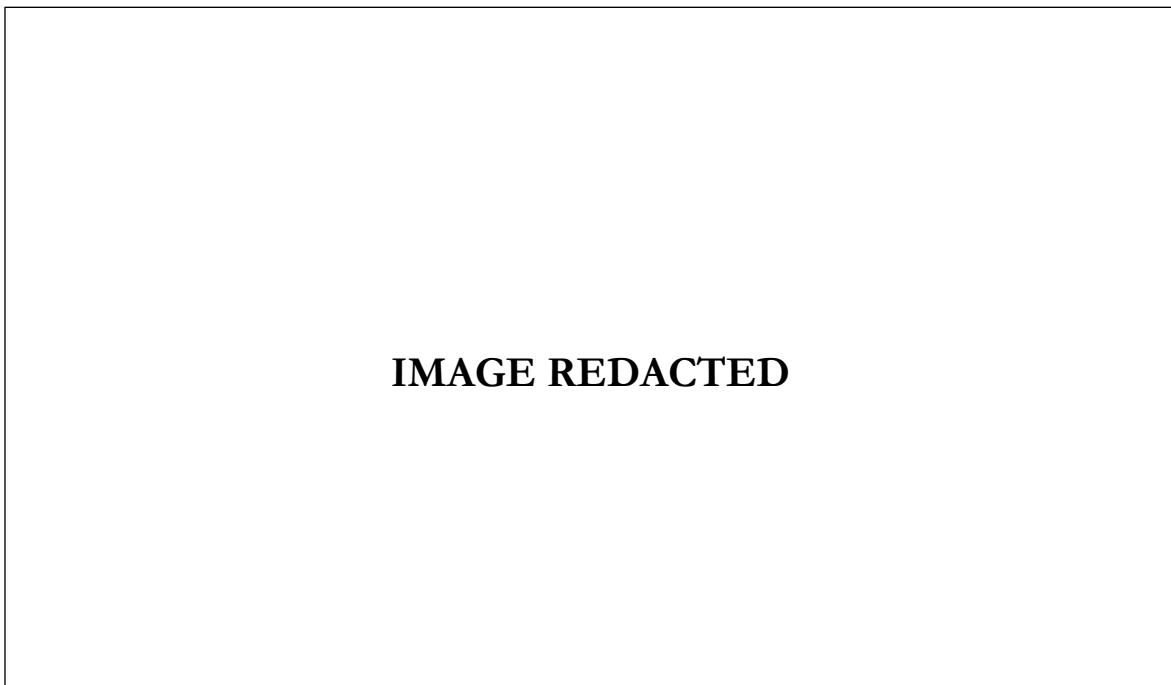


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Figure 26. Live imagery from Lowell Cross's *Video II (B)* (1965). Reproduced in Larry Austin and Douglas Kahn, eds., *Source: Music of the Avant-Garde, 1966-1973* (Berkeley: University of California Press, 2011), 271.

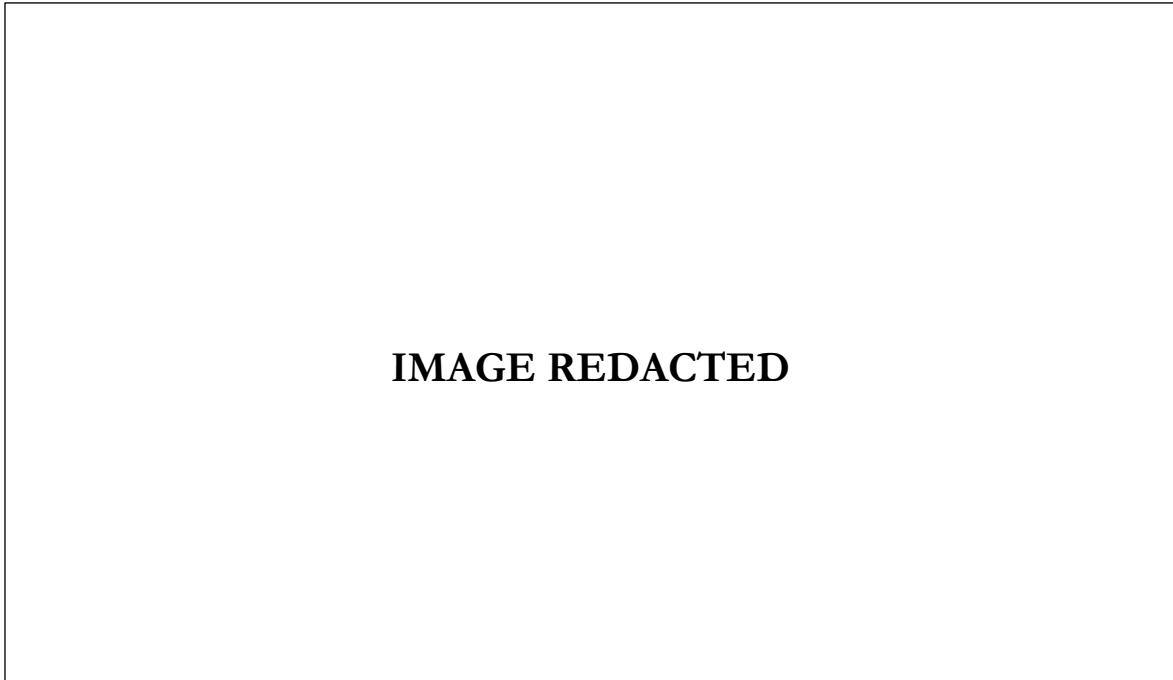


Figure 27. David Tudor (right foreground) performing *Bandoneon! (A Combine)* (1966) as part of “9 Evenings: Theatre and Engineering,” 69th Regiment Armory, New York, NY, October 14–18, 1966. Photograph by Peter Moore. “David Tudor — ‘Bandoneon!’” Medien Kunst Netz, accessed April 19, 2022, <http://www.medienkunstnetz.de/works/bandoneon/>. *Bandoneon!* was performed on October 14th and 18th. Pictured in the background: sound-generated imagery projected atop screen, remote-controlled carts with “instrumental loud-speakers.”

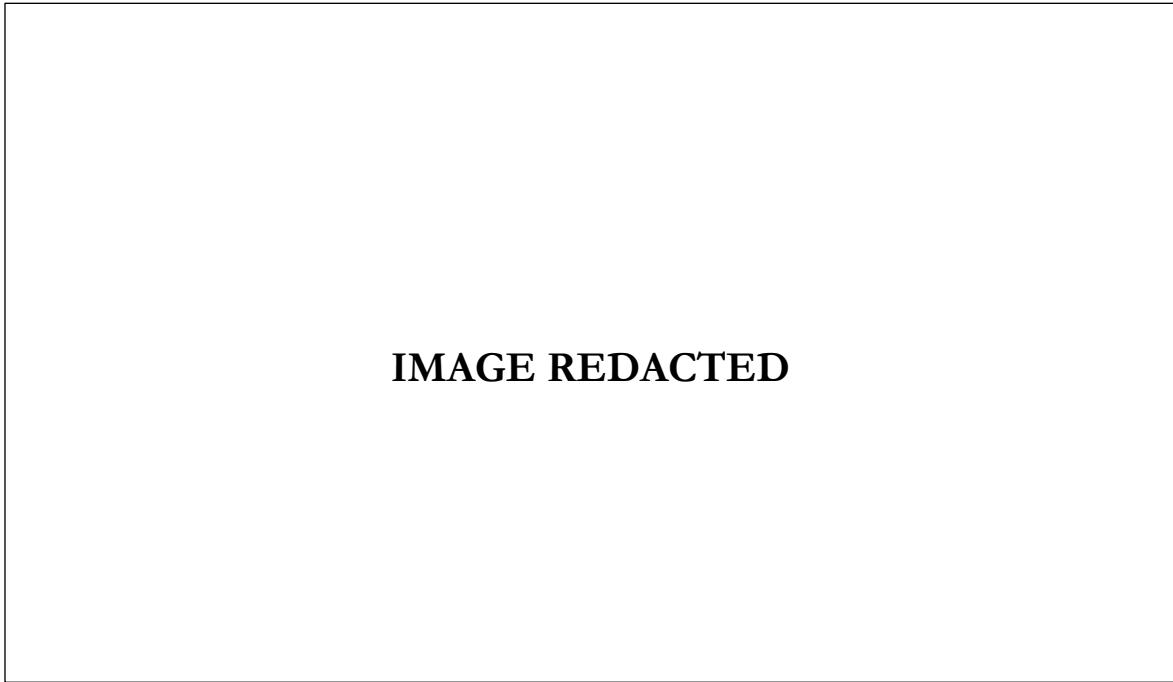


Figure 28. Close-up of David Tudor performing *Bandoneon! (A Combine)* (1966). Pictured in the foreground is one of Tudor's “instrumental loud-speakers”; the small square visible on the loud-speaker’s metal plate is a tactile transducer. Photo: Peter Moore. Reproduced in Douglas Davis, *Art and the Future: A History, Prophecy of the Collaboration between Science, Technology and Art* (New York: Praeger, 1975), 175.

