Improvising Across Abilities

Pauline Oliveros and the Adaptive Use Musical Instrument

The AUMI Editorial Collective

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*Pauline Oliveros and the
Adaptive Use Musical Instrument*

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Key to Abbreviations

ADL	Activities of Daily Living
AUMI	Adaptive Use Musical Instruments (or Instrument)
CIRMMT	Centre for Interdisciplinary Research in Music Media and Technology (McGill)
CIL	Center for Independent Living
DL	Deep Listening®
DLI	Deep Listening Institute
EIS	Expanded Instrument System
ICASP	Improvisation, Community, and Social Practice (2007–2013). Major Partnered Research initiative supported by the Social Science and Humanities Research Council of Canada. http://www.improvcommunity.ca/
IDMIL	Input Devices and Music Interaction Laboratory (McGill)
IGB	Improvisation, Gender, and the Body (Research Group, ICASP)
IICSI	International Institute for Critical Studies in Improvisation. Major Partnered Research initiative supported by the Social Science and Humanities Research Council of Canada (2013–2021) http://improvisationinstitute.ca/
ISATMA	International Symposium of Assistive Technology for Music and Art (RPI)
OT	Occupational Therapist
PT	Physical Therapist
RPI	Rensselaer Polytechnic Institute
SCI	Spinal Cord Injury
TBI	Traumatic Brain Injury

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Introduction

SHERRIE TUCKER AND RAY MIZUMURA-PENCE

In one of her last interviews, composer, musician, humanitarian, and electronic music innovator Pauline Oliveros (1932–2016) discussed a lesser-known project, a computer and iPad application called Adaptive Use Musical Instruments, or more commonly, Instrument (henceforth "AUMI").[1] AUMI's purpose is to support music makers of all abilities. It does so by making sound when the player moves, however the player moves, thus supporting what Pauline liked to call "improvising across abilities."

Pauline's interviewer that day was Ted Krueger (henceforth "Ted"), architecture professor at Rensselaer Polytechnic Institute (RPI). Ted introduced his colleague as "an innovator over a lifetime of practice" with "an important place in experimental music." At eighty-four, her creative advances continued: in composition, performance, technological innovation, and philosophy of listening. He then turned to AUMI, which he described as a computer interface "that provides an opportunity for children with a limited capacity for movement to participate in social music making." He asked, "Can you talk about how that project [AUMI] develops out of and takes its place within your artistic practice?" (Oliveros and Krueger 2016, 282).

Pauline responded with a summary of sixty years of creative exploration, emphasizing interconnections across all aspects of her practice. She described specific projects to illustrate her holistic approach to composition, performance, technology, environment, inclusivity, and listening. Innovations in making music with oscillators and reel-to-reel tape machines in the late 1950s and 1960s, for example, characterize her life-

long interest in using technology to expand her listening. Technology allowed her to explore sound "beyond the range of hearing." It expanded how her body could create and perceive surprising sounds. This continued through her Expanded Instrument System (EIS) of the early 1980s, and a later digitized version. Playing live with the continuously evolving EIS allowed Pauline to expand her awareness "of the intermingling of past and future sound" in the present (283).

She defined listening as a "lifelong practice that depends on accumulated experiences with sound" (284). To illustrate, she told of a transformative listening experience of improvising with others in 1988 in a cistern fourteen feet underground with a forty-five-second reverberation. She and her fellow musicians realized "we had to learn to listen in a new way, significantly we realized that the cistern was playing with us." The environment was "another player."

This she linked with the importance of listening to and playing with people with different kinds of musical backgrounds. She enjoyed composing for "untrained musicians," who, she found, tended to be less "prejudiced about what they were doing" (284). This, too, carried through the span of her life's work, beginning in the 1960s and 1970s with the "sonic meditations" she wrote for "people who were not necessarily trained musicians." She concluded: "I have always valued working with those who are not trained and are not experts. Music should not be imprisoned by expertise!" In this formulation, "expertise" means foreclosure of curiosity, openness, and learning that can result from thinking of oneself as an expert. Music, like consciousness, needed room to expand.

In her lengthy answer to a direct question, Pauline never mentioned AUMI! But Ted, an excellent listener with a long, shared history with his interviewee, understood this was not due to lack of focus. Everything in Pauline's answer directly pertained to the AUMI Project. His next question highlights the connections for the rest of us.

"So these three elements of your practice, listening, technology, and an interest in the untrained musician combine in the AUMI project. How did it start?"

Pauline answered with a story, one that is retold from various perspectives throughout this book. A friend brought her a problem and she got to work. Leaf Miller, an occupational therapist (OT) and drummer, led an inclusive drum circle at a school for children and young adults with disabilities. But it wasn't inclusive enough. It excluded students who could not grip a stick with their fingers or pat a drum with their hands.

Pauline assembled a team of colleagues and students to cocreate an instrument. The team included the three students in the drum circle with the least autonomous movement. In 2009, she added three fellow members of the "Improvisation, Gender, and the Body" (IGB) area of the multisited research initiative Improvisation, Community, and Social Practice (ICASP). For nearly ten years, under Pauline's collaborative leadership, the growing AUMI Research Group used, developed, and studied AUMI.

Even in telling the "AUMI Story," Pauline situated it within her life's work using technology to expand listening—her own and that of others—to expand the listening circle, and to respect difference. In other words, this is not the interview genre where the Great Artist expounds on their goodwill side project. Pauline talked about AUMI as part of her lifelong practice of listening, learning, and making new music.

Throughout the interview, Ted asked grounded questions about AUMI. *Is it software? Is it political? Is it therapeutic?* To which Pauline answered directly, then expanded on what she meant and how it was not *only* that.

Is it software? Yes . . . "and you can get it for free!" *and* "everyone who uses it is a researcher."

Is it political? Not in the usual sense, but yes, because it is "politics when you're enabling something to happen. Then it's a political act and it becomes part of the body politic."

"*Is it therapeutic?*" "It is *musical*," replied Pauline, which might sound like a "no," until she adds, "I think that being able to participate in a community through making music improves the quality of one's life."

This interview is important, partly because it is one of Pauline's last and partly because it offers a glimpse into a time when disability moved to the forefront of her conceptions of inclusivity. Throughout her life, Pauline considered inclusivity an ongoing practice of expanding awareness. Like *listening*, like *consciousness*, inclusivity is never complete. AUMI was a significant player in Pauline's expansion of inclusive awareness in the last decade of her life, along with conferences and performances focused on musicians of all abilities. (See Tomaz, chapter 3, and Braasch, chapter 12.) She premiered a composition for Deaf and hearing audiences in an empty swimming pool in Norway shortly before she died.[2] Her RPI students from 2007 to 2016 remember exuberant guest visits by Leaf Miller, who demonstrated AUMI, and Pauline's assignment to create and perform AUMI duets in class.[3]

It is also important because most interviews with Pauline in the last

decade of her life skipped AUMI, and those that focus *on AUMI* skipped over the vast scope of her artistic life.[4] And yet, in Pauline's own value system, AUMI never played second fiddle to any other project. Nor was it separate from her deep inquiry into listening, creating new music, fostering more inclusive and mutually perceptive relationships, and engaging technology in a full-bodied way to expand what we know, perceive, and do. It is a fitting interview, in other words, with which to open this book.

Pauline continually reminded her team, "It isn't the AUMI software that is important, it's what people do with it." This refrain and her insistence that "everyone who uses the AUMI is a researcher" echo throughout this book. *Improvising Across Abilities* is written by many people, touched by AUMI in different ways: creatively, socially, politically, pedagogically, therapeutically, and musically. Authors share some of what they have done with this unusual instrument. Why do we play it? What does AUMI improvisation do for us? What do we wish it would do? What are the challenges? What do we want for its future?

What Is AUMI?

AUMI is easy to use but difficult to describe. Librarian, artist, photographer Tami Albin has created a series of AUMI portraits involving miniature Lego figures ("mini-figs") that demystify what it is like to play, or witness others playing, AUMI.

In figure 1, Batgirl approaches an iPad clamped to a mic stand. We won't guess her preferred sounds (fluttering bat wings, superhero theme songs?) but let's presume she has already selected them. A cursor on her mirror image on the screen moves when she moves her forearm, activating different sounds that are "planted" in different parts of the screen.

In figure 2, another music maker has approached the iPad in her wheelchair, selected her own preferred sounds and screen setup, and is playing those sounds using subtle hand movements. In this environment, the use of adjustable mounts supports positioning of iPads to many heights and angles. Each iPad is connected to a small speaker. This is optimal, but not necessary. AUMI can also be played on an open laptop, an iPad leaning against a box, without external speakers, etc. Myriad creative ways of using AUMI are shared in this book.

How AUMI Works

A detailed technology history of AUMI is relayed in Section II. In short, AUMI takes cues from cameras, long available as plug-ins, and now a

Figure 0.1. "Batgirl Playing AUMI." Tami Albin.

Figure 0.2. "Playing AUMI with Hand Movements." Tami Albin.

prevalent built-in feature of computers, iPads, etc. When the AUMI player *moves*, the camera follows whatever it is focusing on (a nose, chin, finger, chest), thus eliciting sounds. Camera settings are adaptable, allowing AUMI's motion tracker[5] to follow specified kinds of body movements—up, down, wide, narrow, fast, slow—triggering sounds from hundreds of possibilities, or even more for advanced users who load their own sounds. Hasi Eldib's film about musician Jesse Stewart's many uses of AUMI is an excellent introduction (https://doi.org/10.3998/mpub.11969438).

The player opens the AUMI app, then faces the device (a computer, iPad, or iPhone). A cursor that looks like a ball appears on the screen. It may take some "getting to know you" time, but if all goes well, the ball finds something about the player's body on which to focus. When that focal point moves, so does the ball. And when the ball moves to different places on the screen, it activates different preset sounds. In the case of Batgirl, the ball follows her forearm. You can "set" AUMI to follow a particular feature by clicking on (or touching on a touchscreen) the screen image of the body part the player wishes to move. You can play it alone, as dancer Jessie Huggett demonstrates (https://doi.org/10.3998/mpub.11969438.cmp.41) and with others, such as Propeller Dance (https://doi.org/10.3998/mpub.11969438.cmp.40) or AUMI Dream Ensemble of Kansas (https://doi.org/10.3998/mpub.11969438.cmp.52).

AUMI is not precise. It is not like you wiggle a finger and AUMI immediately plays the note you wanted. Like the cistern, it behaves like another player. Sounds respond to information detected by the camera—in this case, motion–and the camera follows what the camera follows. Sometimes, that might be a cat peering into the screen, an elbow instead of a hand, or a light flickering above. For players accustomed to more conventional methods of instrumental music making, AUMI's imprecision can take getting used to. But the same qualities that frustrate some players can prove refreshing for others, particularly those who seldom, if ever, encounter an instrument that responds to their available movement.

AUMI sustains Pauline's penchant for technology and music that engage the body in real time and leave room for surprise. Writes Jonas Braasch (chapter 12), Pauline was a forerunner in "human/computer interaction" before the field (HCI) existed. While working with her on computerization of her EIS, developer Nikhil Deshpande worked hard to understand what "Pauline was chasing after" until he realized that

it was less about "precision" than "the ability of a technical system to really push her own music forward. She cares about a bigger picture."[6] Similarly for many AUMI players, the flexible body-instrument-sound relationship, or what Garth Paine (2009), following Trevor Wishart, refers to as "dynamic morphology" (229), is one of its improvisational delights, something that adds to rather than detracts from its musicality (see also Lázaro-Moreno 2017).

Admittedly, AUMI is not so great for those wishing to develop more reliable levels of control over its output or perform existing repertoires, though some users have found ways of doing both. Control is an important concept for teachers, therapists, and anyone whose goals include increased independence in cause-and-effect relations, autonomy, agency, expression, and intentionality. AUMI resists control, which may prove a mismatch for some goals. It is *not* a great "Twinkle Twinkle Little Star" instrument, as AUMI trainer Jackie Heyen often said. It isn't good at reproducing a tune (unless you load a recording of that tune as a sample and then trigger it with a dip of the elbow). AUMI presented obstacles for musicians in Thunder Bay who wanted to play familiar songs (Oddy/ Vaugeois, chapter 13). Sometimes obstacles lead to new relationships, sounds, and discoveries. Sometimes not so much.

Control means different things to different people. AUMI can diversify our understanding of those different meanings. Control often implies hierarchies of power that disadvantage people with disabilities and other marginalized people. Control also means autonomy. When people with different relationships to control gather to play AUMI, they can explore these differences, learn new ways of listening and interacting, and suggest technological adjustments. Many AUMI improvements have arisen because of challenges and weaknesses identified by people using the instrument. Other challenges remain on the "to-do" list in this ongoing improvisational collaboration among users and the technology team.

AUMI is aspirational. There is no digital instrument solution everyone can use independently. For many AUMI users, distributed creativity is a fact of everyday life; many rely on assistants for basic functions of life. For many, assistance is required to set up the instrument. An unapologetic work-in-progress since 2007, AUMI resonates with the work of disability justice scholars who identify "independence" as a normative ideal and posit alternate theories of interdependency and what Akemi Nishida (2017) calls "affective relationality." The dialectic of utopia and obstacles is a familiar one for anyone with sustained engagement in social jus-

tice and transformation. Writes Ray Mizumura-Pence (chapter 20), "If I sound utopian, it is because I am grateful for witnessing how AUMI-based activities dilute the dystopian."

AUMI rejects the notion of an ideal body that determines who possesses and who lacks autonomy. It isn't sight-dependent (many sighted AUMI users prefer not to look at camera images of themselves as they play). Deaf and hearing-impaired players have used subwoofers and haptic plug-ins such as vibrating vests and cushions with AUMI. For people who want to improvise together across physical, sensory, intellectual, musical, cognitive, and neurological differences, AUMI is at its "dystopia-diluting" best.

Who Wrote This Book?

Improvising Across Abilities: Pauline Oliveros and the Adaptive Use Musical Instrument is shaped by its contributors, much as AUMI improvisation is shaped by movements of *every* body of every person who plays it. Some authors are members of communities of disability by kinship, friendship, activism, or profession; some are not. Some identify as people with disabilities (PWD) or as disabled.[7] Some self-identify in their essays and bios. Some do not. Some do not live with disabilities or as disabled. All have some relationship with communities of disability. Some authors were drawn to AUMI through their knowledge of Pauline. Others came to AUMI without knowledge of Pauline or her music; as AUMI users, however, Pauline would consider us all fellow researchers.

Many authors and editorial collective members not only *knew of* Pauline, but knew her personally. Many know one another through participation in dispersed local and virtual networks Pauline cultivated. Building community was an important value for Pauline. She made no effort to hide evidence of genuine relationships in her vast orbit of collaborators. We honor the palpable traces of this aspect of her work.

In fact, Pauline coplanned this book up until the time of her passing. In 2015, Sherrie Tucker, just beginning to embrace her identity as a proud ADHD writer, had completed an exhausting fourteen-year project, the last sole-authored book she needed for her academic career. In its wake, she sought a meaningful, collaborative, interactive writing project. She pitched a collaborative volume to Pauline, who loved the idea of a book written by AUMI users of many disciplines, occupations, and abilities. They discussed the book throughout 2015 and 2016. Pauline invited Sherrie to spend her sabbatical semester (Fall 2017) as visiting researcher

Figure 0.3. "Happy AUMI-versary 2007–2017." Tami Albin

at RPI to work on the book, in conjunction with a public celebration of AUMI's tenth anniversary. When Pauline passed on November 24, 2016, the devastated members of the AUMI Research Project had to decide what to do. Tomie Hahn renewed Sherrie's invitation to pursue her "Pauline sabbatical" without her host's physical presence; she accepted. Leaf Miller, original AUMI instigator, insisted the AUMI-versary must go on (see figure 3).

In 2017, Sherrie, along with Jonas Braasch, Ted Kreuger, and David Whalen, planned the AUMI celebration as a day-long feature of the International Symposium of Assistive Technology in Music and Art (ISATMA; see Braasch, chapter 12). The symposium included presentations by AUMI Research Project members, many of whom had founded AUMI research sites as part of the AUMI Research Consortium. A workshop by Leaf Miller and Jesse Stewart offered opportunities to play AUMI. The next day, AUMI researchers met to discuss the future, including how to sustain AUMI (an agenda item for every meeting, before and after Pauline's passing) and whether to continue with this book.

The consensus was to go forward with a volume shaped by an editorial collective composed of people with varied connections to AUMI. Many would come from the AUMI Research Project. Others would join through affiliations with AUMI Research Consortia sites supported by ICASP and a subsequent research initiative, IICSI. (See "Current and Former Members of the AUMI Research Consortium"). Over time, the AUMI Editorial Collective came to include: Thomas Ciufo, Abbey Dvorak, Kip Haaheim, Jennifer Hurst, IONE, Grace Shih-en Leu, Leaf Miller, Ray Mizumura-Pence, Nicola Oddy, Jesse Stewart, John Sullivan, Sherrie Tucker, Ellen Waterman, and Ranita Wilks. Sherrie agreed to continue as facilitator for continuity and to support flexibility of time

commitments for other collective members, thus ensuring broad participation among busy people of many occupations and limited writing time. We envisioned something other than a conventional edited volume—something mixed-genre—animating the uniquely adaptive process of the AUMI Project.

A nonstandard book project calls for a nonstandard editorial process. In early meetings, the editorial collective brainstormed parameters that could support a process that was intentionally collaborative and inclusive across communities where AUMI is important. Throughout the decade of Oliveros's leadership, AUMI researchers communicated in bimonthly Skype meetings across a broad invitation list. After her passing, we met semiregularly. This provided the model for editorial collective dialogues, which yielded an improvisational process of one-month commitments of "editorial relay teams" of three to five people representing different kinds of relationships to AUMI. Breaking down time commitments and tasks, we created a methodology of engaged collaboration and broad involvement across time constraints, backgrounds, and daily routines.

In March 2018, we crafted and distributed a call for "chapters-of-all-shapes-and-sizes." We received twenty-nine proposals, some from people in Pauline's expansive orbit and some whose varied AUMI activities surprised and delighted longtime members of the AUMI Research Project. The first editorial relay team consisted of Ranita Wilks, at the time a peer counselor at an independent living center (CIL) in Kansas; John Sullivan, then a graduate student and AUMI technology team member at McGill University (Montreal); and Leaf Miller.