Chapter 4

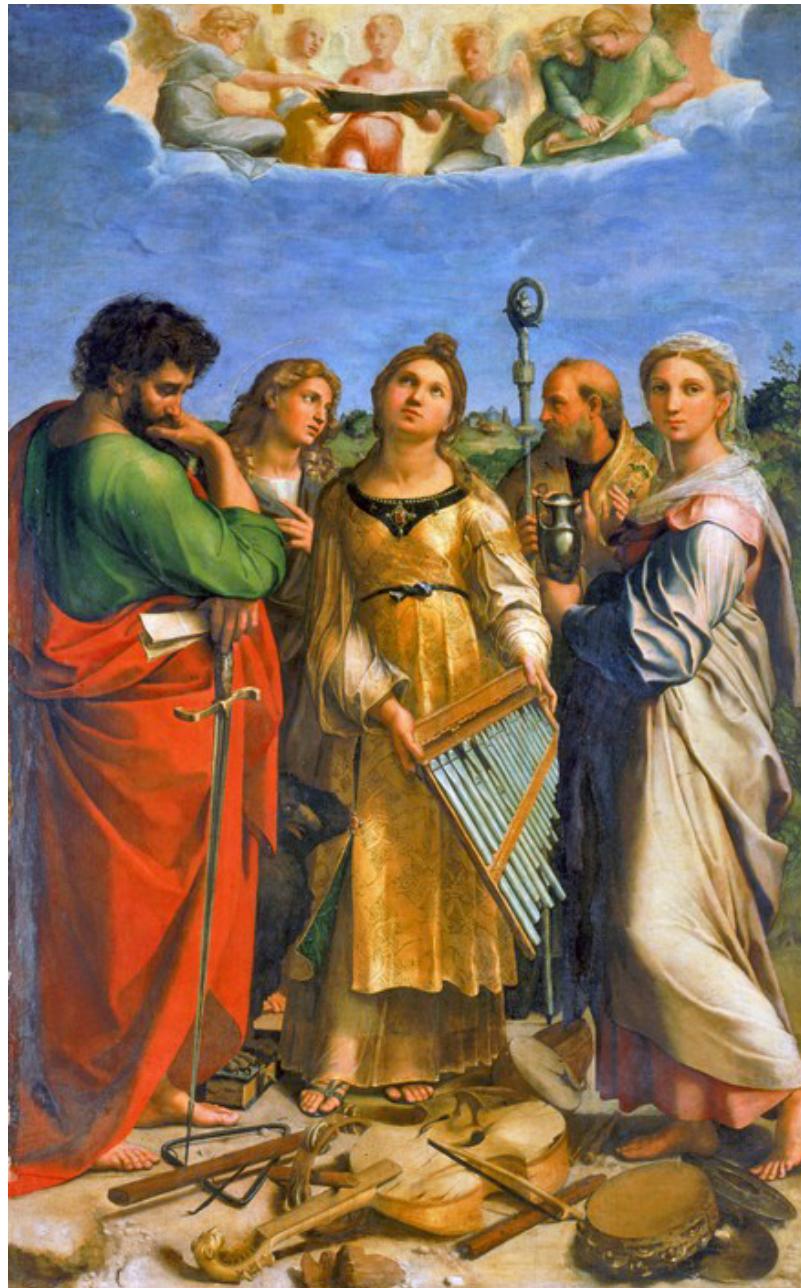


Figure 1. Raphael (Raffaello Sanzio), *Saint Cecilia*, 1516–1517. 87 x 54 inches.

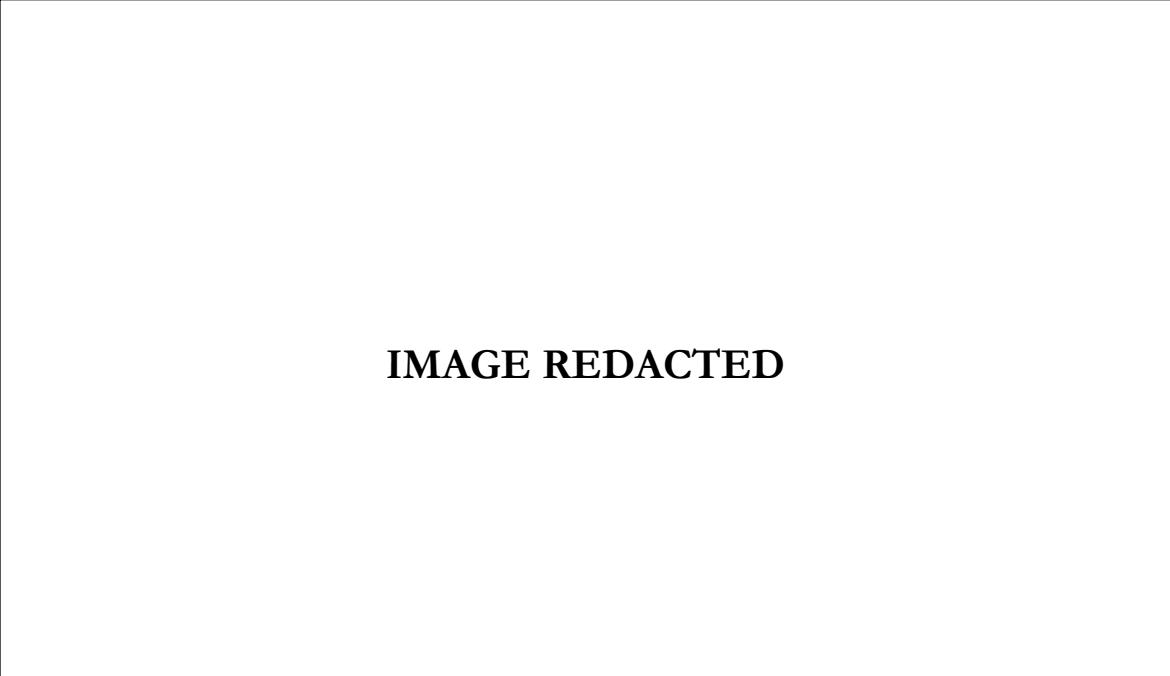
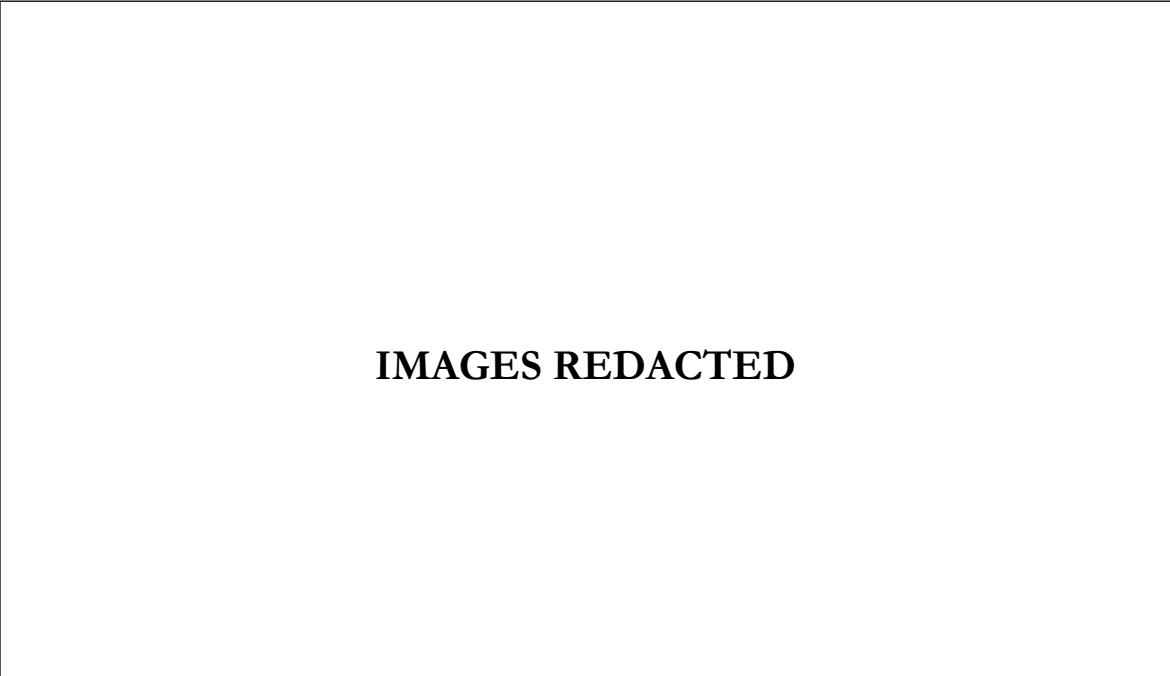


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Figure 2. “A Program of Live Electronic Music and a Combine,” concert program with illustration by Oliveros, 1968, Box 13, Folder 31, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.



IMAGES REDACTED

Figure 3. Assorted stills highlighting Tudor's "moving loudspeakers" from the 35 mm "9 Evenings" film shot by Bell Labs engineers. 9 Evenings: Theatre and Engineering fonds, The Daniel Langlois Foundation for Art, Science, and Technology, accessed April 19, 2022, <https://www.fondation-langlois.org/9evenings/e/david-tudor/performance.html>.



IMAGE REDACTED

Figure 4. William Ashworth's "sound reproducing device" (transducer) is pictured in Larry Steckler, "Fantastic Coneless Loudspeaker!," *Popular Mechanics*, December 1965, 37.

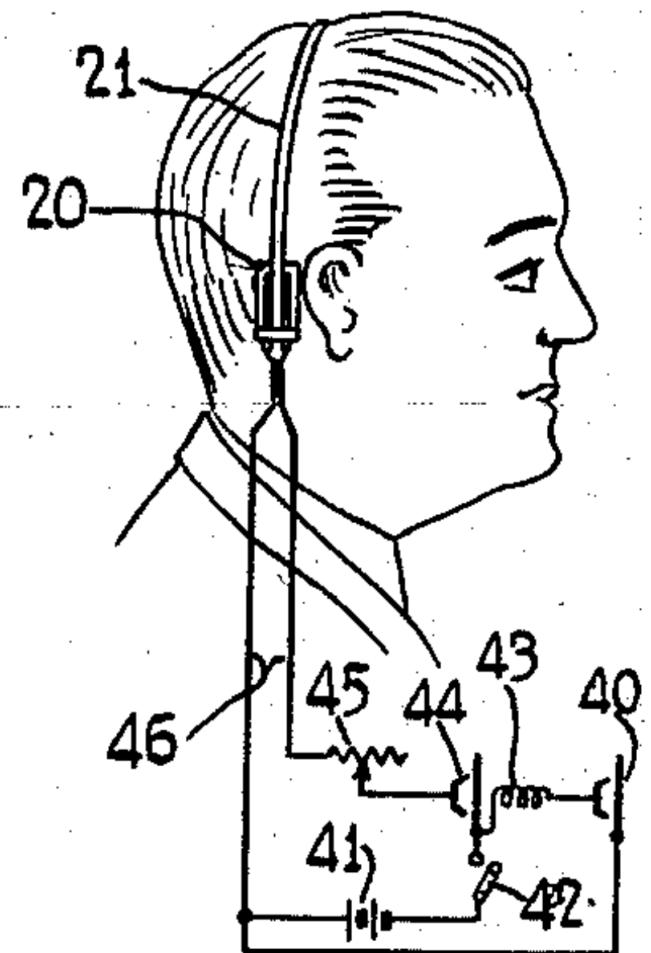


FIG. 1.

Figure 5. E.H. Greibach, Bone Conduction Hearing Device, 2,127,468 (Brooklyn, NY, filed November 11, 1933, and issued August 16, 1938), Figure 1.

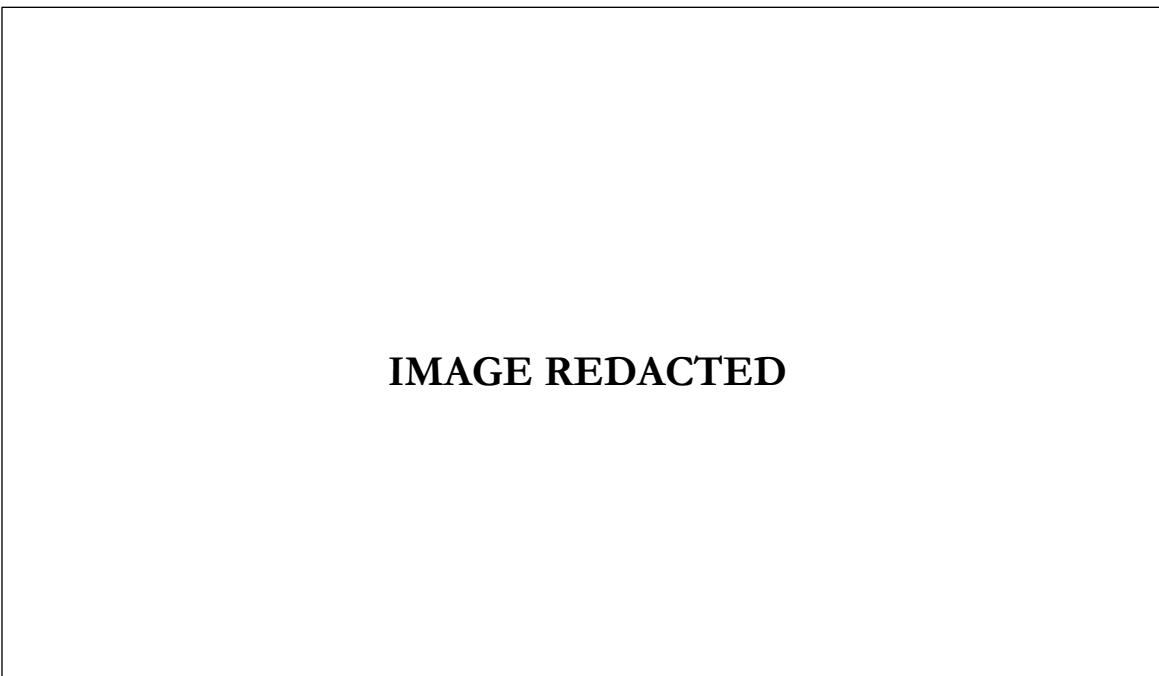


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Figure 6. Unlabeled and undated materials list, ca. mid Sixties, Box 36, Folder 4, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