Team #1 began by asking "what is vetting in an inclusive volume?," then considered each proposal with the goal of accepting as many as possible. Next they worked with authors on revisions, geared toward broadly communicating their ideas, and inquired what each author needed to complete their contribution. For those who had much to say but little time to write, Team #1 paired the proposal author with a coauthor or someone to interview them so they could work with the transcription.

The second relay team intercepted the "baton" of accepted abstracts and notes from Team #1 and from these developed a vision for a book, including a conceptual framework for sections and titles. Team #2 included disability studies scholar Ray Mizumura-Pence; musician/composer/humanitarian Jesse Stewart; sound artist/composer/improviser and music technologist Thomas Ciufo; and author/playwright/director and improvising text/sound artist, IONE, Pauline's longtime collaborator and spouse. Once they established a flexible structure and feel for

the book, they passed their resources to Team #3. And so forth. Each relay team carried work of previous teams to the next task, with clearly bounded time commitments to make participation opportunities as inclusive as possible.

Because of this process, this book has many voices, styles, and perspectives, bearing contributions from authors with broad and varied skills, knowledge, and experience. The "we" who writes this book is a multiple "we" of many differences, working to communicate beyond our immediate circles. We wanted to create a book that, like AUMI, anticipates new communities. Not everyone will read all chapters, and we think this is okay. Those who read across specializations will likely encounter rhetorical dissonance. This, too, is consistent with the AUMI model of "improvising across abilities." By juxtaposing varied specializations—fair housing and disability justice activism, music therapy, inclusive multimedia performance in music, dance, and choral groups, etc.—we hope to facilitate unusual connections.

In combining chapters that draw from (and critique) the social model of disability studies with those situated in clinical research and practice, *Improvising Across Abilities* contributes to critical destabilizing of silo models within disability studies. Thus the book speaks to issues addressed by Katie Ellis, Rosemary Garland Thompson, Mike Kent, and Rachel Robertson in *Manifestos for the Future of Critical Disability Studies: Volume I* (2018). It also reinforces increasing attention to disability studies scholarship within music therapy, signaled by the special issue of *Voices: A World Forum for Music Therapy* 14, no. 3 (2014). Observes Mizumura-Pence, although "Occupational Therapy has a history of being associated with rehabilitation and the medical model of disability," the contributions of Miller as editor, author, researcher, and the person who imagined the AUMI before it was created, "gives me/us opportunities to think about how this book contributes to new thinking and action in relation to disability models" (see Mizumura-Pence, chapter 20). Our methodology follows AUMI to its users and uses and back out to readers, who may also consider new connections across fields, disciplines, practices, ideas, and sounds.

In *Just Vibrations: The Purpose of Sounding Good* (2016), William Cheng's guiding axioms could easily describe Pauline and the AUMI Project. In theorizing, creating, and refining AUMI for use with people of all abilities, Pauline extended her lifelong practice of presuming, like Cheng, that "each of us has the potential to resonate molecularly, socially, and ethically with others" (14), and that it is only by "attending to how our

convictions, relations, and actions ripple through public spaces" that we "achieve a sense of how we matter and what matters most" (15). Pauline encouraged collaborators to bring AUMI to their own communities. Many chapters in this book report back from these ripple effects of Pauline's cocreative leadership.

How to Read This Book

Improvising Across Abilities is a book of many styles and expressive forms: poetry, first-person narrative, interviews, essays, and companion text linkages to media (video and audio). We are grateful to the University of Michigan Press for providing a media platform on Fulcrum where readers may easily access captioned audio and video of various AUMI projects. Some media illustrate points within specific chapters. Some accompany one or more chapters while making a different kind of sense when experienced individually.

The book is divided into five sections. Most chapters resound across multiple themes and may be read in any order. Readers who choose to travel this volume in the sequence provided will experience its contents in the shape of an arc leading from the dream that prefigured the AUMI Project to dreams for AUMI's future.

Section I, "Dreaming of AUMI," opens with the hopes and dreams of the people who initiated the AUMI Project, as well as contributions from people whose dreams (for inclusive expression, for models for social justice) led them to AUMI in its early stages.

Section II, "Software for All People: Improvising AUMI's Development," compiles technological history and context. AUMI's development is driven by input from the diverse group of stakeholders within the AUMI community, including researchers, practitioners, teachers, and end users. We removed technical specifics from later chapters to avoid repetition. This is the go-to section for those seeking vocabulary such as "Max/MSP" and "Jitter." Just remember: AUMI technology continuously changes under unpredictable funding streams. Consult the website https://aumiapp.com for up-to-date information and downloads.

Sections III and IV focus on Pauline's interest in "*what people do with it.*" In Section III, we untidily group some chapters under "AUMI Communities" (part 1) and others under "AUMI Performance" (part 2). Both concepts reverberate throughout, as do keywords of social justice and disability justice. Here, we define "Community" and "Performance"

as interrelated and often coconstitutive AUMI-facilitated practices, the distinction being one of focus. Attention to "Community" foregrounds ways that people have used AUMI to create more inclusive modes of human interaction. This often happens through AUMI performance practice. "Performance" attends to uses of AUMI to expand the ways in which all people may experience creative expression, an essential goal for Pauline. Such performance practices involve listening to others and the environment and working to create more responsive community practice.

Section IV (parts I and 2) continues with the "what people do with it" theme, this time focusing on how teachers and music therapists have incorporated AUMI in their practices. Part 1, "AUMI Classrooms" addresses some ways teachers have used AUMI in different kinds of learning environments. What has worked? What are the challenges? What do teachers recommend? In Part 2, "AUMI and Music Therapy: Supporting Independent Musicking," we hear from music therapists who have used AUMI in different kinds of clinical practice, and who offer insights, techniques, and recommendations.

In Part V, "Dreaming AUMI's Future," we gesture to dreams for multiple surprising AUMI futures. What will people do with it? Where will that take us?

Pauline comes and goes throughout the book. She plays a leading role in some chapters, remains backstage in others, but is always present. We hope this introduction makes clear why this is so. There are other adaptive and assistive musical instruments (see Leu, chapter 8), but AUMI is the only such instrument (or, more accurately, set of *instruments*) to emerge and grow as part of the life's work of Pauline Oliveros. She encouraged cocreative approaches to its development and was pleased when players invented new uses and suggested improvements.

The AUMI Project beautifully carries forward goals of her *Sonic Meditations* [1971/75], in which "no special skills [are] necessary," where all participants, regardless of musical training or experience, are equally valued, and where anticipated benefits of group practice included gaining "greater awareness and sensitivity to each other." The radical conclusion—that "Music is a welcome by-product of this activity"—drives the AUMI Research Project. What is the potential of all-ability sounding and listening in AUMI improvisation to transform social relations and discover new modes of inclusive community practice? What does that *sound* like? The work continues. We invite you to join us.

Notes

1. For more on the Instruments/Instrument distinction, see Sullivan, chapter 10.

2. This is one of the few interviews where Pauline discusses collaborating with Tarek Atoui and RPI students to create new instruments for Deaf and hard-of-hearing musicians and audiences. Students from that seminar recall Pauline discussing in class her own hearing loss. Michelle Temple, interview with Sherrie Tucker, AUMI Oral History Project, January 5, 2022.

3. Sam Chabot, interview with Sherrie Tucker, AUMI Oral History Project, December 11, 2017; Jonathan Mathews interview with Sherrie Tucker, AUMI Oral History Project, December 17, 2017).

4. One notable exception is Daniel Weintraub's wonderful documentary, circulating as we go to press: "Deep Listening: The Story of Pauline Oliveros" (Capone Productions, in association with IONE and the Ministry of Maåt, 2022).

5. Newer versions of AUMI for iOS include several tracking options, but "motion tracker" is the earliest and most commonly used (see Lowengard, chapter 11).

6. Nikhil Deshpande, interview with Sherrie Tucker, oral history, January 8, 2018.

7. "People-first" language (PWD) is born out of the disability rights movement of the 1980s and 1990s. More recently, the disability pride and disability justice movements advocated for "identity-first" language that highlights disability as crucial to a person's identity. This choice was left to each author, since neither term fulfills its purpose when applied to someone who does not identify with it.

Dreaming of AUMI

> Do you listen for sound in your dreams? What do you hear? How does it affect you?
>
> —Pauline Oliveros, "Deep Listening," 55

How did AUMI come to be? How did people come to AUMI? How does AUMI help us to dream? Unlike many computer applications, AUMI did not emerge from a laboratory of related systems, but from a convergence of different dreams.

Chapters 1 and 2 address "how AUMI came to be" from stories by Leaf Miller, the occupational therapist/drummer who brought to Pauline her dreams of a more inclusive drum circle; and Zane Van Dusen, a computer science student and punk musician who dreamed of working with Pauline and built AUMI's prototype in his senior year at RPI.

Dream routes traveled in chapters 3 and 4 explore "how people came to AUMI." Clara Tomaz shares memories as a graduate student artist and filmmaker coming to terms with changes in her embodied relationship to voice and speech. Julie Brocklehurst recounts her story as a mother seeking ways to share with her son "the gift of expression."

How AUMI "helps us dream" toward social justice is the theme of chapter 5. Leading scholar of social movements and inequality George Lipsitz explores how AUMI "envisions and enacts a new way of thinking, not only about music, but about social relations more generally."

We close this section, but not the dream, with a chapter by Pauline's longtime artistic collaborator and spouse, IONE, who situates AUMI within the intimate, expansive dream she shared—and continues to share—with Pauline.

ONE | Going Deep

AUMI Since Before the Beginning

LEAF MILLER

ILLUSTRATIONS BY TY DYKEMA

Introduction

This chapter is an honoring. My praise song for Pauline. Filled with gratitude and love. Our paths connecting. We took an incredible adventure together, filled with people, places, food, and music along the way. This is the oldest AUMI story. Starting even before it was invented. When it was a seed that I shared with Pauline. This is how it began and how it grew.

Pauline Oliveros was a friend, mentor, neighbor, and musical inspiration. We worked together in many ways over many years. The AUMI experience is my most profound collaboration with her. The invention of a new musical instrument! It is truly amazing. This is the story of the beginnings. AUMI began with conversation in the Catskills and has grown and been embraced by people of all ages throughout the world. Pauline, the spider woman. Weaving her AUMI web with incredible vision, musicality, depth, and ability to make things happen and bring people together. She once talked with me about the purpose, and the purpose of the purpose, and it has been a guide for me ever since.[1] AUMI is a musical instrument that can be played by everyone. That is the purpose. But the purpose of the purpose goes deeper. Changing the worldview that music is only for some people, some bodies. A call to consciousness raising. The arts for social change. That is the purpose of the purpose . . .

How I Met Pauline

I met Pauline through a mutual friend in the early 1990s. I was not into new music or electronic music. I considered myself an "acoustic" person, playing drums and percussion in African and Afro-Brazilian traditions. I was one of the first women playing hand drums professionally, performing, teaching, and accompanying dance classes in the Hudson Valley. I am also a musical instrument builder inspired by folkloric styles from around the world.

The drums brought me to all this richness of people and culture. And they led me to Pauline. I worked with her as an artist-in-residence for her foundation and performed with her. She opened a world to me, as I was going to her concerts, learning about her life, and being inspired by her music, her genius, her playfulness, her encouragement, her humility.

We shared the dream of widening the circle of music making. To include everyone in the creative process. To recognize the desire for self-expression. To be part of the action. Not as an onlooker but as an engaged participant. Opening possibilities, sensibilities, opportunities.

For me, AUMI always was, and continues to be, a coming together of the personal, professional, political, and musical. Being a drummer, an OT, and a Jewish lesbian feminist from Brooklyn make up my perspective on AUMI's development.

"Okay Kid, You're On"

Bob Kelleher, Principal, Abilities First School, 2005

The need for AUMI was generated by my drum class at Abilities First, a school for children with disabilities (figure 1.1).

Students lived with a wide variety of disabilities, including cerebral palsy, Down syndrome, autism, aggressive/oppositional behaviors, and sensory processing difficulties.

I saw my OT career as a way to combine my love of working with kids and my love of the drums. But it took almost seventeen years of working at Abilities First, persistently bugging the principal, Bob Kelleher, before I could combine these passions on a sustained basis and teach a drum class.

In 2005, I was inspired by the arrival of Damon, a new student. He was a drummer, I knew, because he was drumming on everything. He was a musical person, and we needed that at the school. Our connection grew through the drums, and we are friends to this day. We played drums and
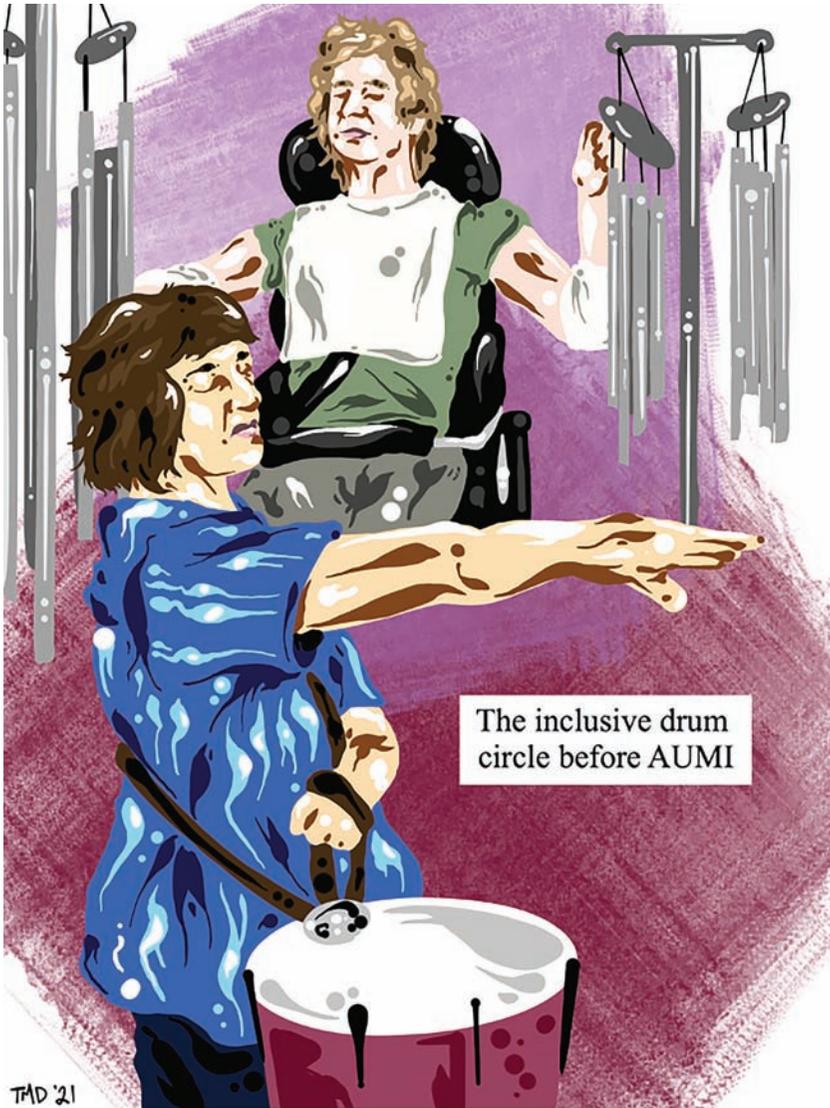
Figure 1.1. "The Inclusive Drum Circle before AUMI." Drawing by artist Ty Dykema. To view in its original color, see https://doi.org/10.3998/mpub.11969438.cmp.52.

made music in our therapy sessions. On the walk back to his classroom, we'd grab our sticks and play on anything and everything, creating an ongoing musical presence down the hallway, to the delight of some and the annoyance of others. Around that time, I finally got the go-ahead from Bob to start up the drum class.

I loved doing the drum class, but it became obvious to me that it needed to be totally inclusive and open to everyone in the school. I researched adaptive musical instruments. There were few options and the ones that existed (e.g., Soundbeam) our school couldn't afford. What to do? Who to call on? Who else? Pauline!

Over the next two years, we talked about this necessary new instrument. As Pauline said, I wore her down. Finally, in 2007, funding!!! I remember her phone call, an excited "we got it!" We were on our way. Pauline put together the AUMI Project, each of us bringing different skills and input, to work together inventing this new and exciting adaptive musical instrument.

AUMI and the Drum Class

We understood the importance of the opportunity to develop AUMI with the Abilities First students. Being on the ground, in everyday school life, I could make sure the kids were a real part of the research and design process. These were students I knew and worked with, some for many years. AUMI was invented to be adaptive, responsive, and sensitive to challenges they faced.

You could feel the excitement and support at the school. Bob believed in what we were doing. He promoted the project to the higher-ups in the administration and he always found the funds to keep the drum class going. He met with Pauline and gave her a tour of the school.

Pauline asked me to select three of the most physically challenged kids on my caseload, to begin working on the instrument design. She brought Zane Van Dusen, a student at Rensselaer Polytechnic Institute (RPI), where Pauline taught a Deep Listening® course for engineers and programmers (see Van Dusen, chapter 2). Zane created the AUMI prototype, working with Annemarie, Geoffrey, and Billy. Zevin Polzin, programmer at the time at Pauline's nonprofit the Deep Listening Institute (DLI), also came to Abilities First. We worked closely together.

We engaged directly with the kids and staff, observing, testing, and retesting. Suggestions. More feedback. Improvements. Constantly evolving and making AUMI more musical, more adaptive, more sensitive,

with new options, sounds, scales, and tunings. Always user-friendly and free. The foundation of AUMI was honed in those early years from 2007 through 2010. A small school for kids with special needs in Poughkeepsie, New York, is the birthplace of AUMI and AUMI music (figure 1.2).

Looking back, it was simpler to develop AUMI in the early years, because the designers, researchers, and musicians were all in the neighborhood. Later, the AUMI Project grew, with a consortium of dedicated international musicians, dancers, academics, programmers, therapists, students, and teachers.

In 2011, Pauline invited the drum class to perform in New York City in Stretched Boundaries, a concert she curated for the Electronic Music Society. This was the impetus I needed to start a performing band that would rehearse and do gigs. I built a piece for the kids, where we created a performance. The first band had three students and three adults playing a combination of AUMI and acoustic percussion instruments. I provided a framework and we created it all together (Tucker et al. 2016, 191–95). Performing was a transformative experience for us all. In that premiere performance of Play the Drum Band and AUMI, and in later gigs, the kids were always right there, totally present with the music. We got a great response wherever we played (figure 1.3).