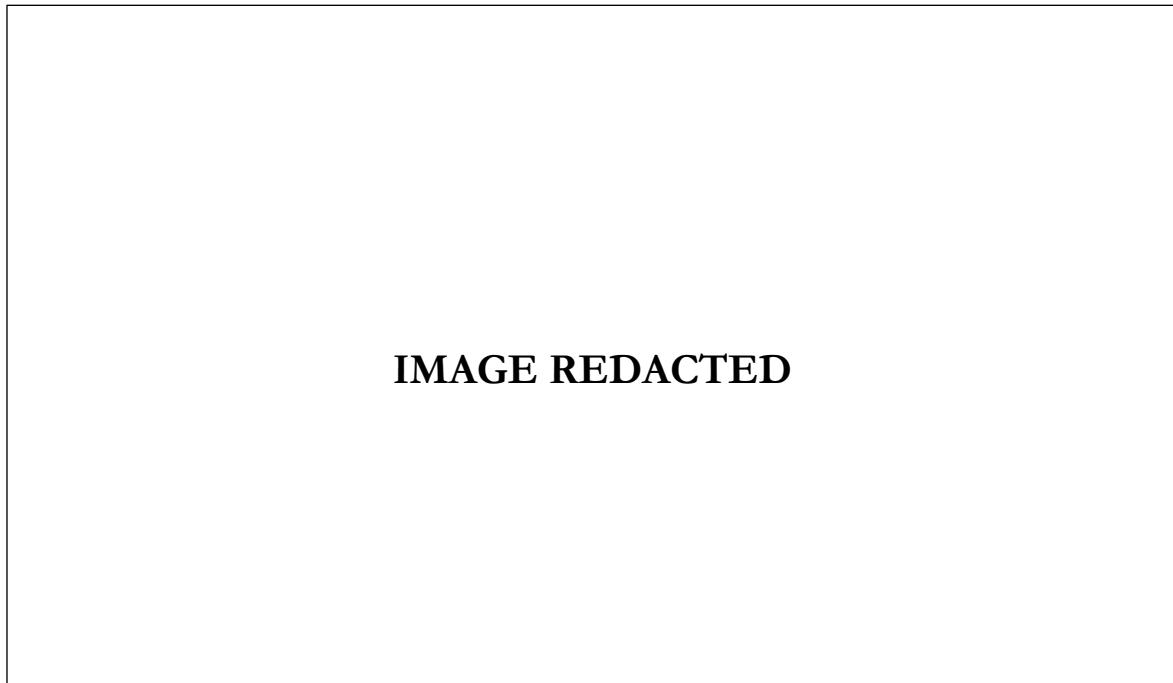


Figure 7. “Rolen Star” transducer ephemera, ca. 1968, Box 37, Folder 4, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

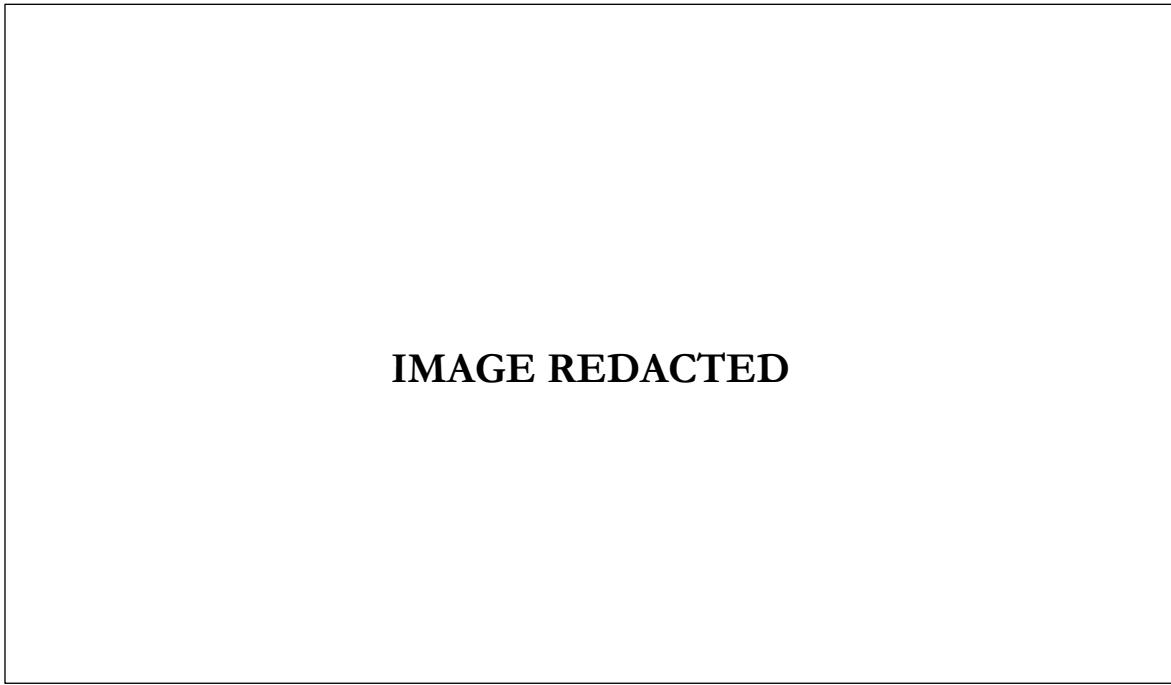


Figure 8. Tudor's Preparatory notes for Oliveros's *In Memoriam Nikola Tesla, Cosmic Engineer* (1969), Box 11, Folder 9, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

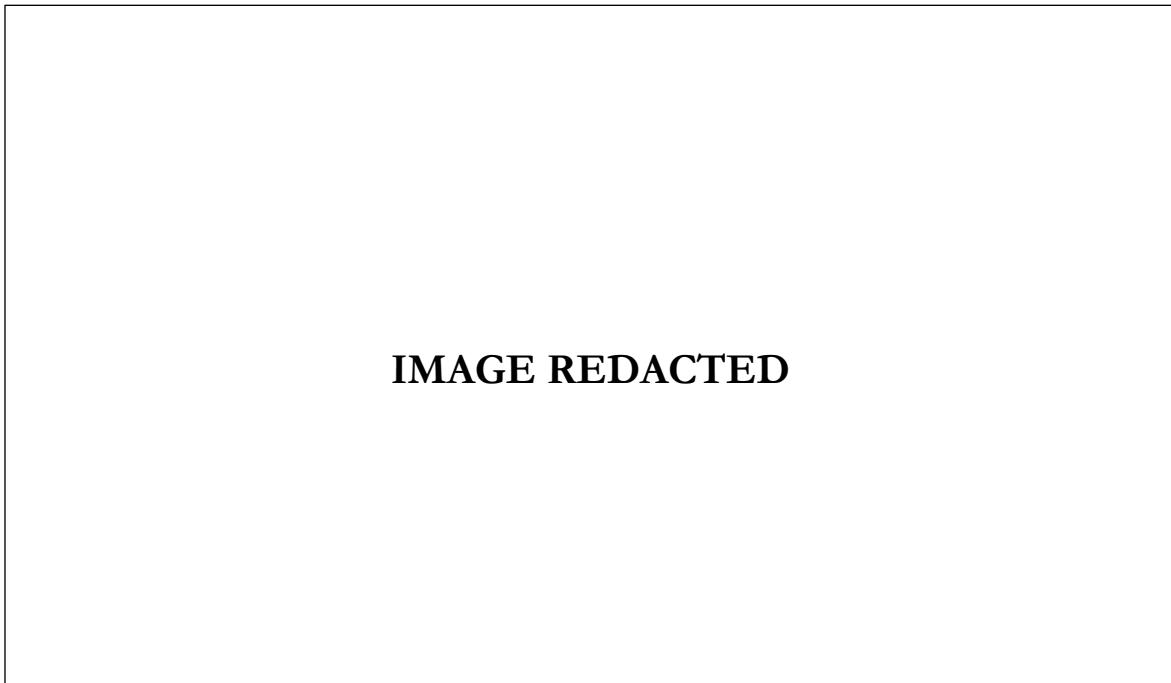


Figure 9. Robert Rauschenberg, *Soundings*, 1968, Mirrored Plexiglas and silkscreen ink on Plexiglas with concealed electric lights and electronic components, 96 x 432 x 54 inches.



IMAGE REDACTED

Figure 10. A diagram mapping the Pepsi Pavilion’s “sound-system rhombic grid pattern,” Box 17, Folder 2, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.



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Figure 11. Pauline Oliveros, draft description of *Electronic Mantra* (1970), Box 3, Folder 6, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

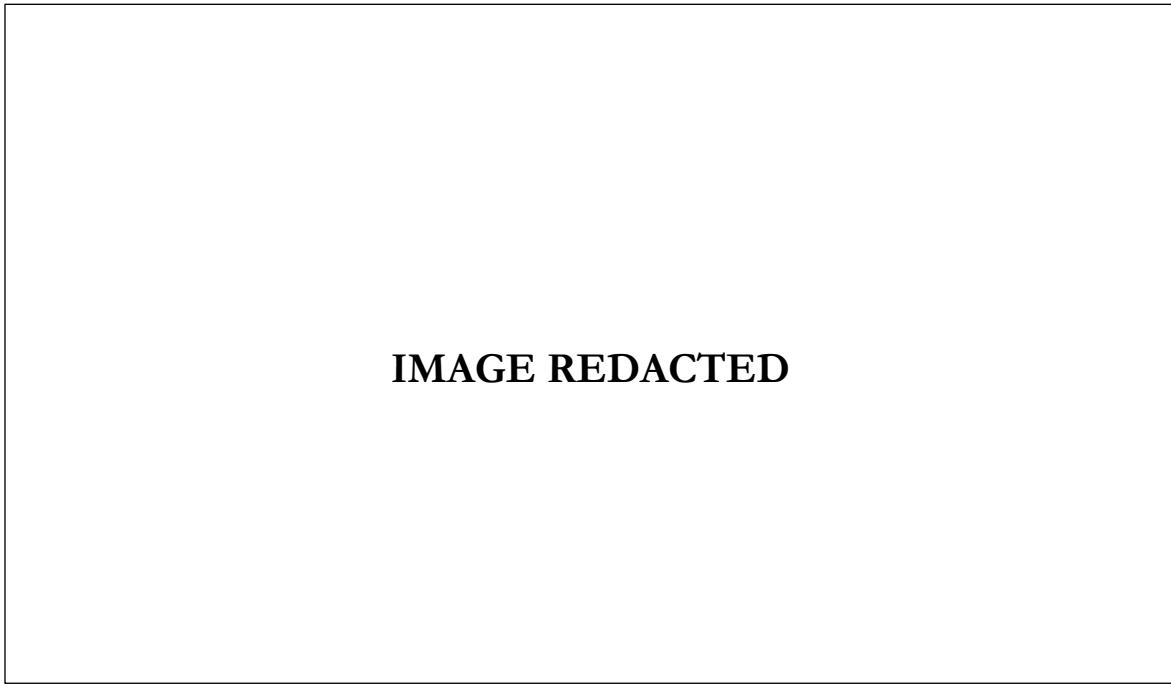


Figure 12. Pauline Oliveros and Lynn Lonidier, draft diagram for *A-OK* (1969), Box 1, Folder 4, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

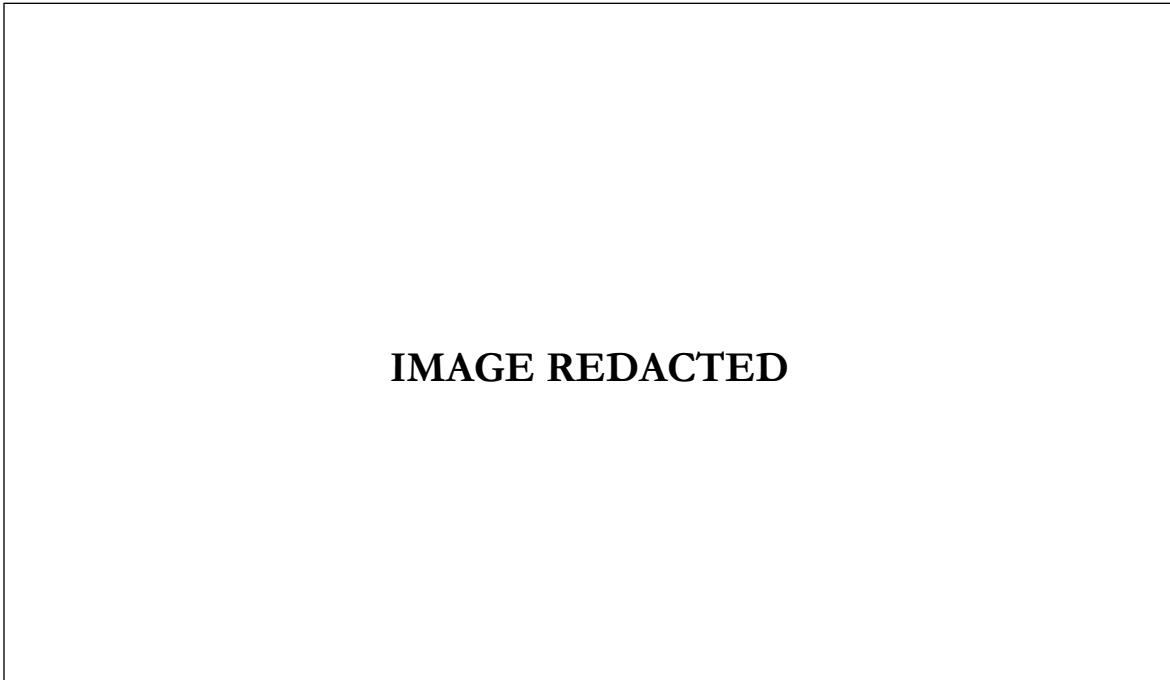


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Figure 13. Installation view of culminating *Rainforest IV* performance (*Sliding Pitches in the Rainforest in the Field*) at New Music New Hampshire (Chocorua), July 1973. Photograph by John Driscoll. Reproduced in John Driscoll and Matt Rogalsky, “David Tudor’s ‘Rainforest’: An Evolving Exploration of Resonance,” *Leonardo Music Journal* 14 (2014): 26, <https://doi.org/10.1162/0961121043067415>.

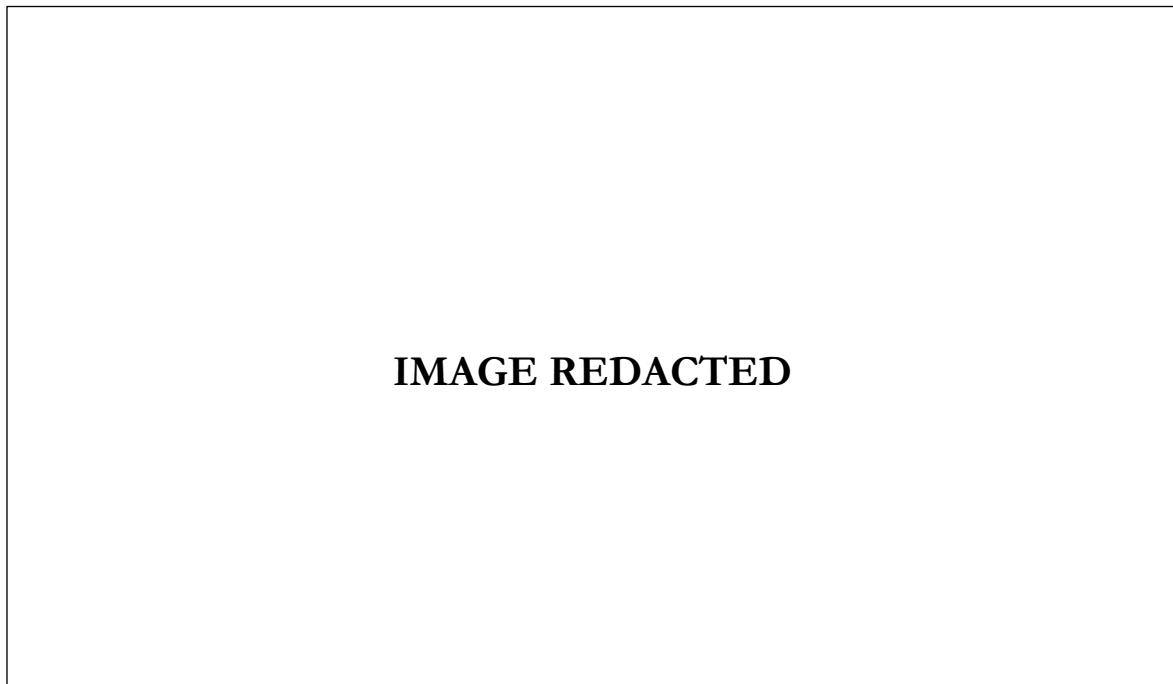


Figure 14. An uncredited and undated photograph of a ♀ Ensemble meeting at Oliveros's home. Oliveros appears at left. Box 12, Folder 6, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