I always say I was the hardest-working woman in show business every Wednesday at 1:00 p.m. in drum class at Abilities First. It took everything to pull it together and keep it together for fourteen years. Luckily, I had help. Setups for each student were needed, as was keeping track of everyone and everything. Bringing everyone into the circle. Safety. Creativity. Inclusivity. Accessibility. Having fun. Improvisation. Trust. Many interns and DLI staff and AUMI Project people came to the drum class. Their help made a huge difference. The school's art and yoga teacher, Rona Mannain, assisted. She was on the drum/AUMI journey from the beginning.

I love playing AUMI. To me, it's a drum. An expressive percussion instrument. I learned the most about playing it from the kids. It took so much for some of them to move. For some, just to raise their head, what it took. Every beat, every sound, had to count. What it took for some of the kids to generate a sound. I learned to listen for everyone. Patience. And to have faith. I knew we would get there and we always did. They are some of the best AUMI players around. How they listened! They made incredible music. They were so great to work with. It expands your consciousness. It expanded my consciousness.

I observed and felt changes in the kids over time, the positive impact

Figure 1.2. "A New Instrument Comes to School." Drawing by artist Ty Dykema. To view in its original color, see https://doi.org/10.3998/mpub.11969438.cmp.5.

Figure 1.3. "Performing with the Play the Drum Band." Drawing by artist Ty Dykema. To view in its original color, see https://doi.org/10.3998/mpub.11969438.cmp.6.

of consistently playing music together in community. Even in the wildest, loudest drumming, we came together. There were always moments of brilliance, of listening, of learning how to play music with dynamics, not just bang on the drum. What I saw and heard, in each kid, and with each other, was special. There was a flow to the class, the unexpected mixed into the familiar. Improvisation. Gentle challenges. Paying attention to someone else. A chance to learn how to be in the world in a new way.

Everyone, no matter the severity of disability, can play AUMI. We experienced this over and over. One student who generates very small voluntary movements, came to class too tired to move. AUMI is so sensitive, so customizable, it tracked the movement of his chest as he breathed. He was still able to be there and participate in music making with his peers.

So many stories, like the time Anne Marie used AUMI to play music with control and independence for the first time. Pauline describes it well in a *Cycling 74* interview (Pask 2010, 188):

> Early on we upgraded the patch so that 4 different drum sounds could be triggered with slight side to side up and down head movement. With this increase in possibilities, we had a breakthrough. Leaf played a drum pattern for A, a 16-year-old, and then pointed to her to play. A answered with a pattern of her own using the 4 sounds. She improvised! Everyone in the room cheered. Without any prompting at all, A understood on her own that she could move quickly to any of the 4 sounds by staying in the center of the quadrant pictured on the computer screen. In the next session, Leaf brought in some students from the drum class. They would play and listen for A. She played! We really felt like we were getting somewhere.

Pauline had a plan for AUMI. Weaving the web. Widening the circle (figure 1.4).

For instance, when iPads came out, we needed an iPad version of AUMI. Pauline reached out to Henry Lowengard (chapter 11), a programmer and musician also in Kingston. AUMI has evolved continuously with changing technology. At all levels, Pauline oversaw the present and created the future, a means to a goal that is unending. Universal design,[2] adaptive thinking and user-friendly technology are key to an inclusive world.

Pauline gave AUMI its name. She drafted many of the original writings we still use today to describe the instrument. We all learned many lessons of the power of language. Talking about children with disabili-
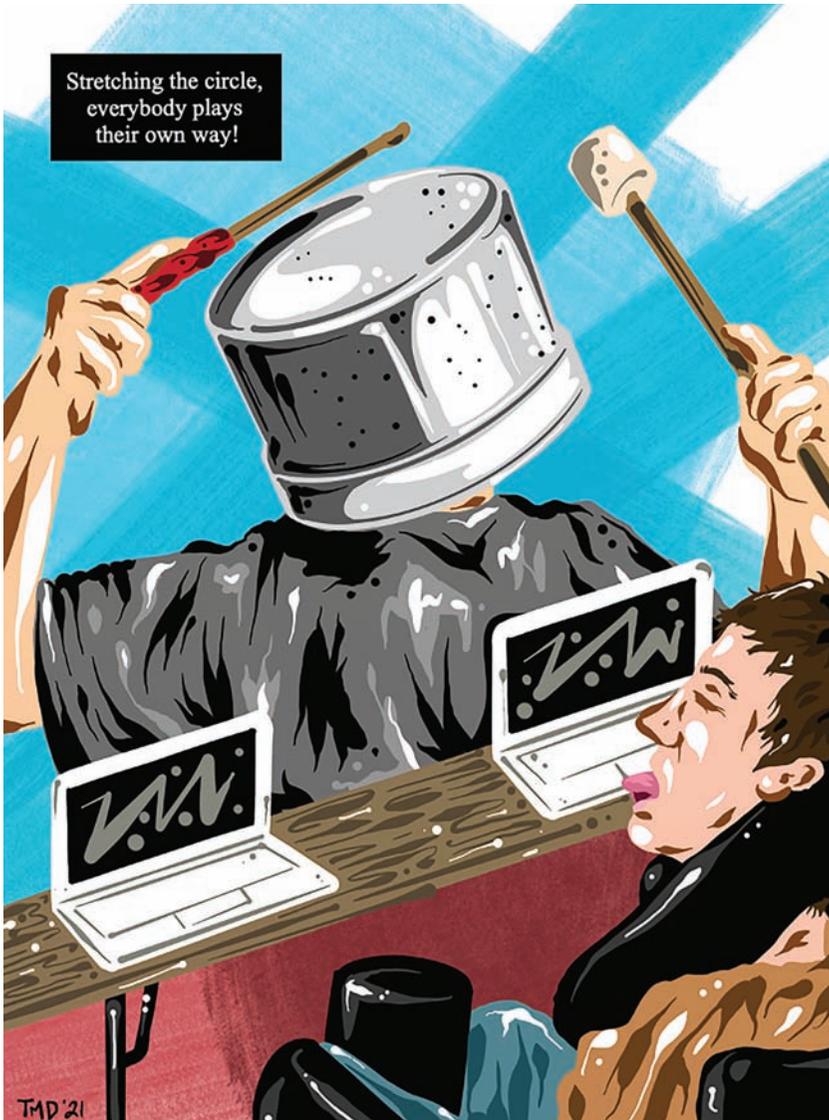
Figure 1.4. "Stretching the Circle: Everybody Plays Their Own Way!" Drawing by artist Ty Dykema. To view this in its original color, see https://doi.org/10.3998/mpub.11969438. cmp.7.

ties is not the same as talking about "disabled" children. At the time, people-first language was strongly preferred. But language changes and it is important to listen. We also learned that we could not do research with children, especially children with disabilities, if we didn't get certified by the National Institute of Health. Which we did.

The world of music technology was often a world away from the students, families, and staff members at Abilities First. Many did not have a computer, or if they did, it certainly wasn't a Mac, which worked better with AUMI in the beginning (later the PCs caught up). Support staff were sometimes intimidated by technology. Anticipating these needs, Pauline's overall concept for the funded project included a component that built the skills and confidence of caregivers in utilizing AUMI technology.

Along the way, new people joined the project, people I would never have crossed paths with if not for Pauline. They brought energy and cared about music making and improvisation as a force for change. I met Sherrie Tucker, Ellen Waterman, Gillian Siddall, professors and comembers with Pauline in the Improvisation Gender and the Body (IGB) group of ICASP. They visited Abilities First in 2009 to see and hear AUMI in action. At Pauline's urging, they all went back to their universities and started something AUMI. Jackie Heyen worked alongside me for two years, working with the students and AUMI and helping develop a training program. Eric Lewis, a professor from McGill in Montreal, joined the project. He brought his trumpet down to Abilities First and we did the drum class together. McGill became a center for research, engaged the OT department, and supported seven years of tech development of AUMI's laptop version (see Sullivan et al., chapter 10, and Lewis, chapter 29).

AUMI Hits the Road

Pauline worked hard to promote AUMI. We needed to get the word out now that we had this great new musical instrument. Over the years we presented at conferences, schools, and universities, nationally and internationally. London, Montreal, Guelph, Thunder Bay, Toronto, Cleveland, Kansas City, New Hampshire, Newfoundland, New York City.

Traveling with Pauline was a trip. Riding in the van with her at the wheel. Waiting in airports. Breakfast buffets at hotels. Lunch in scary convenience stores in the middle of nowhere. (They weren't scary to her. She loved them! But I was like *really*? *Really*?) The talks, dreams, and schemes. Pauline was always touching in with me on a personal level.

For the absolute genius that she was, Pauline was always down to earth. And hilarious. "What are you going to do tonight," I asked her one time before she went on stage. And she said, "Fart." And laughed! And then she went on and played and she was amazing. Her guidance and caring gave me confidence, elevated my actions, my artistry. This project brought me into new spaces and places with Pauline that continue to be life lessons. I have memories but also new knowledge, new ways of being in the world, thanks to her. My experience, I know, is not unusual. She continues to resonate and elevate so many people all over the planet.

I have learned a lot over these many years, and still counting, with Pauline and the AUMI Project: that human potential is amazing when we open the doors to self-expression and creativity for everybody. How this changes how we see ourselves. How others see us. That anything can happen, and usually does. How in the midst of seemingly wild drumming chaos, moments of brilliance and enlightenment emerge and are there for the listening. And these moments can change the world.

Pauline built the foundation of support for the AUMI Project. All things flowed through her commitment to making something happen that had never been done before. Pauline. Weaving the web of inclusion and revolution. Being in the moment. Being patient. Believing in the musical energy and potential of everyone. Pauline's teachings were how she lived her life and music. Deep Listening®. Improvisation. And now, improvisation across abilities.

To me, Pauline's idea of "stretched boundaries" captures her way of being in the world. She constantly stretched her own boundaries, as well as those of everyone around her.[3]

About Occupational Therapy

I always call OT my day gig. And it's a great one. I have no doubt that being an OT has enhanced my drumming, just as being a musician has influenced the therapist that I am.

As an OT at Abilities First, I was responsible for addressing students' adaptive equipment needs. Good positioning/posture is essential to maximize seating comfort, safety, and function. When kids in wheelchairs are positioned properly, they breathe better. Having this knowledge has been essential when setting up the kids to play AUMI. The iPad or laptop needs to be at the proper height and distance from the user to promote good head position and visual access. Positioning impacts attention, endurance, motivation, and independence.

It was in OT school that I learned about the concept of the gate-keeper. It was during my years at Abilities First that I deeply understood its importance. I started the adaptive music program with the encouragement of a supportive principal. AUMI flourished at the school. There was celebration, recognition, and understanding of the importance of the drum class for the kids. All this changed once Bob left. From then on, I struggled every year for the time and space to keep the drum class going. I was successful at this until October 2019, when I finally left Abilities First due to irreconcilable differences.

When you work with children, the gatekeepers include parents, care-givers, school staff members, and administrators. It isn't enough to have a great proposal for a project. Passion, schmoozing, and unwavering perseverance are also essential. But sometimes even that isn't enough. At our school, if the nurse assigned to one of the students didn't like drumming, that student's participation didn't happen. The kids were unable to get there on their own. On the other hand, there were nurses who "got it" and made sure their students came to the drum class. There were teachers who brought their whole classes and participated themselves in the music making. There were OTs who always showed up. And there are administrators who never understood how important the drum class was for the kids.

"Nothing About Us Without Us"

I've always resonated with this phrase. In a book of the same title written by James Charlton, the maxim affirms that people with disabilities "know what is best for them and their communities" (Charlton 2000, 2). As an OT this is part of my thinking, my training. "Empowerment" and "independence" are key OT vocabulary words. Recognizing AUMI users as creative artists, researchers, and developers, the AUMI Project strives to live up to them.

What Is AUMI and Why Do I Play It?

AUMI is designed for expressive musical improvisation, not for playing composed pieces. There are no "right" or "wrong" notes. AUMI improvisation creates a welcoming musical environment. Drumming with AUMI provides a great musical context. In my own training in African and Afro-Brazilian drumming, I am steeped in traditions and styles that lend themselves to playing music in collaboration and community. The

drum circle is a community-based art form that encourages the participation of all.

As the AUMI website puts it:

> While AUMI can be used by anyone, the initial focus has been on working with children who have profound physical disabilities. In taking these students as the starting point, the AUMI project is committed to making musical improvisation accessible to the widest range of individuals. This approach also opens up the possibility of learning more about the relations between ability, the body, creativity and improvisation within a cultural context that does not always acknowledge or accept people with disabilities, especially as creative musicians.[4]

We set out to do something and we did it. A universally designed motion-tracking instrument. Free! Bringing everyone into the circle. The world I walked for thirty-one years at Abilities First was filled with kids with amazing spirits and incredible challenges to deal with every minute of every day. Who can be a musician? What is ability? What bodies do we associate with being a creative person? AUMI provides the answer—*every* body—while challenging the societal constructs that promote excuses and impose limitations in our thinking.

What Now?

AUMI is part of Pauline's vast legacy, for the world, for all of us in the project, and for everyone who plays the instrument. She has touched us all in such profound ways. It is a depth that I always dream of reaching. I call in Pauline when I take the time to listen to the sounds that surround me. Every time I set up the iPads for a workshop or AUMI demo. Every time I am a witness to a child or adult making music for the first time in their lives, independently improvising. Playing music across abilities, across time and space.

Pauline saw and experienced for herself the brilliance of the kids and their true potential. Expanding her already gigantic universe. Taking it all in. I look back at all the experiences Pauline and I shared, the excitement of discovering and uncovering, of putting ideas into action, of patience and perseverance, of knowing and not knowing. I have been stretched deep and wide. The purpose of the purpose.

For me, it can be bittersweet, sometimes heartbreaking, to be on this AUMI journey without Pauline's day-to-day presence. But she continues

to be at the hub of the wheel. For those in the project and beyond, we are all spokes and offshoots from that place she once occupied in real time and, since her passing, occupies in timelessness. It is up to us here now to keep the wheel turning—listening to each other, improvising all the way—as we write new chapters in this ever-evolving AUMI story.

<div align="center">To be continued.</div>

Notes

1. "Purpose of the Purpose" came from Pauline and IONE's Tibetan teacher Tai Situ Rinpoche.

2. Universal Design is "design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability." National Disability Authority, Centre for Universal Design, https://universaldesign.ie/what-is-universal-design/, accessed December 27, 2021.

3. For more on this concert, see Tucker et al. 2016, 181–98. For more on the Stretched Boundaries concert series, see Braasch, chapter 12.

4. AUMI website, http://aumiapp.com/about.php, accessed October 29, 2019.

TWO | From Punk Philosophy to
Musical Accessibility

ZANE VAN DUSEN

In spring 2007, Pauline Oliveros and I drove to Poughkeepsie to do the
first AUMI demo with actual students. I was nervous the whole ride,
thinking about all that could go wrong. Arriving at the school where
Leaf Miller worked, we entered a small room and quickly set up a tablet
computer and a webcam. An unusual setup at the time, webcams are now
available on any smartphone. A couple of technical issues later, we were
ready for the first student.

Gregory had extremely limited mobility due to cerebral palsy and
could only move his head a couple inches in each direction. Leaf posi-
tioned Gregory in front of the tablet. I set the AUMI to follow his nose.
AUMI generated haphazard notes as it captured Gregory's minor head
movements. Then I heard something change. The phrasing of those
notes began to sound careful, intentional. Everyone felt that shift at the
same time. We were stunned. All we could do was sit there and listen to
this student, who had previously been unable to make music, play for
about twenty minutes straight with utmost focus, at times exerting him-
self to move his head more than he normally would. It was one of the
most beautiful moments of my life.

But how did a "punk" kid like me even get into this room with Leaf,
an OT, and Pauline, a pioneer of electronic music, to deliver a project
like this?

Punk Culture to Pauline

The first time I saw Pauline perform was the spring of 2003, my senior year in high school. The deadline to pick a college was approaching, and I was trying to choose between two schools: Rensselaer Polytechnic Institute (RPI) and the University of Texas in Austin. After spending many nights working on my own coding projects ranging from creating my own video games to cryptanalysis, I was really excited to be accepted into both computer science programs. They seemed similar, so my final decision would be based on what they offered beyond academics. After another unsuccessful day of deliberations, I went out to clear my head in my usual way: checking out a concert. I lived in New York City's Chinatown, so I had a lot of options for nearby music venues, but my go-to was Tonic. I never needed to know who was playing because it was owned and operated by John Zorn, who consistently booked unique stuff that satisfied my craving for weird music.

That night, Pauline was playing with her New Circle Five. Although it was more "low key" than the loud noise-punk-jazz I loved, I was captivated. It sounded light and deeply relaxing, even though the group featured five musicians playing freely on an odd collection of instruments. Somehow, the dissonance gently invited you in. About halfway through the performance, I realized the psychic connection exceeded the boundaries of the stage; the musicians were intentionally incorporating noises from the room itself, including the people. It didn't matter who you were, your background, or how much sound you were making, if you were in that room, they made you part of the performance. You could feel it, and it was exciting. After they finished, Pauline commented about a project she was working on with her RPI students. After that, it didn't matter what anyone told me about the Austin music scene. I needed to work with Pauline.

In my freshman year at RPI, I was excited to attend a lecture by Pauline. It was a fascinating whirlwind tour of her life, philosophy, and creative process. In the Q&A at the end, a visibly annoyed student raised his hand and brattily said, "I didn't realize that you were just going to talk. I thought we would hear some music." Pauline, completely unfazed, responded, "Well, you know what? I'm really interested in humming right now. So let's do an exercise where I will start humming a tone, then everyone can either hum a tone that they hear or one that is totally unique in the room. Then on your next breath you can pick another tone that you hear or a new one. After we have hit all the tones that

we needed to hit, we'll just end." We did it, and it was awesome. I later learned this was a version of Pauline's "Tuning Meditation." When the room was finally silent, she smiled and simply said, "That's kind of what I do." I remember walking back with the friends I had dragged along. All we could talk about was how Pauline was such a badass and how that humming thing was "so punk." Most people might not think impromptu group humming improvisation falls into the category of punk, but for me it's the very definition.