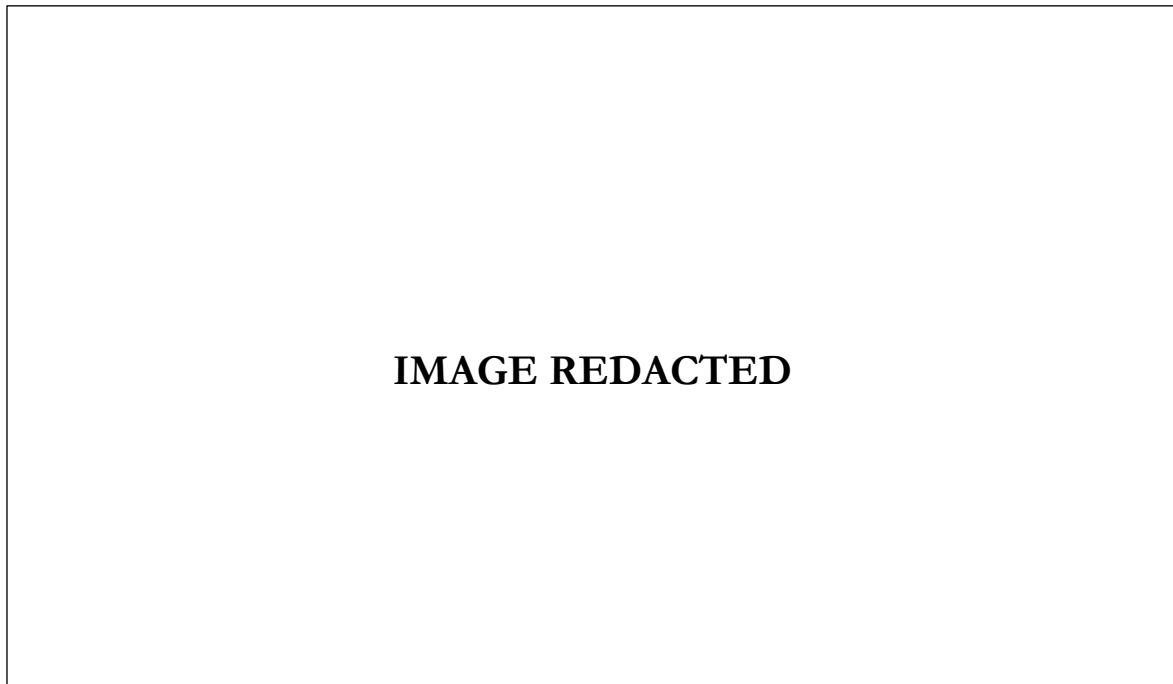


Figure 15. A biofeedback printout with EEG readings. Box 6, Folders 12–15, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.



IMAGE REDACTED

Figure 16. Floorplan of Fort Worth Museum solarium, materials related to 1975 performance of *Rainforest IV* at the Fort Worth Museum, Fort Worth, TX, Box 19, Folder 8, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.

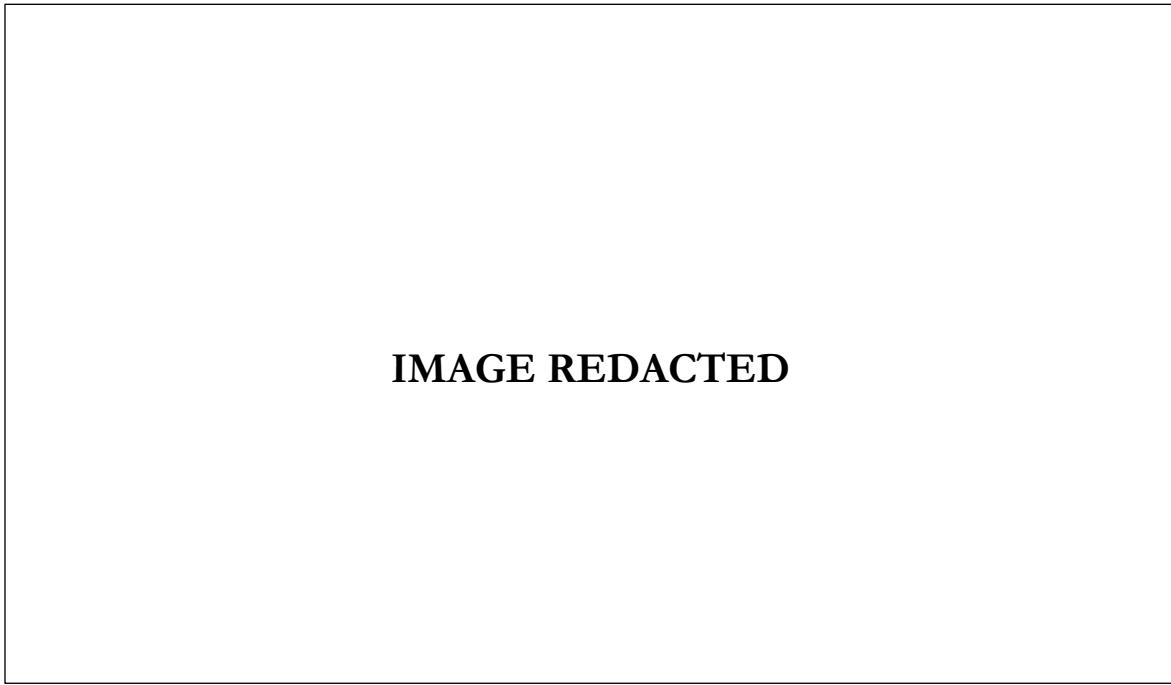


IMAGE REDACTED

Figure 17. Poster promoting Oliveros's appearance at the Women's Building in 1975, Box 14, Folder 7, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA.

Conclusion

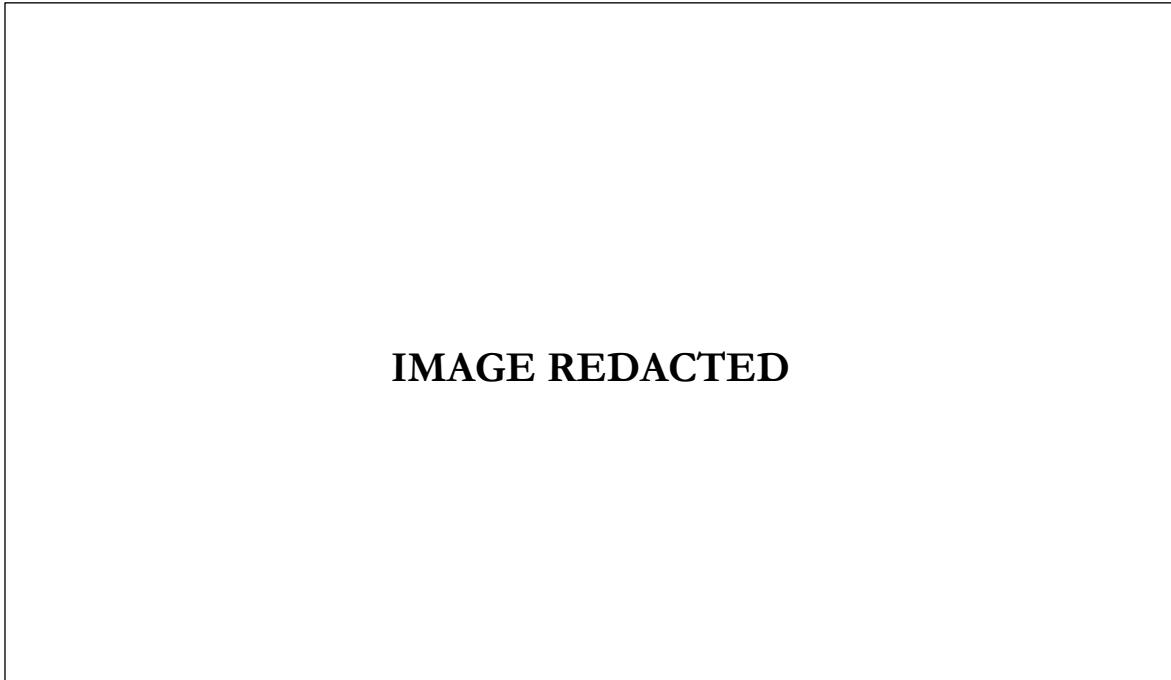
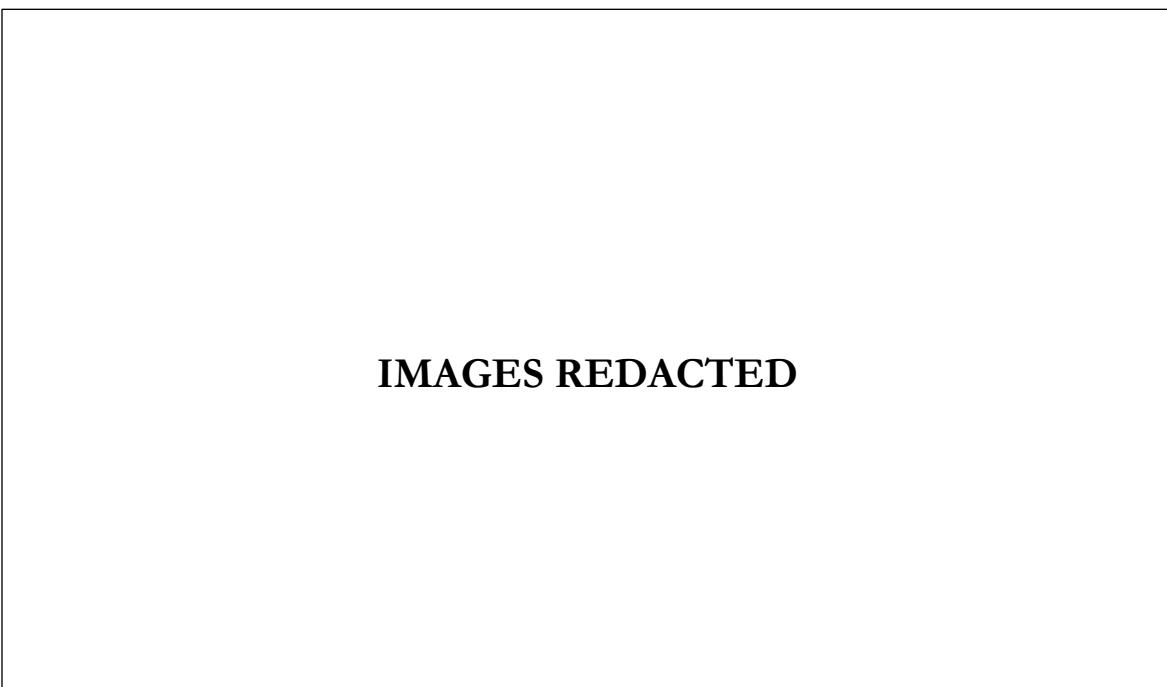


Figure 1. Maryanne Amacher sits with her recording equipment in a Budget Rent-a-Car in Minneapolis, MN, routing ambient sound to an indoor gallery in the city's Walker Art Center. Amacher's work, *City-Links #9 (No More Miles—An Acoustic Twin)* (1974), is an installment in her larger *City-Links* series, an extended engagement with the long-distance transmission of sound via telecommunications networks. Reproduced in Alan Licht, *Sound Art Revisited*, (New York: Bloomsbury Academic, 2019), 58.



IMAGE REDACTED

Figure 2. Schematic diagram mapping the genealogical branches of experimental music and sound art in the twentieth century, included in the catalogue for René Block's 1980 Akademie der Künste exhibition "Für Augen und Ohren: Von der Spieluhr zum akustischen Environment." René Block, et al., *Für Augen und Ohren: von der Spieluhr zum akustischen Environment: Objekte, Installation, Performances* (Berlin: Akademie der Künste, 1980), 6.



IMAGES REDACTED

Figure 3. Left: Pauline Oliveros and Sari Dienes, working drawing for *Talking Bottles & Bones*, reproduced in catalogue for William Hellermann's 1983 "Sound/Art" exhibition. William Hellermann and Don Goddard, *Sound/Art* (New York, NY: The SoundArt Foundation, Inc.), published in conjunction with an exhibition presented at The Sculpture Center, New York, NY, May 1–30 1983, and at BACA/DCC Gallery, June 1–30, 1983, n.p. Right: postcard included as an insert in the "Sound/Art" catalogue. Note the advertised Pauline Oliveros performance.

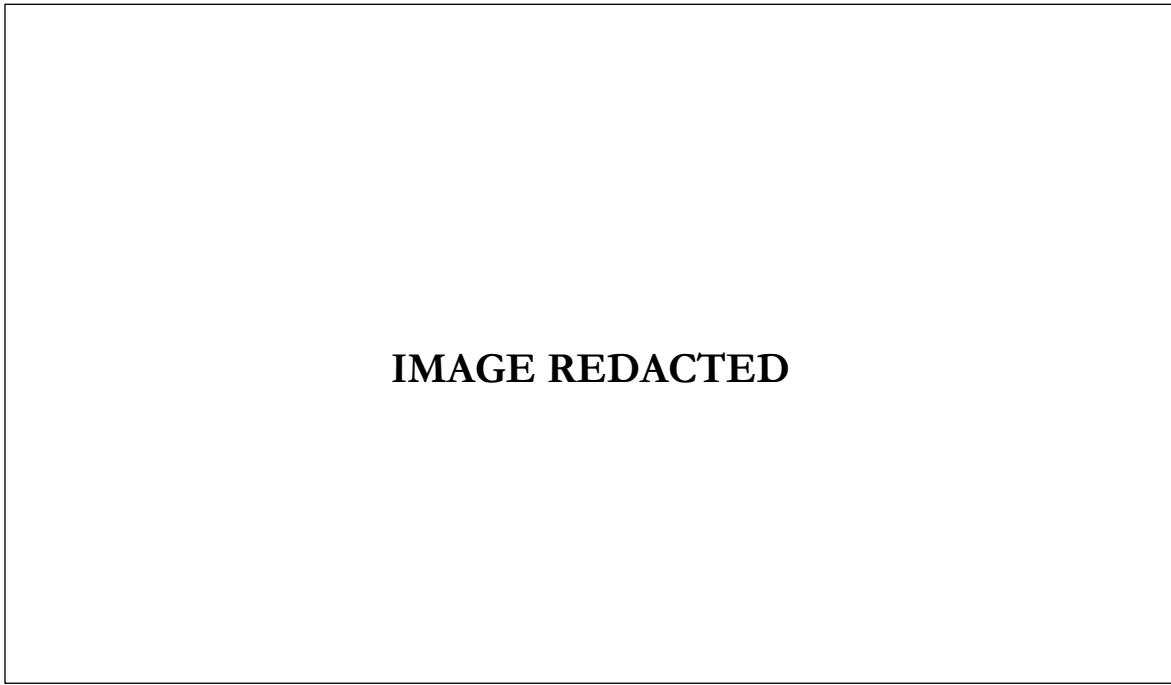


Figure 4. Artist Man Ray's "Indestructible Object" (1923/1964) appears on the cover of the catalogue for René Block's 1980 Akademie der Künste exhibition "Für Augen und Ohren: Von der Spieluhr zum akustischen Environment."