Growing up in New York City, I had the opportunity to immerse myself in nonmainstream music. For me, this started with traditional "punk rock" but quickly led to more experimental, weird, and performance arty stuff. I roughly remember a quote that said New York City never had a true punk scene, it was just a bunch of weirdos who got lumped together under the punk moniker. While some punk purists may take issue with that loose classification, for me that is the essence of punk culture that I love. Therefore, when I think of "punk," it's not a band that plays three-chord progressions fast and loose, it's a person who doesn't care about other people's definition of music and confidently gets on stage with some scrap metal and contact mics and makes a racket for fifteen minutes. Part of my fondness for punk culture was that it helped me find a positive community toward the end of high school, when I had a falling out with my friends and just needed to do something completely different. This community of weirdos that was putting on shows in tiny backrooms and people's houses was curious about the oddity of a lone sixteen-year-old showing up to their events, but they accepted me as part of the scene. It amazed me when the performers would just start talking to me, a kid, openly discussing their ideas and influences, allowing me to further explore the depths of this weird music scene. This was particularly exciting to me because I was actively trying to change the music I was making after quitting my first band that had become too rigid.

When I wasn't coding or attending concerts, I made experimental recordings using my guitar, a mic, and a four-track cassette recorder. Because I had not studied experimental music academically, these were literally experimental recordings: scientifically testing what would happen if I used these tools in unintended ways then tried to incorporate that into a song. I figured out how to make feedback with my guitar and thought, "This is cool. I wonder if people have done this before?" Then a couple of weeks later I'd learn about Sonic Youth and realize that guitar feedback is a well-established tradition. I had reached a point in my musical training where I felt everything was constrained by rules

of what's good and what's too simple; but punk allowed me to ignore that and just follow my passion and curiosity. These experiments were exciting and challenging, a different way of expression than prescribed. This also changed the type of person I played music with. After playing only with formally trained musicians, I started playing almost exclusively with people who had literally no experience (e.g., a guitarist who never played guitar but thought it would be fun). It was so much more exciting because I was bringing people who had previously sat on the sidelines into music. They didn't care about the rules because they didn't even know the rules, and they weren't worried about what's considered good. They just played what they liked. Little did I know that this thrill of bringing people into the music would be the catalyst for my work with Pauline.

A Real-World Computer Science Research Project

During my senior year, I wanted a research project that offered practical programming experience. But according to my computer science advisor, most applied research projects at RPI were in biology, chemistry, and nuclear engineering, which did not interest me. Luckily, during my sophomore year I added a dual major in electronic media arts and communication. Knowing of my disappointment over research opportunities, my arts advisor asked if I had considered any arts research projects. The concept of "arts research" blew my mind. What did that even mean? How could I possibly do applied research in the arts? She went to her bulletin board and pulled down a flyer: Pauline Oliveros was looking for help on a research project on "adaptive use musical instruments." I did not know what those last four words meant, but I knew I had to work with Pauline.

The previous semester I had taken her Deep Listening® course. As a bit of a teacher's pet, I knew Pauline well enough to ask for an overview. She explained she wanted to build software instruments for students with physical disabilities, particularly those with cerebral palsy. I tried to contain my excitement while explaining that I knew I could build software to do this. She said she would be happy to have me on board. It was finally happening! My dream of working with Pauline.

To begin, Pauline handed me a box filled with different devices Leaf used with her students. "This is what they use at the school for the kids who can't play traditional instruments. They plug all these buttons and levers into computers, and then each device can play one or two sounds." I returned to my apartment and cluttered my desk with all the buttons

and levers. I decided I must find a way for these devices to generate more than just one or two sounds. The solution seemed obvious: build a driver to connect the devices to sophisticated audio software like Max/MSP so students could use buttons and levers to play a synthesizer, or something more complicated, like create a loop.

Once I had a prototype, Pauline and I returned to the school. We watched Leaf lead an improvisation session where many students had mallets in their hands and were hitting drums and other percussion instruments. Despite Leaf's best efforts to incorporate everyone, we saw that students with extremely limited mobility were unable to fully participate. Afterwards, we asked Leaf about her biggest challenges when trying to work with less mobile students. Leaf held up the buttons and levers and said,

> They hate these. They are so annoying to use. Some of the kids can't use them. And the worst part is they all have these wires. And whenever we set them up, the wires touch the kids' skin and they get distracted. We spend a ton of time setting up, taking out all the devices, plugging them into the computer, trying to loop the wires around the kids so they don't touch their arms or necks. We launch the software and try to convince the kid to press the button or lever. By this time, it's almost thirty-five minutes into class. It's a huge ordeal and we're not even sure the kids get that much out of it.

After hearing this, I put away my computer and skipped the demo I had planned.

On the drive back, Pauline and I agreed we needed to discard everything we'd done. The focus had been on adapting the devices to work with better software, but the devices were the problem. I felt bad about the wasted time and effort, but, thankfully, Pauline made it comfortable to switch gears. She said, "You know what? You spent your time on that. It was probably worthwhile to learn how to connect all those things; maybe for this project, maybe not. Turns out, we have a totally different need. We shouldn't force our own ideas on these kids. Let's figure out what they need." Pauline and Leaf were passionate about helping the students. That passion was infectious, which made it easy to shift focus. Plus I was still excited just to work with Pauline. The two of us met regularly for an hour or two just to discuss ideas. At a certain point, I would get into technical details. She would wait for me to stop and give me a prompt like, "How do we make this fun?" and after waiting a beat, she

would say, "Go ahead, do what you want with it. I trust you. Come back and we'll see if it works."

I stayed up late, brainstorming to solve Leaf's problem. Eventually it came to me: it needed to be video-based. Cameras can capture movements from a distance, so we don't have to deal with wires. It also meant this instrument would work for students unable to press buttons or pull levers. By leveraging raw motion data from a camera, we could build an instrument that allowed teachers to adjust the sensitivity to each student's individual needs, ranging from small movements of an inch or two to large, sudden involuntary movements. From that point, I was able to rapidly develop a basic AUMI version that could use any movement to trigger a tone.

The next time we visited the school, we were prepared with the first AUMI iteration installed on an early tablet device and an external webcam. We had no idea if it would work. We got rid of all the stuff they were familiar with. But we were delivering something they really cared about: an easy setup. After a quick demo, Leaf brought Gregory in to test it and we were blown away, as described earlier. This is when I fully realized AUMI's power. It was life-changing for a student like Gregory with extremely limited mobility to finally play—and explore—music on his own. AUMI allowed him to express himself creatively after being stifled by tools previously available to him. This wasn't a frivolous project. The students wanted to play music and express themselves like their more mobile friends. Now that I could see the real-world impact of what we had built, I couldn't wait to get back home to work on further enhancements.

Translating Student Feedback into AUMI 1.0

The first demo's success, along with Pauline's encouragement, energized me as we started enhancing the software into what became AUMI 1.0. We let the students guide us on what to build next: we had pages of notes after observing five students improvise with AUMI that day and feedback from Leaf as she incorporated AUMI into her classes. One of the first things we addressed was adjusting the software to skip unintentionally wide movements common for many students. To do this, we programmed AUMI to ignore movements outside a certain speed and range. This not only improved usability but helped these students increase control by rewarding them for small intentional movements rather than big unintentional movements.

Then we implemented different scales and sounds. We first added

the blues scale, inspired by my memories of learning to play guitar as a kid. I first learned to improvise on the blues scale, it was so fun and flexible. Even as a beginner, you feel like you can't go wrong! The blues also has a rich history of improvisation that I wanted to bring to AUMI. In terms of sound, Pauline noticed some students were easily startled by noises AUMI made and that this could trigger spasms, so we decided to add softer tones. Practically speaking, I also needed a setting with pleasant sounds because I was noodling around, testing it for hours every day. I needed something peaceful, soothing, and ambient; something like that New Circle Five concert years ago. Eventually, we came up with a soft, "boo boo baw boo baw" sound.

Finally, we added traditional instrument sounds like horns and drums. For melodic instruments, we leveraged Max/MSP's powerful audio synthesizer, but I decided to record the drum sounds myself. At the time, I was running a music venue out of a dorm basement, so I invited a drummer friend over, set up a bunch of mics, asked him to hit every drum in a bunch of different ways, and then added those to the original AUMI drum kit. I had never used an electronic drum kit that sounded close to the real thing, and Leaf's music class only used analog percussion. I thought percussive sounds would stand out and not blend well with the group if they sounded too digital.

On the technical side, I made sure that with every new feature, AUMI was still easy to set up and use. As the programmer, I needed to ensure that no matter what we added, the initial setup was as simple as: turn on the tablet, plug in the webcam, double-click the application, and it's ready to go. If anything went wrong at any of these steps, the solution had to be easy because we knew the teachers could not call "tech support" in the middle of class. Furthermore, the design had to be intuitive enough so that someone who is not technical could easily explore features and adjust settings for each student. This ease of use is one of the key features of the software I still see; it's still very "plug and play."

Taking the AUMI Mission beyond the Classroom

Working on the AUMI Project with Pauline continues to have a profound effect on me more than a decade later. Before this project, my purpose in breaking the institutional "rules" of music and finding ways to play with nontraditional musicians was simply because it was more fun and exciting to me. With Pauline, I learned that this philosophy served a higher purpose. The rules, tools, and institutions governing the

music world are inherently ableist, racist, and sexist. They need dismantling so everyone can participate with their whole self. Students' reactions to their first AUMI experience is the same reaction I see when my friends without formal training pick up an instrument for the first time: a euphoric sense of excitement. But all too often this is shot down when some "music authority" informs them they could improve with training. This instills unnecessary fear of being creative. Plus it isn't correct! Too often we see talented musicians follow up brilliant raw debuts with less inspiring work because they overengineer their music to be more "technically interesting." I wish I could unlearn some rules that prevent me from fully expressing myself musically. Opening the world of music and art is something I have tried to incorporate in every post-AUMI project.

Shortly after graduating from RPI, I started running an art space in Brooklyn, LaunchPad, with a simple philosophy: anyone with an idea for a public event could use our space for free. It was totally uncurated; if the date you wanted was available, it was yours regardless of who you were and what you wanted to do. It was a volunteer gig—inordinately time-consuming—but rewarding because every day I got to put aside my preconceived notions and help bring someone else's vision to life. Some people were pros who were constrained by a lack of venue and/or equipment. Others were creative folks who had never run an event and needed our support on everything from online promotion to setting up chairs. By disregarding traditional rules, we got to host everything from music, literary readings, film screenings, dance parties, comedy shows, lectures, drawing nights, screen printing classes, haircut parties, potlucks, art galleries, to community meetings, and usually some combination of these. This freedom allowed the space to act as a mirror of the community by revealing what people were working on but not sharing beyond their immediate circles. Our mission was to ensure that everyone had a stage where they could be heard.

A few years later, I landed my dream job, booking music for a TV show. After building a reputation for making and promoting "weird but somehow accessible" music, I was asked to curate musical guests for an experimental talk show called *The Chris Gethard Show* on Manhattan's public access network. After a few years, the show started receiving a lot of press and we were eventually brought onto a major cable network. Suddenly we had a budget for musical guests, and the network readily offered up connections at the major music labels. But those artists already had a platform. I wanted to showcase artists and music people didn't even know existed. Luckily, the host and the showrunner were

fully supportive and fought hard to let me book guests my way. We ended up booking a few well-known artists, but that actually helped the lesser-known, atypical artists because we put them on the same stage and presented them as peers. For example, we had a local cumbia/punk/afrobeat band play the episode after They Might Be Giants. And the following episode featured the band I was proudest to present: a rap group of neurodivergent members (due to brain injuries or autism). They were living proof of how we all win when we tear down the structures that contain us. Their beats were otherworldly and their freestyle sections were truly free—not contained by anything, not even language—and we had a roomful of freely dancing audience members.

Nowadays, my life is dominated by my two kids: a three-year-old and a ten-month-old. I don't have time for punk bands, experimental art venues, and public access TV shows. But I still get to share my passion for music with my kids. It isn't that different from my previous bands except my kids are really free: they don't know the rules of music, and they have not had decades of listening to music that would instill these rules subconsciously. As a result, they have been teaching me how to disregard rules and make truly raw music. Recently, I started tuning my three-year old's ukulele, and he asked, "Dad, why are you tuning my ukulele?" I explained that "it sounded bad" to which he quickly replied, "Um . . . no thanks. I think I like it bad." He was more punk than me, and I could not have been prouder.

THREE | My Transformation into a Masterpiece Musical Instrument and Musician

CLARA TOMAZ

I met Pauline Oliveros in August 2009, only twenty-one months after losing my speech to cancer. While I perceived myself as a newly disabled individual mourning the loss of my tongue, she perceived—and consequently transformed me into—a musical instrument of unprecedented qualities and a music-illiterate composer/vocalist/improviser worth mentioning in a speech she gave at the Tate Gallery of London in 2013.

I had worked with a speech pathologist for about six months and had barely found my way back to swallowing—and modulating vague sounds through a vocal box damaged by radiation therapy—the day I sat in Pauline Oliveros's office, at her invitation. I was heartbroken, and she was excited. She told me something about "embracing my disability" and "becoming a vocalist" that I wasn't ready to understand. At that life-altering moment, my mind was lost in the cosmic perception of all that was missing in me, while she vividly saw the abundance of what was there, my perfect uniqueness. "The human body is our first musical instrument," she said to me "the one that nature gives us when we are born. Your instrument has been modified by your recent events: embrace its uniqueness and explore the new possibilities with an open heart." When she finished talking, a vision formed in my mind of someone trying unsuccessfully to glue together the pieces of a broken vase, but who suddenly decides to throw all the pieces back in the mix and start an abstract sculpture. The vase would always be an imperfect resemblance of its past glory; why not embrace the tornado of creative potential ignited by the mere idea of the abstract sculpture?

Figure 3.1. Clara Tomaz (l) and Pauline Oliveros (r). Photo by Ellie Markovitch.

The next year, Pauline invited me to observe a session of the AUMI program at Abilities First School in Poughkeepsie and film the class for the AUMI archives (https://doi.org/10.3998/mpub.11969438.cmp.9). After interviewing and collecting testimonials of a few therapists, I proceeded to the class. It felt disorienting at the beginning, as it was unlike anything I had ever experienced. As a beginning video student, I did not know where to point my camera; there was no detectable significant action and all that was going on was so ethereal and felt uncatchable. Was I supposed to film people sitting almost still in front of their laptops and record the music being contributed to the room? Finding my way through the filming project meant breaking the surface and diving in beyond the appearance of this untraditional orchestra to understand the immense world of each musician.

When Leaf Miller entered the room, things started to fall into place. She had inspired Pauline to create AUMI software for people whose severe disabilities limited opportunities to play traditional instruments. Leaf began moving in front of a few laptops to show me how the AUMI software works. She looked like an inspired dancer, throwing her arms in the air, swinging her body from side to side, taking steps back and forth. Each computer captured a different movement and reacted by producing sound. The sounds slowed down or sped up following the rhythm of Leaf's body in the space, and other musicians in the room started responding to them. But who was creating each separate sound? It's easier to associate music to analog instruments being played in front of you. When it comes to digital sound, how do you detect which computer is sending it to the speakers? I looked around and decided to get closer to each musician. To my greatest surprise, I realized that even the people

who seemed completely still in their chairs were enthusiastically playing their instrument of choice! With the visual help of the speech pathologist, each of them had already indicated—with the blink of an eye or almost imperceptible movement of their tongue—which musical instrument they wanted to select in the AUMI software. And with the same eye blinking or tip-of-the-tongue movement, now detected by the software as driving forces, these musicians were controlling their instruments, improvising music, and participating in the concert. How empowering it must have felt to be able to contribute to a whole concert when your body is more accustomed to contexts that fail to recognize and respond to its animate life?

Pauline seemed to believe that simply being human means to be a natural sound artist, with the body being the primary musical instrument. During the years I worked with her, she especially counted on differently able individuals; in this community, she saw the same possibilities as those noncategorized musical instruments occasionally created by underground artists for the sole purpose of producing unique works of art: mass reproduction of any of them is unintended, just like each disability is absolutely distinctive. I think that for Pauline Oliveros, who dedicated her life to music and must have explored the widest array of musical instruments, it was this small community of one-of-a-kind "instruments" and musicians that most fascinated her in the late stages of her career. While playing a traditional instrument requires control, believing in differently able individuals to use their bodies in creating transformative sound is about letting go of the control and projecting endless possibilities into the unknown. For a musician/composer of the caliber of Pauline Oliveros, this might have been the most transcendental of all music meditations.

FOUR | The Gift of Expression

Playing AUMI with My Son

JULIE BROCKLEHURST

When my son, Brennen, was born in 2005, I was completely unprepared for his diagnosis. Like most expecting parents, I was planning for a life with a healthy child. I had no experience with children with disabilities and no idea how to raise a child with special needs. In those early days, all I could focus on was how he wasn't rolling over or holding his head securely or sitting unassisted. It seemed like there were so many more things he couldn't do than things he could, and nothing came easy. I stumbled through Brennen's first months dutifully following doctors' recommendations, hoping that their treatments and therapies could make my child "better." After several months, it started to become clear that Brennen was not going to get "better" and that cerebral palsy was going to be something he lived with for the rest of his life.

When I realized the extent of his disability, I worried about Brennen's quality of life. I worried about the struggles he would have and challenges he would face. I worried if he would ever have friends or be able to participate in social events or recreational activities. I thought about him struggling to learn in a classroom full of typical children and lost sleep at night worrying if he would ever be truly happy.

Having a child who was "different" felt isolating. It seemed as if everyone else had moved on with their lives and were happily doing all the typical things parents do with their children, while we were left behind to navigate this new path on our own. Friends were busy posting photos of their children in ballet classes and soccer practice, while I was living in

the medical world, learning all I could about brain-based developmental disabilities, medications, and seizure protocol. It was not at all what I had planned, and I had a hard time adjusting to our new "normal," but I did the only thing I knew how to do at the time, and that was to love my son and support him with every ounce of my being.

Early in his life, in addition to his busy schedule of physiotherapy, OT, and speech therapy appointments, Brennen started taking music therapy classes. Music therapy uses music interventions to accomplish individualized nonmusic goals, including things like increasing attention span, developing communication skills, and working on social skills and self-expression. For Brennen, these goals also included increasing his independence and giving him the opportunity for choice. His sessions were fun and a welcome escape from the institutional setting of his other weekly appointments. Brennen did private and group music therapy, and I attended each class to help with his participation. Because Brennen's disability affects all aspects of his life, he has no functional grasping ability and is unable to hold objects in his hands without assistance. All activities we do with Brennen are hand-over-hand, so in a music therapy setting, this means someone must help him hold or manipulate the instruments.

Brennen enjoyed music therapy. He was able to show preference for certain sounds and would squeal with delight at the different notes and keys. Still, I always secretly wished he could somehow experience music independently, to foster his individual creativity and allow him to express himself and produce music of his own choosing. I didn't think this would be possible for Brennen until we discovered AUMI.

In 2011, on recommendation of our music therapist, my family attended an AUMI training session at the Memorial University of Newfoundland School of Music. Musician and OT Leaf Miller and multimedia artist and composer Jaclyn Heyen of the Deep Listening Institute demonstrated how the instrument is used. We took part in a drum circle, where Brennen was set up to participate using AUMI. It all seemed so foreign at the time. Even though it was explained to us that AUMI was intended for users with diverse ranges of mobility, I still questioned whether my son's limited voluntary movements would produce any sort of sound.

I will never forget the moment I heard the sound of instruments being played from within the computer system my son was controlling with his body. It took me several moments to realize what was happening, and I remember having an emotional reaction when I recognized

he was doing this all on his own. It was astounding and heartbreaking at the same time. At age six, this was the first time in his life Brennen was able to do anything independently, without me helping him, and that made me so incredibly proud. His dad and I were able to stand back and watch him participate in a drum circle with other children. That feeling is something that will stay with me forever.

We continued using AUMI for several years. I was amazed at the freedom it gave my son and was excited about its potential to open up different kinds of learning and creative expression. Working in conjunction with Easter Seals Newfoundland and Labrador, music therapist Susan LeMessurier Quinn, and the dean of the Memorial University School of Music, Ellen Waterman, Brennen was fortunate to become a participant in a research study exploring AUMI's potential in solo and group music therapy sessions (Finch, LeMessurier Quinn, and Waterman 2016). Until that point AUMI had not been studied in a music therapy context, so the research project was looking at whether AUMI could be effective in this type of setting for enhancing goals of the program and musical responses of the participant. The results were fascinating and truly spoke to the capacity of all individuals to improvise, adapt, and collaborate.

AUMI opened my eyes to technology's potential to create profound learning experiences for individuals with disabilities. This was our introduction to the world of adaptive and assistive technology. Our exposure has grown over the years to the point where Brennen is now learning to use eye-gaze software to help him communicate. Assistive technology has opened a world of possibilities for Brennen and many other individuals with complex needs. Programs like AUMI have given us the hope of promise and potential. Options were once limited for children like my son, but there are so many ways to dream about the future now thanks to creative minds that are forging new paths.

This whole special needs parenting journey has been a roller coaster of emotions. While we believe in dreaming big for our children, we also want to be responsibly realistic. We know Brennen will face many challenges in his life. We also know there are people out there doing incredible things, working hard to create opportunities for individuals with disabilities, and allowing them to accomplish things they never have before.

While I have come a long way over the years and now celebrate Brennen for all that he is, I cannot deny how true and real the hurt is of knowing that someone you love so desperately has to experience a life with so many struggles. I can't make everything better for Brennen. I can't magically change the way his brain works, fix his muscle tone, or

promise he won't have moments of feeling very different from his peers. Yet I can do my part in supporting him to live his best life and create daily moments of happiness. Brennen has had great success with AUMI and it has been truly a remarkable experience for me as his mom to see him gain some independence and learn new skills. To freely express yourself through music and not be confined by physical ability limitations is, without question, a profound gift!

FIVE | AUMI as a Model for Social Justice

GEORGE LIPSITZ

Participants in the creation, distribution, and deployment of the AUMI software engage in a project that envisions and enacts a new collective understanding of what music is, how it can be made, and who is invited to make it (Finch, LeMessurier Quinn, and Waterman 2016). At the same time, AUMI stages a broader provocation to embrace innovative thinking that extends far beyond music. It advances new ideas about normativity, difference, and democratic social relations in society at large. AUMI's existence, and the new social relations it permits and provokes, demonstrates the influence and impact of powerful and generative ideas raised by disability rights and disability justice advocates, activists, and allies in many spheres of social and cultural life. Rather than viewing disability as an embarrassing impairment, as a deficiency to be corrected or grudgingly accommodated, the disability rights movement affirms the value and possibilities of difference. It highlights harms perpetuated not only on individuals but on society at large by narrow notions of normalcy and normativity. Disability activism exposes how constructing able-bodiedness as a norm creates artificial, arbitrary, irrational, and unnecessary exclusions that misallocate resources, squander talents and abilities, rupture the social fabric, and impede imagination, invention, and innovation. Yet disability never appears alone; it exists among people divided by the ways in which many different kinds of difference are turned into domination. For that very reason, however, disability justice points the way toward pursuing what Daniel HoSang calls "a wider type of freedom" that recognizes connections between ableism and heteropatriarchy, white supremacy, coloniality, and capitalism (HoSang 2021; Berne 2015).

As Patty Berne, Tom Shakespeare, and others have argued, disability justice requires more than mere removal of barriers to full social participation that people with disabilities face. It requires radical revision of core concepts that guide shared social practices and widely held beliefs about ability, impairment, dignity, and worth. This approach resonates with W. E. B. Du Bois's insistence that the Abolition Democracy, created by formerly enslaved people after the U.S. Civil War, required more than mere removal of expressly racist exclusions from citizenship and full social membership, but instead needed to entail attempts to create a wide range of new democratic practices and institutions that challenged the core premises behind racial rule. Similarly, disability justice activists and advocates argue for more than inclusion of the previously excluded in the society as it now exists. Instead, they champion radical rethinking of the ideas and actions that produce normative assumptions about embodiment, identity, and worth (Du Bois 1998; Berne 2015; Shakespeare 2017). Disability justice is a political and moral imperative, an essential element in crafting a more democratic and decent world, a necessary ambition to be advanced even when—and especially when—it conflicts with the calculus of value that prevails in an ableist, sexist, and racial capitalist society. Yet even within the hegemonic world of ableism, removal of obstacles to full social participation is in fact cost-effective and beneficial to all society, not just for those individuals deemed to have disabilities, but to the vast majority of people harmed by the artificial, arbitrary, irrational, and unnecessary nature of ableist exclusion.

When businesses and educational institutions make reasonable accommodations for people with disabilities as required by civil rights laws—when they install elevators, ramps, curb cuts, and electric doors—they are not generously dispensing charity to needy individuals. Rather, they implicitly acknowledge *themselves* and others as injured by impediments to free interaction, by physical barriers that leave commercial establishments with an artificially limited pool of potential customers, salespersons, and executives, and by policies that deny schools access to the broadest possible array of capable students, teachers, and researchers. The entire economy is harmed by discriminatory practices. Discrimination and exclusion squander talents, abilities, and potential productivity of those deemed disabled while channeling unearned advantages to those presumed to be able-bodied. Discrimination based on ableist presumptions about "normal" bodies turns small differences of identity into large gaps in opportunity. The whole social fabric is harmed by these practices.

Yet as disability justice activists insist, judging the worth of humans and assessing their rights on the basis of economic value is an innately unjust, destructive practice. This distorted view of people is not confined to the area of disability. Activists and scholars working within the Black Radical Tradition show how the freedom sought by enslaved and formerly enslaved people during and after the U.S. Civil War became co-opted and transformed into the "freedom" to labor for their oppressors for inadequate wages. They reveal that society viewed Blacks as even marginally valuable only when their labor could be exploited to produce profit for their oppressors. Janelle Levy and Damien Sojoyner (2021) demonstrate how this link between blackness and labor utility continued to guide state policies in Jamaica and the United States during the COVID-19 pandemic by designating Black laborers as "essential" to the economy. This compelled them to live and work under conditions that rendered their lives disposable as workers in the health care, food production and sales, and transportation industries. Levy and Sojourner call for an end to calculations that judge human worth only in terms of economic productivity.

Disability justice, like the Abolition Democracy central to the Black Radical Tradition, challenges the equation of worth with productivity and offers a diametrically opposed understanding of the value of humans. Beyond economic considerations, democratic citizenship depends on developing a broadly based, widely shared capacity for free, full interaction among differently situated people. Democratic governance and creative problem solving require full participation of all members of society in practices that promote intentional deliberation and decision making rooted in interactions among the widest possible range of identities and experiences. This cannot be achieved in a society where people deemed disabled are shamed, shunned, segregated, and silenced. By changing the meaning of music and the identities of musicians, AUMI thus plays a part in a broader process aimed at creating new social sites and social relations grounded in dynamics of difference rather than simple solidarities of sameness.

Accommodating the widest range of ability and disability and recognizing and remedying how social construction of difference creates artificial, arbitrary, and irrational exclusions can make life better for everyone. Removing unnecessary barriers and enabling broad-based participation in economic and social life does more than expand the pool of potential market actors, intellectual and educational interlocutors, and engaged participants in collective social life. It also instigates valuable

forms of imagination, innovation, and invention. For example, ramps, curb cuts, and automatic doors installed initially to accommodate people with impeded mobility work to make movement safer and easier for all travelers. Having only steps at front entrances increases the risk of falls, the leading cause of accidental death for people over the age of sixty-six and the most frequent reason for their emergency room visits and hospitalizations (Metro Fair Housing Services 2011, 17). Ramps reduce the numbers of these falls. Buildings that are difficult for mobility impaired people to negotiate can be fire traps for everyone. The National Fire Prevention Association advises builders to provide safe egress for all (Metro Fair Housing Services 2011, 18). Subtitles on television sets, film screens, and opera stages first came about to assist the hearing impaired and linguistically limited, but they also enhance understanding for all participants who can see. Audible signals at traffic lights alerting visually impaired pedestrians when they may safely cross the street provide another source of information to protect sighted pedestrians. Failing to build dwellings that are accessible to all requires extensive retrofitting of the homes of people who become disabled as they age. This retrofitting increases costs of construction, residence, and insurance, but it also means materials removed during the retrofitting process are added to overcrowded landfills while new materials needed for construction deplete natural resources. Constructing buildings to be accessible to people with limited mobility, hearing, or sight also produces significant positive social gains. It allows for visits from and to people who might otherwise remain socially isolated. Studies show that isolation correlates to higher incidences of premature death at a rate similar to that caused by cigarette smoking (Metro Fair Housing Services 2011, 17). Universal design and open access can encourage children and adults to have direct experience with people with disabilities and develop communication skills with them. Such activities may lead able-bodied people to recognize and resist stigmatization of those deemed disabled, and it may begin movement toward deriving the benefits of free, full, and open interaction with the broadest possible pool of people. Attending to those who declare themselves in need of justice is a social and moral imperative of its own, but it can also lead to a better, richer, and fuller life for everyone. AUMI is an exemplary model of this process. In the course of inviting previously excluded individuals to participate in making music, AUMI helps rescue all music and all musicians from the narrow constraints of outdated and unnecessary aesthetics, technologies, and social parochialisms.

AUMI as Cultural and Social Practice

As a digital instrument that anyone with access to a computer can download without a fee, AUMI promotes democratic access to music making. Individuals previously blocked from composing and performing can generate a wide range of sounds by controlling a visual cursor guided by eye, head, hand, and body gestures. Because AUMI technology can track small movements of the body such as eye movement and chest movement from breathing, it enables users with limited voluntary mobility to generate notes, chords, rhythms, and melodies through an apparatus designed to register the minutest degrees of motion sensitivity. At the same time, however, when programmed to reduce sensitivity to motion, AUMI technology enables music composition and performance by people with active involuntary movements. This flexibility has important ramifications for issues of disability and social justice more generally. Instead of assuming one size fits all, instead of forcing individuals to adapt to the physical demands of instruments not designed for them, AUMI adapts to needs and capacities of differently situated people. Rather than treating all people the same, AUMI recognizes that justice comes from recognizing differences and responding to them appropriately. By treating differently situated people differently, by making accommodations geared to their circumstances, AUMI also establishes a rare social realm that refuses to segregate people on the basis of perceived and ascribed differences (Finch, LeMessurier Quinn, and Waterman 2016).

Through the process of addressing and redressing ways in which limitations imposed by outmoded technologies and conventions limit the range of people playing music, AUMI clears paths for production of new musical sounds and new social relations among music makers. It unleashes artistic impulses not bound by physical and social conventions that have long defined Western art music. It expands access to the palette of sounds from which music can be made. An aesthetic canon that privileges the sonic tones of the Western measured scale made only by historically validated wind, brass, string, keyboard, and rhythm instruments excludes some who are disabled because of physical requirements for playing those instruments, while also marginalizing many players from social classes unable to afford the costs of those traditional instruments. These acts of social exclusion are often rationalized by aesthetic hierarchies. Practices of music instruction, apprenticeship, and performance that dominate Western art traditions elevate harmonic complexity and purity of tones as privileged musical realms. Although this hierarchy is

appropriate and necessary for many signature works, it represents an impoverished appreciation of the range of sounds that different kinds of instruments and instrumentalists can produce. It is not just that existing musical practices discourage differently embodied and experienced performers, but rather that uninterrogated conventions, allegiances, and exclusions place arbitrary and artificial limitations on music itself.

Composer, instrumentalist, and musicologist Alex Lubet observes how what he calls a preservationist ethos that coalesces around the symphonic music of the eighteenth and nineteenth centuries entails an uninterrogated ableism that harms both music and musicians (2004). Social rather than musical considerations explain why performers with relatively limited mobility, amputated limbs, or other socially designated nonnormative physical features have been discouraged from training for roles as opera singers or orchestra soloists. The few who manage to endure and survive training under these circumstances often encounter employment discrimination. Validation of—and emphasis on—sight reading of written scores in training and performance disenfranchise vision-impaired musicians, as do conventions of ensembles responding to conductors' physical cues. Yet people can make music effectively without sight reading and without a conductor. Emphasis on written notation, fidelity to written scores, and conductor-led ensembles are presented as aesthetic necessities rather than strategic social choices and compromises. They privilege one understanding of music and preclude others. They promote conformity and predictability while impeding invention and innovation.

The preservationist ethos privileges a purity of tone that does not account for the AUMI sound palette, which includes effects, animal noises, loops, freely available medium-quality instrument sounds, as well as high-quality sounds contributed specifically for AUMI. Users are invited to upload and play their own sounds, whatever those may be. For those accustomed to Western art music conventions, this inconsistency can seem a fatal defect in the software (Finch, LeMessurier Quinn, and Waterman 2016. See also Leu, chapter 8, and Hayes and Tucker, chapter 19, regarding AUMI's inconsistency of time). Yet medium-quality sounds have often been deliberately cultivated in other forms of music. They have the potential to increase rather than decrease creativity and enjoyment. Pop music producers and arrangers Phil Spector and Berry Gordy geared their recording works to sounds that could be heard most effectively on inexpensive transistor radios and record players. Hip-hop producers make sounds geared to both small, handheld devices and

large "jeep beat" automobile speakers. Don Cherry, Ornette Coleman, many musicians in the Sun Ra Arkestra, and players affiliated with the Association for the Advancement of Creative Musicians frequently played plastic toy instruments and other unconventional noise makers, not because they were sonically superior, but because novel differences in their tones grabbed the attention of audiences and required players to produce creative improvisations (Fischlin, Heble, and Lipsitz 2013, 26–27; Lipsitz 2007, 95).

An example of the generative potential of expanding the palette of sound beyond the Western measured scale comes from the music of the late composer, accordionist, and director of the AUMI Project Pauline Oliveros, through her Deep Listening® concept. Oliveros chose to position recording microphones near a window facing a street so her music would contain unexpected sounds from the universe along with her own notes, chords, and rhythms. When playing back what she had taped, Oliveros heard new sounds that escaped her notice as the recording was made (Oliveros 1984, 182). Oliveros championed the idea of music as a complex embodied experience graced with infinite variations, arguing that

> All cells of the earth and body vibrate. Humans sense the sonosphere in complex and multiple ways, according to the bandwidth and resonant frequencies and mechanics of the ear, skin, bones, meridians, fluids, and other organs of the body as coupled to the earth and its layers from the core to the magnetic fields as transmitted and perceived by the audio cortex and nervous system. (2011, 162)

For Oliveros and AUMI performers, composers, arrangers, and engineers working in the tradition she established, possibilities of music are infinite and open. From their perspectives, difference is to be savored and multiplied, not suppressed and contained.

Viewing "different from" as necessarily "better or worse than" is a recurrent trope in Western thought. Lubet demonstrates that even seemingly small, irrelevant deviations from the norm, such as left-handedness, are treated as impairments in many Western art music practices. Left-handed players confront stringed instruments designed for right-handers. Playing conventions of string sections require simultaneous choreographed symmetrical movements by right-handed players. Piano pieces written for left-handers are rarely commissioned. Even non-left-handed and putatively able-bodied players suffer from effects of forms

of ableism. For example, orchestral conventions require performers to play too often and to perform repetitive pieces flawlessly. These practices constrain musical imagination and put musicians at risk of injury. They help explain starkly disproportionate incidences of upper limb disorders among orchestral musicians and music teachers caused by repetitive motion injuries.

Blues, rock, jazz, and many forms of folk music from around the world have been less committed to the priority given to sight and less hostile to bodies classified as disabled than has the social world of Western art music. Yet for these players, participation in music frequently required them to objectify and market themselves through their disabilities by being known through their perceived impairment, as in the cases of Cripple Clarence Lofton, Peg Leg Bates, and Blind Lemon Jefferson. Important innovations, especially in jazz music, however, often emerged precisely because artists dealt with seeming disabilities. Guitarist Django Reinhardt had two fingers of his fret hand damaged by a fire when he was eighteen years old. He switched from playing the banjo to guitar, which necessitated development of his unique fingering style as necessary adaptation to his injury. What Alex Lubet insightfully calls Reinhardt's "adaptive virtuosity" proved so effective that it revolutionized understandings of his instrument and became a model for others. Similarly, pianist Horace Parlan had a right hand marked by enduring injuries from childhood polio. The seeming limits imposed on him by this condition led him to an innovative style of playing that mixed highly rhythmic right-hand phrases with powerful left-hand chords that perfectly complemented the playing of the virtuosos he accompanied, including Charles Mingus and Archie Shepp (Lubet 2011, 45, 66). Vocalist Jimmy Scott was born with Kallmann syndrome, a hormonal situation that prevented his voice from changing during puberty. As a result, as Nina Eidsheim's brilliant analysis reveals, the seeming anomaly—yet virtuosity—of Scott's singing exposed how gender is socially constructed in part by sound and consequently can be revealed as artificial, arbitrary, and limiting (2019, 91–113).