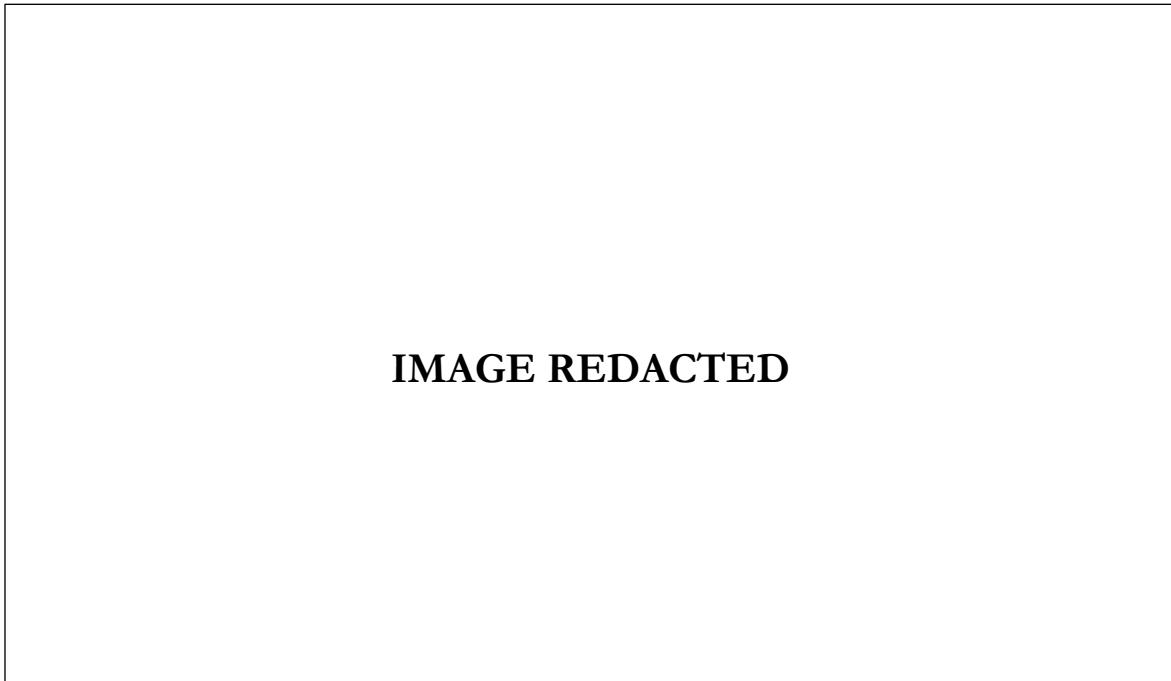
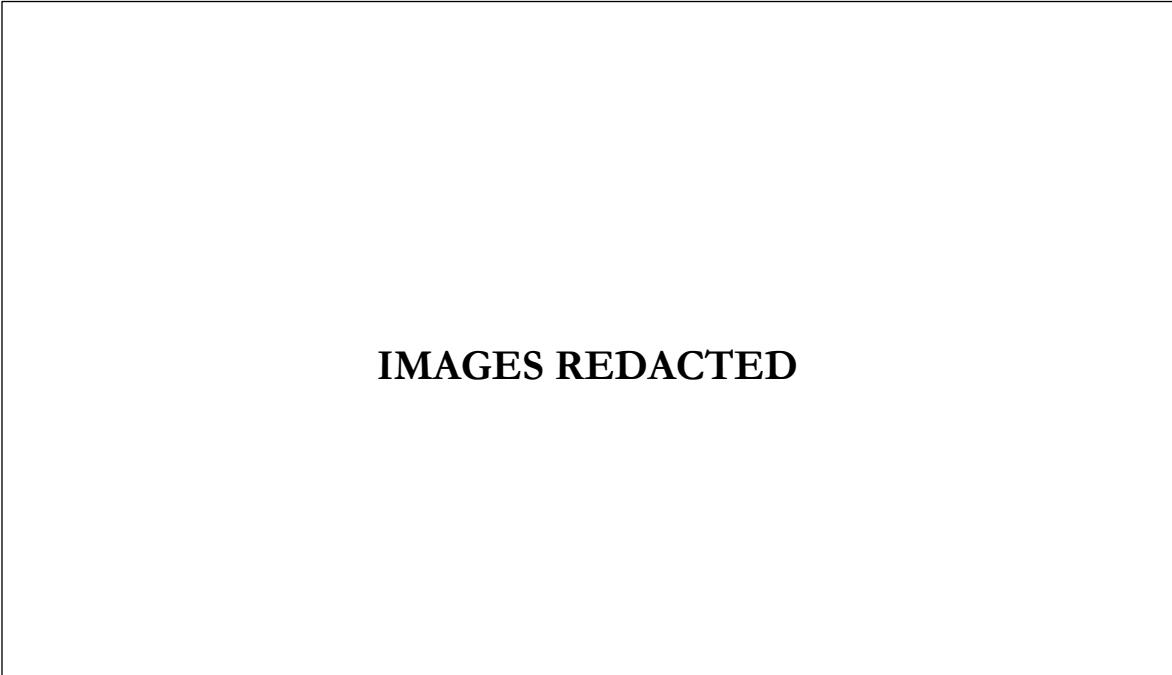


Figure 5. Two installation view of the Museum of Modern Art exhibition “Projects: Bill Viola,” March 15, 1979–April 24, 1979. Photographic Archive. The Museum of Modern Art Archives, New York. IN1255.3. Photograph by Mali Olatunji.



IMAGE REDACTED

Figure 6. Annea Lockwood, *Morning Meditation* and *Water Meditations* (1973), Box 24, Folder 26, Pauline Oliveros Papers, MSS 102, Special Collections & Archives, University of California, San Diego, La Jolla, CA



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Figure 7. Annea Lockwood, *Play the Ganges Backwards One More Time, Sam* (1974), performed at New York performance venue Franklin Furnace on January 8, 1980. Photograph by Franklin Furnace. Franklin Furnace Archive, Inc. 112 Franklin St. New York, NY, <https://www.jstor.org/stable/community.11869177>; <https://www.jstor.org/stable/community.11887245>.

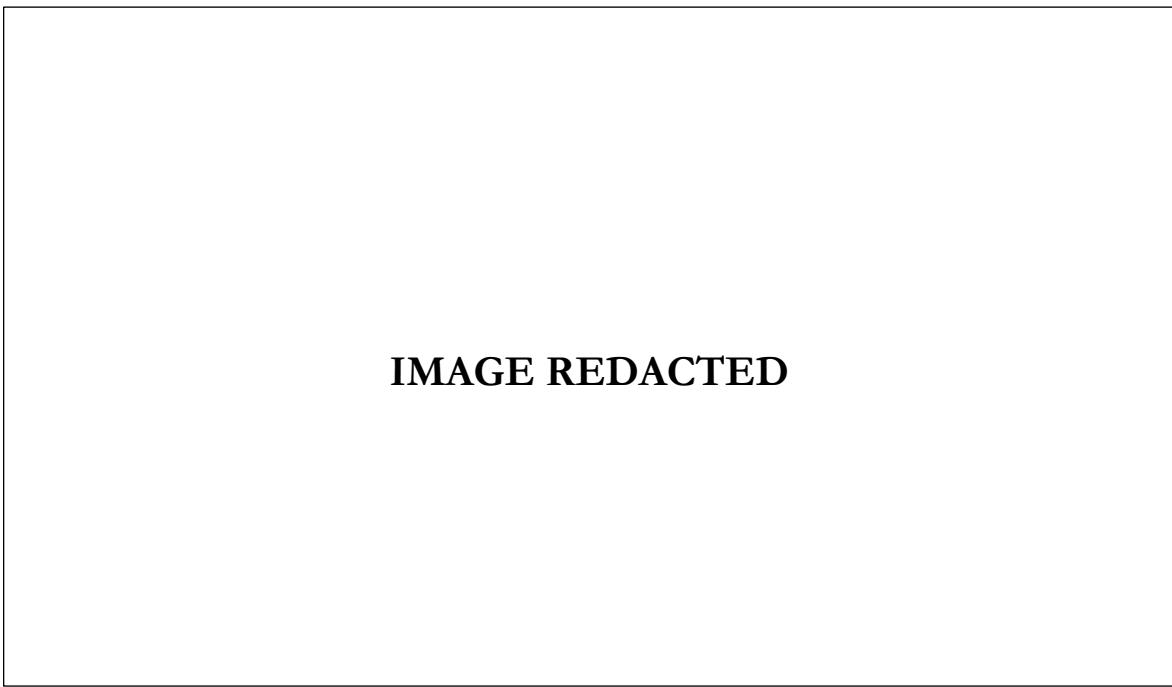


Figure 8. David Tudor, "The View From Inside" (1976), Box 19 Folder 12, David Tudor Papers, accession no. 980039, Special Collections, The Getty Research Institute, Los Angeles, CA.