This history highlights the importance of the AUMI Project—and endeavors like it—such as the use of the accessible digital musical instrument (ADMI) technology by the Performance without Barriers initiative and the Drake Music Project Northern Ireland, along with the making of music on computers in rehabilitation centers by the Creative Technologies program at the University of Regina in Canada. These efforts show how music expression, instruction, and apprenticeship ben-

efit not merely from accommodating embodied difference, but also can use difference to question received categories and imagine and enact new social relations and social practices (Caines 2019; Samuels and Schroeder 2019).

AUMI offers unique benefits to participants in music therapy programs. Some young musicians engaged in making music with AUMI prize the ways it enables them to gain increased control of upper body movements, develop arm strength, and improve posture. Yet as Mark Finch, Susan LeMessurier Quinn, and Ellen Waterman observe, social achievements of these programs can be as important as physical and psychological benefits. They note that parents of children participating in music therapy value the ways AUMI offers young people with disabilities "community-based experience" where personal growth comes in the context of a program that is relationship-based and skills-based. Another important social feature of AUMI is that it exists outside traditional rehabilitation locations. It also enables participating children to make new interpersonal connections under careful, supportive monitoring by specialists aware of the child's goals and needs (Finch, LeMessurier Quinn, and Waterman 2016). Combining individual development with group participation, this version of therapy resembles qualities prized in many kinds of ensemble playing, especially the blend of careful listening and attention to others combined with personal imperative to contribute something new. Conceived more broadly as social practice, this way of thinking encourages individualism that does not succumb to selfishness, and a collective consciousness that resists coercion and conformity.

Nothing in AUMI's design limits its use to people with disabilities. Although designed with particular bodies in mind, it offers new musical and social spaces for anyone interested in making music through bodily movement. The Stretched Boundaries concerts staged by Pauline Oliveros in 2011 exemplified possibilities of this part of the project. Drawing participation from sound artists considered able-bodied and from sound artists considered disabled, the concerts rehearsed through music new social relations that would be tremendously liberating if they permeated society at large. As participant Sherrie Tucker observes, stretching boundaries in music provokes similar thinking in other realms. She explains how these concerts made her aware of difference not so much as problem but as possibility. Tucker et al. argue that experimental music communities' explorations of differences in harmonics, form, time, and timbre can promote avid exploration of "the differential variables in musicians' and audience members' modes of sensory and

perceptual relationships to sound waves, as well as differences in mobility, range of motion, ratios of voluntary/involuntary mobility, modes of cognitive processing and language" (2016, 183). Instead of coasting on conventional music practices, Tucker and other Stretched Boundaries participants came to see *all* communities as never fully inclusive, as impoverished by arbitrary exclusions, and in need of what Tucker et al. describe as "the collaborative potential of improvising across multiple modes of 'sense-making'" (2016, 183). AUMI offers one vehicle for seceding from dominant norms of a sorely unequal, unjust society. It teaches participants to find value in unpredictable interactions in unexpected spaces. It cultivates collective capacity for noticing, engaging, and valuing other people. It draws on musical practices to forge a notion of social *responsibility* rooted in cultivated capacity for respond-ability.

Beyond the Fear of Difference

The expanded view of the sonosphere that AUMI enables not only counters the narrowness of traditions of Western art music, but it also resonates with ways of knowing important to disability studies in particular and to social justice work in general. Western philosophy relentlessly recapitulates the approach to difference Plato followed in articulating a "great chain of being" (Lovejoy 1936). For Plato and many thinkers who followed his lead, "different from" must translate into "better than" or "worse than." The great chain of being is a vertical hierarchy that turns difference into deviance, insisting on "either/or" rather than "both/and" approaches to conflicts and contradictions. Lennard J. Davis shows how this tradition led to the nineteenth-century invention of the "normal" and relentless division of humanity into mutually exclusive categories of the putatively virtuous "standard" and the presumably dangerous, deficient, and criminal "nonstandard" (2017). Applied to disability, this way of thinking assumes superiority of the normative and inferiority of the nonnormative. It views impairment and disability as objective facts rather than socially constructed judgments. It can sometimes mobilize sympathy or pity for people deemed disabled, but it is incapable of promoting respectful, reciprocal relationships among differently situated people. It assumes the able-bodied have nothing to learn from those deemed disabled, and that mistreatment of people with disabilities is the private, personal, and parochial problem of those so designated, rather than evidence of the dominant society's use of arbitrary, artificial, irratio-

nal, and unnecessary categories to skew opportunities and life chances unfairly and unwisely.

Activism around the concept of disability can offer alternatives to these deeply embedded ways of thinking, but it can also be co-opted, contained, and constrained by them. The difference-making dynamics of ableism can appear in disability rights and disability justice initiatives. When any social movement group coalesces around a common identity, it risks occluding differences within the group (Crenshaw 1989; Sandoval 2000; Shah 2001). People with disabilities experience their situations differently because of their race, class, gender, age, and perceived departure from gender normativity. Scholarly studies show the highest levels of disability occur among women, Native American and Alaskan Indians, and adults with low incomes. Almost one in five African Americans claims a disability. Impoverished middle-aged adults report levels of mobility disability nearly five times greater than those with incomes greater than 200 percent of the federal poverty level (Okoro et al. 2018). Civil rights laws that open up access to previously closed spaces can bring more benefits to people whose legal status and finances make it possible to pursue litigation than they can to people who are poor, incarcerated, or undocumented. Disproportionate focus on mobility can occlude attention to issues related to hearing, vision, and cognition. Projects focused on eliminating physical barriers in the built environment need to grapple with the impossibility of a completely barrier-free world in the natural environment (Shakespeare 2017). Like other hegemonic ideas and practices, ableism cannot be wished or willed away. Disavowing it does not make it disappear, but it can be worked on and worked through in the kinds of activist and artistic spaces the AUMI Project envisions and enacts.

The Utility of AUMI for Rethinking Antisubordination Legal and Social Practice

The AUMI Project offers generative ways of thinking, being, and acting that have ramifications for all efforts to achieve social justice. Historically, the thinking encoded in the great chain of being in antiquity grew in importance when it started to inform the ways Europeans understood their relationships with people they designated as Other when their nations embarked on projects of conquest, slavery, and colonialism, which they disingenuously labeled "the age of discovery." Conquerors rationalized their brutality and plunder by designating the peoples of

Africa, Asia, and Latin America as fundamentally different and therefore rationally and ontologically inferior. All major humanities and social sciences disciplines came into existence at this time. The disciplines still contain traces of those early attempts to grapple with coloniality justified through categories of difference (Crenshaw et al. 2019). From the utility of anthropology and geography as tools of empire to the naturalization of the nation as the logical and inevitable unit of study in history and literature, Europe's vexed confrontations with populations it deemed less than human, or not yet quite human, shaped fundamental categories of thought. Musicology and art history came into being by designating the dominant particulars of Europe as universal standards to which all humanity should aspire (Crenshaw et al. 2019, 1–19; Kajikawa 2019, 155–74). Sociology emerged as a managerial field set up to protect hierarchically organized Western societies from problems attributed to the stranger, the Other, the different, the dependent, and the deviant. This approach treated people *with* problems *as* problems, posing unequal and unjust economic, political, and social relations as baseline norms not to be disturbed. As Kahlil Gibran Muhammad argues, inequalities caused by predations of the powerful became attributed to inherent biological and social weaknesses of the oppressed (2019, 24). Because of the understandings of sameness and difference inscribed in the great chain of being and in scholarly disciplines created to serve interests of colonial rule, the putatively able-bodied, prosperous, properly gendered, and property-owning white male became the implied and inscribed privileged subject of medicine, law, and literature. All others were measured in relation to that central figure. In music and law, the tradition of the great chain of being places issues of sameness and difference at the center of social life, but in complex and contradictory ways. The law and public policy often exaggerate differences that do not matter and ignore differences that do. Describing the different as deviant has been a recurrent trope in scholarship and civic policies, as evidenced by the psychology field's long history of defining homosexuality as mental illness and by urban planners' treatment of underresourced neighborhoods inhabited by the poor and members of aggrieved racial groups as blighted imperfections to be expunged from the metropolis (Bayer 1987; Bedoya 2013; Fullilove 2016).

The fear of difference at the core of the great chain of being enshrines desires for homogeneity, purity, and predictability as aesthetic pleasures and social imperatives. It conceives of justice as treating similarly situated people the same. It exaggerates small differences in identity such

as race or disability to justify exclusion, exploitation, and segregation, while ignoring large differences in condition to treat the market actors of capitalism and the rights-bearing subjects of the law as if they were equally situated. As Anatole France quipped in the nineteenth century, "in its majestic equality the law forbids rich and poor alike to sleep under bridges, sleep in the streets, and steal loaves of bread" (1930, 62). This dynamic has been evident in a series of U.S. Supreme Court decisions in the most recent decade and a half that have deemed as illegitimately race-conscious the very remedies that are most needed to address and redress the special conditions facing Black people because of the legacies of slavery and segregation. If the law cannot use race to segregate institutions, the Court holds, then it cannot use race to desegregate them. The oppressed and the oppressor must be treated alike. These rulings hold that recognizing the existence of differences in conditions caused by racism is innately unjust, that it provides unfair preferences for Blacks. In fact, however, *not* recognizing race in these cases does not make people equal and interchangeable, but rather protects the unjust preferences of whiteness authored and authorized by centuries of racist rule.

Disability rights and disability justice advocates provide a productive alternative to limits of civil rights law regarding race. The U.S. legal system subjects race-based affirmative action programs to special scrutiny because of the alleged danger that opening up opportunities to Blacks will interfere with the settled expectations of whites. In these situations, the courts insist that except under rare circumstances all applicants for contracts, employment, and school admissions must be treated interchangeably. But disability law is different. It *requires* differently situated people to be treated differently. While disgracefully limited in many ways, the laws that promote augmented forms of access and inclusion for people with disabilities nonetheless have value. They are not considered by the courts to produce reverse discrimination against those considered able-bodied. Moreover, acts of discrimination that impede access for people with disabilities are not treated solely as the personal concern of the disabled; they are treated like antitrust violations or hate crimes, as unjust fetters on the market and democratic citizenship and as barriers to the free social interactions these institutions require. This approach resonates with insights and achievements of the AUMI Project, which recognizes the harm done to individuals and society alike by dogmatic adherence to artificial ableist norms.

AUMI challenges hierarchies mandated by the great chain of being and the unjust baseline norms it endorses. It interrupts the ways in which

anxieties about the body have been exploited by people in power to depict the crossing of social barriers as violations of biological taboos. The AUMI process encourages people to view "different from" as simply different, as neither necessarily "better than" nor "worse than." It does not presume a privileged central subject. The music AUMI musicians play replaces the passive, preservation-based ethos of the Western art tradition with an active, creation-based ethos grounded in deployment of new forms of surprise, disguise, improvisation, and invention. The social world that coalesces around AUMI technology defies barriers that segregate people into different spheres because of their embodied features and capacities. AUMI practices do not require people designated as disabled to adapt to existing norms of able-bodied identity, but instead deploy technology to correct the deficient imagination that confines the design of musical instruments, music instruction, music practice, and music performance to serving only the needs and desires of imagined able-bodied subjects. It promotes analysis that faults society for its exclusions, but also conceptualizes society as injured by its own discriminatory practices that create impediments to full participation.

A New Frame for Social Justice

The aesthetic, social, and moral dimensions of dynamics AUMI sets in motion offer new ways of thinking in realms of social life that may seem, at least initially, far removed from practices and processes of music making. Rather than merely protesting exclusionary practices or simply attempting to help marginalized people fit into society as presently constituted, AUMI deploys democratic cocreation and accompaniment as mechanisms for restructuring social structures and social relations. It is a form of cybernetics that serves human need rather than corporate greed. It demonstrates understanding of justice grounded in recognizing possibilities of difference rather than repressing mention of them.

Perhaps most important, AUMI questions the ways in which the social definition of merit has been distorted by reliance on outmoded, uninterrogated baseline norms. When music is defined largely as a preservationist practice revolving around playing pure tones on traditional instruments, many players with disabilities are judged as lacking merit. Yet they become judged as meritorious without any change in their bodies once new technologies and new understandings of music are embraced. This example can be applied productively to other realms. It is not just bodies deemed to be different that suffer from discrimination; different minds

are also treated unfairly. Disability theorist Angelica Guevara points to the case of a medical school student with dyslexia who was disadvantaged by his school's reliance on written multiple-choice exams and its refusal to allow him to take an oral exam instead (2020). Guevara notes that the written multiple-choice format tested the speed of information retrieval rather than depth of the student's knowledge, in the process rewarding a skill without bearing on the practice of medicine while punishing the student for his disability rather than identifying any failure to master needed material. Similarly, when universities judge merit of applicants for admission on scores for standardized tests with origins in eugenics and continue creating stratification by privileging questions that wealthy, white students are most likely to answer successfully, they allow privilege to masquerade as merit (Kohn 2000, 2015). The extra weight attached to advanced placement courses in calculating high school grade point averages guarantees a student earning all A's in an underfunded school with few or no advanced placement classes will have a lower GPA than a student getting several B's in a school offering large numbers of these courses. Every year, millions of Black and Latinx families are told they are not sufficiently creditworthy to merit home mortgage loans because their scores are too low as measured by the FICO 4 scoring system. Yet if lenders used the equally rigorous Vantage system, these same borrowers would then be creditworthy and able to secure assets that could appreciate in value and be passed down across generations (Rice 2018, 103). For many years, the Los Angeles Fire Department had height and weight standards that unnecessarily excluded from employment many qualified women applicants. These same standards also served to disadvantage male members of minority groups, especially Japanese Americans. Yet as affirmative action proponent Luke Harris points out, these measures of "merit" were simply culturally based stereotypes. After all, Harris notes, when fires break out in Japan, local firefighters are able to contain and extinguish the blazes without having to fly white males in from the Los Angeles suburbs across the ocean to douse the flames.[1]

Disability law is one area of civil rights law with a flexible understanding of merit, a suspicion of uninterrogated baseline norms, and a rejection of insistence on nonrecognition of difference. The 1988 amendments to the Fair Housing Act made people with disabilities a protected class in respect to housing. This has enabled forms of legislation, litigation, and administration that have opened access to dwellings previously denied to millions of people. Just as music making no longer needs to depend on physical ability to play drums, keyboards, strings, reeds,

and horns, access to residences and businesses no longer needs to be denied because builders do not think about the need to provide ramps, elevators, curb cuts, roll-in showers, and other conduits of accessibility in dwellings, stores, and offices. Moreover, the Fair Housing Act does not presume to be an act of charity to individuals but rather a collective obligation to justice by the entire society. Barriers to residence, employment, and mobility based on the social construction of disability enact arbitrary, artificial, and irrational impediments to forms of free movement and interaction upon which a democratic and prosperous society depends. Like discrimination based on race, gender, sexuality, language, national origin, or family form, ableist forms of exclusion deprive society at large by misallocating resources, squandering talents of individuals, and creating artificially constrained social, political, and economic networks.

Civil rights laws focused on disability contain an especially generative element that needs to be applied more generally to civil rights law, especially in respect to race and gender. The principle of interchangeability guides civil rights law by demanding that people be treated alike. This presumes that sameness is a desired goal and that difference is a problem. In contrast, disability law insists that differently situated people be treated differently, that reasonable accommodation be made to ensure full participation and social membership. This presumes that democracy requires dynamics of difference rather than simply the solidarities of sameness. It mandates that differently situated people be treated differently to enable society to get the full benefit of its plurality and diversity. When civil rights remedies include affirmative action policies in education and employment, set-asides in contracting, and recognition of disparate impact in housing policies, they approach the insights firmly established in disability law.

The AUMI Project provides a model of social justice practice that does not seek a return to a previous "before the injury" condition institutionalized in the tort model of injury in law and the biomedical model of disability, but instead advances a way of thinking and being that authors and authorizes new democratic practices and institutions. It demonstrates a collective social stake in extending social justice to aggrieved individuals. It challenges acceptance of untheorized baseline norms and concepts of normativity. Like other such initiatives, the AUMI Project is not to be seen as a generous attempt by the able bodied to bring the joy of music to people previously excluded from it. Rather, it is a provocation that reveals how accepted notions of normalcy and normativity

injure everyone. The project opens a door to greater understanding of how all other forms of exclusion similarly squander abilities and suppress creativities for artificial, arbitrary, and irrational reasons. At the same time, its premises and practices provide potentially new ways of thinking about improving civil rights laws and other social policies and practices by expanding the range of voices involved, creating new social relations, and recognizing and removing unnecessary and outmoded impediments to full participation.

Note

1. Luke Charles Harris, "Countering Colorblindness," panel presentation, London School of Economics, May 30, 2019. Author's notes.

IONE

Foreshadowing

Culturally, we use the term "dream," in the sense of a desired outcome, of a vision, as well as to reference the physiological phenomenon of dreaming, our ephemeral dreams of the night. Pauline and I both—certainly before, and conceivably beyond—our thirty-two years of creative and personal partnership, have had an abiding interest in both.

What memories, dreams, and visions informed and fueled Pauline throughout the astonishing breadth of her career as musician, composer, teacher, administrator, and humanitarian? More specifically for this writing, what elements may have influenced the project that was dearest to her heart: AUMI, an instrument that would enable those with the least mobility to create their own sounds, to improvise their own music?

One memory (or was it a dream?) stayed with Pauline throughout her life. She was not sure if it actually happened, or if it was a childhood dream.

> I was barely able to walk or talk. My mother is in trouble, crying out—immobilized.
>
> Perhaps she is ill, or perhaps she has fallen?
>
> She is on the floor and I want to assist but cannot. I spend anguished time that seems endless with my mother before adult help finally arrives.

Pauline and her younger brother lived in Houston with her mother, Edith Gribbon (later Gutierrez) and grandmother, Duddah, both of whom were gifted pianists and piano teachers and called themselves "Piano Girls." Pauline listened to her mother and grandmother's playing and to their students' lessons. The sounds infiltrated and illuminated her dreams day and night.

Pauline writes:

> I remember my mother and grandmother practicing the Dance of the Sugar Plum Fairies. The two pianos were in different rooms. I could not understand their sense of urgency. It is my first clear memory of an actual piece of music. I was 3 or 4 years old.[1]

These sounds intertwined with the rich sonic tapestry of the insects of Texas of the 1930s and 1940s. All became a part of her at deeply listening cellular levels.

From time to time, Pauline has shared another teaching from Edith:

> It is a park in Houston where the family often has picnics. Pauline is perhaps 8 or 9 years old and all the children are playing games and enjoying themselves. At a certain point Pauline spots a poorly dressed little girl who is clearly not among those invited. She lingers at the edge of the festivities. Another child attempts to shoo her away. Pauline watches as Edith intervenes, taking the child by the hand to the picnic table, and slicing her an enormous piece of cake.

Pauline never forgot Edith's message on generosity and inclusion. Always give to those who have less than we do, who are on the margins. Bring them in. Make them feel welcome.

And throughout her life she was always conscious of those who were excluded or overlooked by society. While growing up and then beyond—as she moved onto the international scenes with her music and teachings—she always intentionally pulled against the racist–separatist southern culture that had surrounded her early on.

Creation Dream and Another Birthday Party

> In many indigenous cultures, it is understood that the work of art—the pottery, the weaving, the sculpture—is dreamed before it takes shape in the tangible world.

I recall the "creation dream" of Deep Listening Institute, Ltd., the not-for-profit organization that supported Pauline's dream of AUMI.

In May of 1986, Pauline and I sat across from each other in a sunny courtyard in Upstate New York's Hudson Valley.

We were there to celebrate our birthdays, but we did not yet know each other very well.

We had only recently met in Manhattan, where we were staying in the same building on Leonard Street and frequently passed each other on the stairs. Seated side-by-side at a downtown concert, it somehow came out that our birthdays were only two days apart (May 28th for me and May 30th for Pauline, five years earlier in 1932).

I was house sitting in the Hudson Valley while I worked on my memoir, *Pride of Family: Four Generations of American Women of Color,* and I invited Pauline to join me for a country celebration. She loved the area and was pleased to return there, having spent memorable time on Mount Tremper in the days after she left her tenured professorship at the University of California, San Diego, to concentrate on her own music and performances.

As it turned out, the few other friends I had invited to the birthday party canceled due to car troubles, and Pauline and I were left to celebrate on our own.

Pauline had arrived fatigued from what was already an extremely busy schedule of travel and performance. She gravitated to one of the bedrooms and slept for several hours.

When she woke, we had a simple meal together; I believe there was cake!

We sat in a small courtyard together, and as a way of getting to know each other, almost as a kind of game, we decided to share our big Life Dreams with each other.

To our mutual astonishment, Pauline and I discovered that we had a shared dream!

The Shared Dream

> There is a vibrant community, a new kind of organization—comprising many, many members, all cultures, ages and all abilities—a network of artists all linked by a common thread of creativity.

As we sat in the courtyard, I could see the shapes and colors of our dreaming:

Circles of ever expanding friends and colleagues—sounds of voices and instruments lifting and blending. Threads that unite artists of many persuasions; all kin, I thought to Indra's fabled web of creation, filled with glittering gems, all united by shining filaments.

That evening, we stood out on the porch and a shooting star streaked across the sky directly in front of us. Something was happening.

I didn't know then that a few months earlier, Pauline had written in her journal, expressing her desire for a relationship that would:

be the nucleus of a great family of creative people working to educate and open ways for many to express themselves fully as artists for humanity.

In the same time period, she had also written down a dream she'd been told by her manager:

Pauline is building a house for hundreds of people, each person has a hammer and a nail. The house was all assembled but not nailed together. On cue from my whistle everyone put in their nail and the house was built!

On the winter solstice that December, Pauline and I invited close friends to our Commitment Ceremony on Leonard Street in New York, during which we pledged to make "Home" together wherever we were.

Our shared dream of a new kind of organization came alive with Deep Listening Institute, Ltd., a 501(c)(3), a not-for profit organization (currently, The Center for Deep Listening at Rensselaer), and Pauline and I returned to the Hudson Valley, where we made home for the organization between 1987 to 2015.

Those decades were, in fact, a cross between the Dream of Reality and the Reality of the Dream.

They were filled with creativity, music, concerts, exhibitions, and theater emanating from, but not limited to, our building, called Deep Listening Space, on lower Broadway in Kingston.

One day in 2007, at our friend, certified OT, and percussionist Leaf Miller's urging, Pauline visited REHAB Programs North Road School (now Abilities First), a school dedicated to caring for children with cerebral palsy and other severe physical and intellectual disabilities.

When she came home from that now legendary first visit, I could see and feel the intensity as she came in the door.

A sudden and clear vision had appeared to Pauline. She was already poised to send out emails as she moved with purpose to her favorite chair and computer station. She relayed to me and then to a host of others—students, colleagues, old friends—the depth of her feelings about what she had witnessed. Pauline was dismayed by many of the cumbersome mechanisms that were in use to assist the children, and she was delighted and inspired by their enthusiastic responses to Leaf's lively drum circles.

Pauline's dream was to create an instrument that would enable these children and, by extension, those with similar physical disabilities to make music. They would be empowered to improvise and to create their own music. She stipulated that it would be an instrument friendly to those with the very least capability of movement. She made sure that it could be offered to all as free software as it continued to expand. She assembled the initial "Dream Team" including Don Millard, director of the Academy of Electronic Media at RPI and Rensselaer student researchers along with the staff of Deep Listening Institute, Ltd.

Today, AUMI continues evolving, surpassing the simplicity of the first prototypes, including now, a myriad of sounds and imagery nourished by a dedicated consortium of universities and researchers.

The AUMI Project continues to be revised and improved with input from technologists, students, and therapists and through feedback from users.

AUMI is nourished by Pauline's early dreams and memories of Houston and Edith as well as by a shared dream of a deeply listening community.

All are coming true.

Note

1. Pauline Oliveros, journal entry, 1972.

Software for All People

Improvising AUMI's Development

> You asked me about my priorities. My priority is [not only] for the software to be used—but to be updated and upgraded continually. Not fix it and forget it.
>
> Because it really needs to be evolutionary. Evolutionary in the terms that you can see and experience today.
>
> Maybe there's a plateau somewhere, but every time I've been over there [to Abilities First School], I've learned an amazing amount of things.
>
> And every situation has a new challenge in it, and new details.
>
> —Pauline Oliveros, Kingston, New York, 2009[1]

Pauline Oliveros's "evolutionary" priorities for AUMI required a collaborative team of improvising developers, responsive to technical implications of "new situations" where users illuminate "new challenges" and "new details." Parameters included: (1) *everyone who downloads it is a researcher, and thus may contribute to its development* and (2) *no technological decision will be made without collaboration with the larger AUMI Research Group, many of whom were/are not specialists in technology, design, or programming.*

Such goals and aspirations presented particular challenges for AUMI developers! The balancing act between expanding AUMI's capacities with ensuring that it still runs on older machines with little memory, of working collectively and with fluctuating material support, all take on particular valences when considered from the tech team's viewpoint.

While never open source, AUMI technology bears traces of many creative developers, working in collaboration with an ever-changing community of AUMI researchers. Along with the goal of being inclusively user-friendly, free of charge, responsive to user input, and continuing to work on all commonly used operating systems and updated accordingly, Pauline wanted AUMI to be conducive to improvisation, to creating new, more inclusive music, and to transforming social relations.

In her 1978 lecture "Software for People," Pauline posited that musical composition could train those who played and listened to it to increase their awareness and expand consciousness. Compositions that built skills for ethical cocreation could help people with their own "bio-programming," thus, software for *people*. Thirty years later, AUMI is machine software on the one hand, but also "software for people," given Pauline's hypothesis that "improvising across abilities," like her earlier "training pieces," could transform social relations and consciousness (Oliveros 1984, 185–88).

This section provides history of AUMI's improvisational, collective, and technological development. First, we place AUMI in two historical contexts. Leading scholar of disability and music Alex Lubet positions AUMI within a long history of adaptive music (chapter 7). Then, Grace Shih-en Leu (chapter 8) zooms in, situating AUMI among contemporaneous adaptive digital musical instruments (ADMIs).

Subsequent chapters relate histories of AUMI technologies and developers. Between 2007 and 2019, a series of developers worked on AUMI versions for computers (Macs, first; then Mac and PC). Sherrie Tucker (chapter 9) discusses the Deep Listening Institute (DLI) years of AUMI development and developers (2007–2012). Next, John Sullivan, Ivan Franco, Ian Hattwick, Thomas Ciufo, and Eric Lewis (chapter 10), share their perspectives from the center of AUMI desktop development at McGill (2012–2019). In chapter 11, Henry Lowengard discusses developing AUMI for iOS (released in 2013), which extended use to iPads and iPhones.

Jonas Braasch (chapter 12) closes this section by situating AUMI among Pauline's life's work using technology to expand inclusive music making and listening, and within the period of Pauline's heightened awareness of disability.

As of this writing, AUMI continues to develop according to the aspirational goals and collaborative ethos of its founder. If past is prologue, what appears in these pages little resembles available downloads. For the current state of technological affairs, consult http://aumiapp.com.

Note

1. Pauline Oliveros, meeting with Leaf Miller, Gillian Siddall, Sherrie Tucker, and Ellen Waterman, November 9, 2009, Deep Listening Institute, Kingston, New York.

SEVEN | AUMI in the Context of Adaptive Music

ALEX LUBET

Introduction

AUMI is a unique contribution to the liberatory project of inclusive music making, enabling performance regardless of one's ability to move or control motion. This chapter locates AUMI within the context of adaptive music for physically disabled musicians, an effort traceable to the nineteenth century. A classificatory system and a history, adaptation strategies include:

1. Playing techniques
2. Assistive apparatus
3. Adapted instruments
4. New instruments
5. Coalition building
6. Fixed-media (notated scores and recordings) composition technologies

Additional taxonomies include:

1. Adaptations by professional versus avocational musicians
2. Professionally crafted versus DIY (do it yourself) adaptations
3. Economics of adaptation
4. Range and control of mobility required
5. Musical genre

The consideration of AUMI's unique place in the world of adaptive music is contextualized with examples of:

1. Disabled professional performers: Django Reinhardt (Lubet 2011), Rick Allen,[1] Cedell Davis (Pareles 2017), David Nabb (Giboney 2013)
2. Coalitions: Vancouver Adapted Music Society (VAMS)[2]
3. Adaptive apparatus/instrument programs: Centre for Rehabilitation and Music (Woldendorp and van Gils 2012); One-Handed Woodwind Program (Geli 2008); OHMI (One-Handed Musical Instrument) Trust.[3]
4. Brainwave controllers: Smirnoff Mindtunes Program[4]

Different musical genres and cultures lend themselves more or less readily to adaptive musicking. Vernacular traditions, typically amenable to wide latitudes of interpretation, and particularly in improvisation, typically offer greater opportunities than traditions more reliant on fastidious notation and single-composer control. As will be shown, it is through genre that AUMI most asserts its unique place in the world of adaptive musicking.

Disability Musicking: A Very Brief History

Evidence of disabled people making music for millennia includes the blind bard Homer's sung epics. One venerable association between music and blindness—that music is an apt, sometimes legally delegated and organized occupation for the blind—has been practiced in Ukraine (Kononenko 1998), Japan (Matisoff 2006), France (Husson 2001), Ireland (Sacks 2007), and (in acoustic blues) the United States (Sacks 2007). Francesco da Firenze (aka Francesco Landini; ca. 1325–1397), arguably the best-known blind composer in the Western classical canon, depended on scribes to notate his works, an early disability accommodation (Cuthbert 2015). But only in restricted circumstances, such as print notation or a conductor, does blindness present significant difficulties in musicking (Lubet 2011). Because AUMI was initially developed to enable musicking by people with mobility impairments, physical disabilities make up this chapter's focus (for neurodiverse musicianship, see Bakan 2015).

Adaptive music for physical disabilities is a more recent development. One-handed keyboard works originated in the eighteenth century and,

by the nineteenth century, were sometimes written expressly to address needs of disabled musicians, mostly amputees, both professionals and wounded veterans. Drozdov, Kidd, and Modlin (2008) regard piano as the ideal instrument for adaptive musicking, playable despite injuries without additional adaptive technology.

The twentieth century brought a shift of interest by disabled musicians to strings, principally guitar. Deke Dickerson's website documents, mostly pictorially, a freak-show tradition of "armless musicians."[5] Lubet (2018) chronicles a tradition of disabled self-determination, with some artists providing instruction manuals for adaptive playing apparatus.

String adaptations differ from those for keyboards. They are of necessity more radical revisions of playing technique. Armless guitarist Tony Melendez, who plays with his feet, may be the paradigm. Assistive apparatus, typically conceived and invented by performers, tend to be simple and inexpensive, such as bluesman Cedell Davis's butter knife slide.

Another important distinction between keyboard and string adaptions concerns, if covertly, class. Piano ownership and music literacy are often accoutrements of middle- and upper-class status (Leppert 1992). Guitars are more identified with vernacular culture, borne out in the extreme in Dickerson's showcase of sideshow freakery and more generally by the association of guitar with folk/popular music, blues, and jazz.

More recently, advanced technologies, often promoted by adaptive music organizations, have appeared. In 1988, the Vancouver Adapted Music Society began "Canada's only fully-accessible recording studio." Saxophonist/professor David Nabb and technician Jeff Stelling developed a one-handed saxophone, leading in 2001 to Nabb's One-Handed Woodwinds Program, making such instruments available worldwide (Giboney 2013). The UK's OHMI (One-Handed Musical Instrument) Trust, established 2011, has a similar mission that includes wind, brass, string, and new electronic instruments, an annual conference, and an inventor's competition.

The Netherlands' Centre for Rehabilitation and Music, unique in that its staff includes physicians, "prescribes" instruments and gear of all families (Woldendorp and van Gils 2012). One-armed Def Leppard drummer Rick Allen, arguably the world's best-known amputee musician, plays a digitally enhanced drum kit, apparently one of a kind. Allen's Raven Drum Foundation (founded 2001) focuses, through its Project Resiliency, on posttraumatic stress disorder (PTSD) (especially in veterans), rather than physical disability.[6] The most intricate technology may be the Smirnoff MindTunes Project, which uses brain-wave con-

trollers to enable quadriplegic musicians to participate in composing an electronic dance music (EDM) track.

These innovations and organizations differ from earlier DIY projects in both technological complexity and variety of instruments available, notably enabling greater participation in Western classical music. For the first time, engineers and health care professionals are involved. Unlike DIY guitar adaptations, these projects are expensive—Nabb's saxophone costs $45K (Geli 2008)—although efforts to defray or limit costs to musicians themselves are common. High costs (for research and development [R&D] and for instruments and apparatus), renewed interest in classical music, and involvement of technological/medical experts have inevitably injected (largely nondisabled) forces of class and power into decisions about what to adapt for whom and for what music.

AUMI

While AUMI's original target clientele was physically disabled children, the instrument proved apt for other disabled people and may be enjoyed by anyone. In development since 2006, it is a self-proclaimed new instrument rather than an assistive apparatus. It is part of the recent wave of high-tech accommodations (see Leu, chapter 8) and responds to any type of movement, not just movement of the limbs. Unlike Mindtunes or some activities of VAMS, its forthright intention is real-time improvisation, not fixed-media composition. Thus, AUMI challenges the assumption that live performance is not an option for some musicians.

AUMI's website (http://aumiapp.com) chronicles extensive R&D and broad collaboration across organizations and individuals. There is a history of grants and a GoFundMe project indicative of significant money (and time) spent in development. AUMI, though, is distinguished from other high-tech accessibility projects in having always endeavored to be free of charge to users (briefly, there was a small charge for the iPad platform). That AUMI is downloadable is another important element of accessibility. Access to AUMI-friendly hardware is, of course, essential and part of user cost, though these are already owned by most Americans (Pew Research Center 2018[7]), if less by disabled Americans (Anderson and Perrin 2017).

What may be most significant and unique about AUMI is its relationship to musical genre, an aspect related to its foreground purpose, enabling musicking by people, especially children, with profound movement disabilities. Long story short, AUMI is most apt at making music

uniquely idiomatic to itself, rather than insinuating itself into extant genres. In that sense, AUMI is both an instrument and a genre.

By contrast, other approaches to disability musicking—composition, playing technique, modified or new instruments, or assistive apparatus—either blend into existing aesthetics as seamlessly as possible or challenge their genres' aesthetic limits by incorporating "disabled virtuosity" (Lubet 2015, 2011) while leaving these music's respective soundscapes essentially intact. The latter applies to the music of all the "professional performers with mobility impairments" listed above. And Mindtunes, which requires no movement whatever, yielded a single dance track in which its composers' extreme mobility impairment had no apparent aesthetic impact.

Elsewhere (Lubet 2015), in a discussion of "musical citizenship" apropos of Western classical music, jazz, and EDM, I observe that all three genres limit, in varying degrees and manners, participation by or for musicians with limited mobility. Given that these aesthetically and culturally distant genres all fall short in varying degrees of full emancipation of physically disabled musicians, it is understandable, laudable, and visionary—but not surprising—that Pauline Oliveros and Leaf Miller understood that a radically new genre and instrument was the appropriate path to a liberatory musical idiom. One particularly compelling performance is by the Mills College Adaptive Instrument Ensemble, a mixed group of AUMI and traditional acoustic instruments, at the 2019 Signal Flow Festival (see Vid25_01.mp5 and Robidoux, chapter 25).

AUMI's singular achievement is in being simultaneously freeing and free.

Notes

1. "Rick Allen," https://rickallen.com/, accessed October 1, 2022.
2. Vancouver Adapted Music Society, https://www.vams.org/, accessed October 1, 2022.
3. OHMI Trust. n.d. "OHMI: Enabling Music-Making for the Physically Disabled," https://www.ohmi.org.uk/, accessed October 1, 2022.
4. Duval Guillaume Modem, "Smirnoff MindTunes," http://www.youtube.com/watch?v=r7Nw41vNLUg, accessed September 21, 2022.
5. Deke Dickerson, "Armless and One-Armed Musicians," https://dekedickerson.com/armless-musicians/, accessed October 1, 2022.
6. Project Resiliency: Mind-Body-Drum, https://project-resiliency.org/, accessed October 1, 2022.
7. Pew Research Center. 2018. Mobile Fact Sheet. https://www.pewinternet.org/fact-sheet/mobile/

AUMI among the ADMIs

The Adaptive Digital Context

GRACE SHIH-EN LEU

At the time of AUMI's emergence in 2007, adaptive digital musical instruments (ADMIs) had existed for a decade, and they continue to proliferate (Frid 2019; Krout 2014). Such instruments typically divide into two categories: (a) instruments for people with disabilities and (b) instruments to augment musical performances. This review begins by listing instruments from each category that share at least one of two digital technologies central to AUMI: noncontact, motion-to-sound capabilities, and the sole use of computer/tablet hardware and peripherals. I then argue that AUMI's contribution to the world of digital instruments is not in its historical or technological contributions to either category, but rather in its accessibility and power to disrupt ableist categorization of digital instruments. In other words, through its inclusivity, AUMI unravels dominant scripts that confine certain persons, places, and purposes as appropriate to certain instruments.

Adaptive Digital Musical Instruments for People with Disabilities

Fitting the adage, "necessity is the mother of invention," AUMI was conceived by Pauline Oliveros out of a need for musical instruments suited to Leaf Miller's students with significant cognitive and motor disabilities (see Miller, chapter 1, and Van Dusen, chapter 2). Before and throughout AUMI's emergence, other innovators created digital instruments for similar needs. These have been called adaptive musi-

cal instruments, accessible digital musical instruments, inclusive musical instruments, and accessible digital instruments (Samuels and Schroeder 2019; Frid 2019; Grond, Shikako-Thomas, and Lewis 2020). Like AUMI, these instruments invite persons with disabilities to express themselves through musical improvisation and social interactions. They have also been used by music therapists to improve persons' physical functioning and well-being (Magee 2014b).

Among the earliest was Soundbeam (McCord 2004), invented in the early 1990s. Then came Movement-to-Music (Knox et al. 2005) and Eyecon (Wechsler, Weiß, and Dowling 2004) in the late 1990s. Similar to AUMI, all three are noncontact. Soundbeam uses infrared to turn motion into sound while Movement-to-Music and Eyecon, like AUMI, use camera tracking to trigger sounds. A fourth created around the same time, the MIDIGrid/MIDICreator (Kirk et al. 1994), relies solely on computer hardware and peripherals. Unlike the other three, however, MIDIGrid/MIDICreator is a contact instrument that uses a mouse or joystick to trigger sounds.

Contemporary to the AUMI prototype (2007) are the VMI (Virtual Music Instrument) (Ahonen-Eerikäinen, Lamont, and Knox 2008); the Music Maker (Gorman et al. 2007), an instrument that triggers musical responses based on hand movements to improve fine motor skills and coordination; the L'orgue sensoriel (Picotin 2010), created for persons with autism; and the dynamic sonification system (Lem and Paine 2011). Between 2010 and 2019, the MotionComposer (Wechsler 2018), Shaker System by STEIM,[1] and AirHarp,[2] designed for a person with cerebral palsy, emerged. Of these contemporary and later instruments, VMI, Music Maker, L'orgue sensoriel, the dynamic sonification system, MotionComposer, and AirHarp have noncontact movement-to-sound features. Additionally, STEIM allows movement to sound using a handheld device; Music Maker relies on computer hardware and peripherals.

Adaptive Digital Musical Instruments to Augment Musical Performance

Since its conception, AUMI has played supportive and central roles in performances (see section III, part 2). In this way, AUMI fits among digital instruments designed to augment musical performances; also called technology virtual instruments, virtual musical instrument, electronic musical instrument, digital musical instrument, and augmented performance instrument (Goto 2000; Mulder 1994; Hughes 2010; Malloch

and Wanderley 2007; Yang and Essl 2014). Like AUMI, these instruments have been played by professional musicians, used in improvisation, featured in performances, and played in concert with other instruments.

Instruments to augment performance created before AUMI include Buchla Lightning,[3] EyesWeb (Camurri et al. 2007), and cART Lab (Tarabella and Bertini 2001). Contemporary to AUMI is the T-Stick (Malloch and Wanderley 2007). From 2010 to 2019, the Gesture-Augmented Keyboard (Yang and Essl 2014), the Octonic (Challis 2011), and MiMu Gloves (Heap 2021) were invented. Of these, EyesWeb is a computer program requiring no other devices. EyesWeb, cART Lab, and the Gesture-Augmented Keyboard use camera or video tracking. Octonic uses infrared sensors and MiMu Gloves uses WiFi sensors for noncontact playing.

An Inclusive Discussion

AUMI was not the first of its kind. By the early 1990s there were instruments that featured camera-tracking technology and used computer platforms created for persons with physical and cognitive disabilities and were designed for creative performance. In some respects, AUMI's digital specifications are unremarkable. Nor does AUMI possess the polished appearances and readily available technical support of commercial instruments created for persons with disabilities like SoundBeam and MotionComposer. AUMI also lacks precision sensors and custom options of instruments designed to enhance professional musical performances such as Buchla Lightning, EyesWeb, and T-Stick. Put another way, if a person were to select the "most innovative," "visibly appealing," or "technologically advanced" digital instrument, AUMI would probably not make the cut.

Yet while AUMI does not stand out in any single attribute, an integrated comparison makes AUMI's contribution to digital instruments evident in two ways. First, in its combination of ease of use, price, and availability, AUMI's accessibility is unparalleled. Second, AUMI's rough technological edges have created much needed dialogue and community among professional and amateur musicians with and without disabilities and everyone in-between (see table 8.1).

AUMI's interface can be learned by children, therapists, and other nonprogrammers. This contrasts with the complex design of other software-based instruments such as EyesWeb, Eyecon, the dynamic sonification system, and VMI, all of which require programming skills or

Table 8.1. Comparison of Adaptive Musical Technologies

Name	Year	Enabling	Augmenting	Requires Physical Contact	Requires Specialized Hardware	Cost (if publicly available)
Soundbeam	1990	x			x	£2500.00–4500.00
MIDIGrid/MlDlCreator	1994	x		x		$30.00
Eyecon	1997	x				Free
Movement-to-Music	2000	x				
L lorgue sensoriel	2004	x			x	
VMI (Virtual Music Instrument)	2007	x			x	
Music Maker	2007	x				
MotionComposer	2010	x			x	€12,450.00
Dynamic Sonification System	2011	x			x	
Shaker System by STEIM	2016	x		x	x	
AirHarp	2017	x			x	
AUMI	2007	x	x			Free
Buchla Lightning	1 991		x	x	x	
cART Lab	1995		x		x	
EyesWeb	1999		x			
T-Stick	2006		x	x	x	
Octonic	2009		x	x	x	
Gesture-Augmented keyboard	2013		x		x	
MiMu Gloves	2014		x	x	x	£2500.00 (pair)

training to manipulate effectively. Second, while instruments such as the Soundbeam, MotionComposer, and MiMu Gloves are user friendly for non-computer experts, they are prohibitively expensive. Costing £2,500–4,500 and 12,450€ respectively, Soundbeam and MotionComposer are often only available in institutional settings such as schools or hospitals or for rent. Few persons and families can afford their own. Equally expensive, the performance-oriented MiMu Gloves are £2,500 a pair. In contrast, AUMI has been low cost ($4.99 USD) or free. Finally, several instruments were not, at the time of review, publicly available. The cART Lab, the Gesture-Augmented Keyboard, and the Octonic appeared to be in experimental stages, while the AirHarp was a custom-made one-time project. The Buchla Lightning is no longer sold and the T-Stick is a DIY project not available for purchase. Frid (2019) explained that while creation of digital instruments has increased in the past decade, most new instruments are experimental in nature, demonstrated at conferences,

or reported in dissertations or research articles. In sum, AUMI's combination of ease of use, cost, and accessibility as free software downloadable to any PC or iPad makes it the preferred available digital instrument for many.[4]

Second, AUMI's rough technological edges have widened the inclusive potential of musical improvisation, creating dialogue and community among professional musicians, persons with disabilities, and everyone in between. While AUMI's tech team works to refine its technology to detect minute and accurate motions within affordable limits of current computer and tablet built-in cameras and peripherals, AUMI's rough edges level the musical playing field and create noncompetitive, inclusive, improvisational spaces. A narrative of my first AUMI experience provides a glimpse of what this means.

My introduction to AUMI was a combination of frustration and intrigue. Unlike other instruments, AUMI seemed intent on creating sound from any and all of my movements (intentional or not), playing out shadows and minor changes in lighting I failed to notice. My frustrations, however, loosened into playfulness during my first AUMI studio recording. I realized that instead of trying to master AUMI as I had been trained to play other instruments, playing it meant allowing AUMI and my fellow players to transform my movements into sound and silence combinations as they/it/we may. I can honestly say that moment was the first time I thoroughly enjoyed improvisation. Previously, I dreaded improvising for fear of sounding "bad." Immersed in jazz trumpet playing for a time, I had heard phenomenal riffs that drained my musical confidence. Yet here was this instrument refusing to be mastered by my movements and demanding I improvise every performance! Fears of judgment melted and a community came into focus. I began listening to others not to compare sounds but to join in musical conversation. Then, after the recording, instead of analyzing sounds for "right" and "wrong" or "good" or "bad," colorful reflections conjured images of mice drumming in a leaky sewage tunnel (https://doi.org/10.3998/mpub.11969438.cmp.10).

Since then, I affectionately label AUMI as "having a mind of its own." Participating in COVID-19 AUMI Zoom jam sessions when AUMI unexpectedly decides to call the shots has brought humor and camaraderie (https://doi.org/10.3998/mpub.11969438.cmp.11).

Unlike other digital instruments, AUMI's rough technological edges muddle ableist distinctions that structured this literature review: distinctions between instruments created to serve needs of persons with disabil-

ities and instruments made to augment professional musicians' performances. The unpredictability of AUMI moderates self-labeled musicians' ability to master an instrument, pulling down competitive and judgmental barriers to inclusion, reclaiming musical performance as something for everyone, not exclusively for professionals. With this, terms used to divide digital instruments such as "support" versus "augmentation" and "enhancement" become synonymous in AUMI as it supports, augments, and enhances improvisational possibilities of any player: professional or amateur, disabled or nondisabled. In this, we discover AUMI's greatest success, as echoed throughout this book: its ability to close the gap between who counts and who is heard, fulfilling Oliveros's desire that AUMI "transform social relations and discover new modes of inclusive community practice" (introduction, 13).

In sum, this literature review reveals that AUMI's critical contributions do not draw from any one of its particular features, nor was AUMI groundbreaking technology. Rather, AUMI's continual vitality and relevance draw on its accessibility and its challenge to the ableist distinctions of uses and users that divide digital instruments today.

Notes

1. "STEIM helps people with disabilities . . ." https://steim.org/2016/06/steim-helps-people-with-disabilities-to-have-fun-making-music/, accessed January 3, 2021.

2. "Airharp," Drake Music, https://www.drakemusic.org/technology/instruments-projects/airharp/, accessed January 3, 2021.

3. "The History of Buchla," https://buchla.com/history/, accessed January 3, 2021.

4. Henry Lowengard, developer for AUMI for iOS, is working on a browser-based AUMI.

NINE | AUMI Development and Developers

The DLI Years (2007–2012)

SHERRIE TUCKER

One challenge of writing AUMI tech history is that Pauline did not consider the technology separable from artistic, communitarian, and consciousness-expanding aspects of the AUMI Research Project. This holism was especially pronounced in the early years, when AUMI development emanated from Pauline's Deep Listening Institute (DLI).[1] Along with DLI staff members, many of Pauline's colleagues (Don Millard, Curtis Bahn, etc.) and students at Rensselaer Polytechnic Institute (RPI) contributed to AUMI development, alongside fellow researchers at Abilities First School: students, teachers, staff members, therapists, and aides.

While not the only adaptive instrument born of collaboration by therapists, programmers, and players across academic and nonacademic communities, AUMI was unique in its immediate, expansive release beyond any semblance of a controlled environment.[2] Once the software traveled free of charge into the world, all who downloaded it were considered researchers and invited to offer feedback. Much of what Pauline considered data never cycled back. But some did. All was important to her vision of "expanding the improvising community." Pulling at the tech strand of the cross-community AUMI fabric, this chapter provides a brief history of AUMI development and developers at DLI between 2007 and 2012.

AUMI Tech from Z(ane) to Z(evin)

As Zane Van Dusen recounts in chapter 2, he had the good fortune of spending the spring semester of his senior year working as Pauline's research assistant. This senior project was much celebrated by RPI, yielding what would sadly turn out to be the peak of mainstream press attention to AUMI (*Discover*, Associated Press, and other outlets). Upon Zane's graduation in May 2007, Pauline urged him to linger in the Hudson Valley to work with Zevin Polzin, DLI technology assistant, who would transform the prototype into AUMI 1.0. As Zane put it, "I developed the beta version of it that really got the software started. That was the proof of concept that showed what worked—and [Zevin] really brought it to the first usable version," meaning that its use did not require presence of developers.[3] Pauline credited Zane, Leaf, and Zevin as original developers, with Zevin as first lead developer. After Zane's departure, Zevin and Leaf spent the next two years working together with students, therapists, and teachers at Abilities First to improve AUMI's usefulness (Oliveros et al. 2011, 173).

To understand AUMI's early history, one must have a sense of what DLI was like between 2007 and 2010, when Zevin worked on AUMI and other projects (such as the Intelligent Expanded Instrument System and sleep music projects for IONE's Dream Festivals).[4] DLI, then on lower Broadway in Kingston about one hour south of Troy, home of RPI, was workspace, office, publishing company, art gallery, recording studio, and performance, meditation, and gathering space. The nonprofit provided Pauline freedom to pursue boundary-crossing projects in arts, technology, and consciousness without worrying about institutional legibility or control. It kept her connected with the broader local arts community. Many people followed Pauline back and forth between DLI and RPI, her academic home, but these were distinct places, different universes, albeit with significant crossover. Many aspects of AUMI—that it is free, that all who use are researchers, that it works on old machines—are traces of its formative years spent in community-connected art spaces where such goals would be unquestioned, as well as Pauline's insistence that these values intersect and connect with academic research spaces.

From DLI, the AUMI Research Project was a twenty-minute drive to Abilities First School, the pilot site of AUMI. Between 2007 and 2010, as AUMI developer, Zevin regularly made the trip between Kingston and Poughkeepsie, as did Pauline, who sometimes brought her students (see Tomaz, chapter 3 and accompanying film https://doi.org/10.3998/

mpub.11969438.cmp.9). Himself a programmer, composer, guitarist, and multimedia artist, Zevin observed student musicians, conferred regularly with Leaf, and created new features as needed. "It was so much fun," recalled Leaf in a 2017 interview. "Like, I'd say, 'Can we do this?'. . . . He'd make it happen!"[5] Leaf's observations, gathered while making music with the students, provided invaluable feedback. Other therapists, teachers, and staff members at the school also contributed: for example, a vision specialist gave feedback on best colors, thicknesses, and sizes for designing grids and ball for users with low vision. Most important, the students, who were most closely engaged in the process of making music with AUMI, discovered new uses and identified opportunities for technological improvement. Students had different motion ranges, velocities, directions, and control, and different sound and movement *preferences.* All this informed tech development in a multidirectional transmission of knowledge.

The prototype Zevin inherited used Max, a visual programming language for music and multimedia, to track movement captured by a camera on a MacBook Pro (Pask 2010, 187). When the player moved side-to-side, so did the cursor on the screen, activating sound from a software library for computer vision. The cursor, which looked like a red ball, "stuck" to the screen image of a moving body part: an arm, a finger, a head (for example, Zane's nose in figure 9.1). When the "ball" crossed a line on the screen, it triggered a snare drum sound. The distance required for triggering sound could be adjusted for wide or narrow movement by changing the width of the "guide" on the screen. Similarly, an optional setting programmed a blues scale, playable when the camera followed the player's side-to-side movement over the illustration of a keyboard. This opened the playing field to more bodies and abilities; still, it became clear that lateral movement was not optimal for all Abilities First students. So one of the first adjustments Zevin made was an optional setting that responded to up-and-down movement. The snare drum switch was expanded to a quarter-screen option with four different percussion sounds. The prototype had only one scale: Blues, a flexible choice for proof of concept, but more were needed for creative play. Zevin programmed them, one at a time: major, minor, chromatic, with Leaf ever pressing for pentatonic.

Six months into AUMI 1.0, Zevin and Pauline recounted in an interview the AUMI tech story up to that point, sharing how they were integrating what they were learning from Abilities First students with future enhancements of AUMI's ability to "amplify very small, limited move-

Figure 9.1. Screenshot, Zane Van Dusen demonstrates AUMI. Courtesy Zane Van Dusen.

ments into real musical expression." Zevin commented on the ubiquity of switches in the daily lives of many of the children at the school. Even a motion-activated switch had limitations, he mused. It could do many things and was experientially different from a touch-activated switch, but it was limited in the extent to which it could open up the "whole gradient of movement" that children accustomed to switches rarely experience. "We're interested in moving away from grids," he said, and toward "relative movement" to "track more subtle movements and create more sophisticated sounds" (Pask 2010, 188).

By March 2009, a Beta AUMI 2.0 featured "relative movement," a hit for many at Abilities First. As Leaf put it, "the dot just isn't going to work with all the kids."[6] It offered a different user experience for players with small movement range. The sound could respond not only to the crossing over of a line or illustrated piano key, but to variations of small movement. Musical expression was not beholden to a dot or grid. For players with a lot of movement, including wheelchair users who wanted to travel while playing, it offered the benefit of not "losing the dot" (and therefore the sound). Players with low vision need not worry about missed visual cues from the screen. Not everyone liked the sound distortion of

"relative movement," and intentional sound triggering remained desirable and useful, so "relative movement" remained optional. Previous setups were enhanced: percussion sounds were not only available for quarter-screen percussion, but also on a split screen that could be set up with between two and eight grid areas (with a sound in each one).

A pentatonic scale remained prominent on Leaf's wish list, along with the ability to enlarge the instrument on the screen and flexibility to customize other visual aspects. The "guide" or "frame" was width-adjustable, but one could not yet change its height, thickness, or color, or change anything whatsoever about the dot (or "ball").

Throughout this period, Pauline shared her work with AUMI at meetings of the Improvisation, Gender, and the Body (IGB) research group of ICASP, a seven-year research initiative directed by Ajay Heble. Each group was charged with identifying and conducting collaborative research. Pauline felt AUMI would be an excellent IGB project. Although it was clear to the group that AUMI was "a good thing," it took time before members were convinced our skills prepared us to be AUMI "researchers." It is a testament to Pauline's persuasive leadership that so many tentative members became intensely involved.

In February 2009, Gillian (Jill) Siddall, Ellen Waterman, and I committed to the AUMI team within IGB. By the time we visited Kingston that November, DLI had settled into the spacious circa-1917 shirt factory *cum* art space in midtown Kingston at 77 Cornell Street. Pauline planned a rigorous schedule (we understood *how* rigorous after getting "in trouble" taking too much time in a coffee shop the first morning). We visited Abilities First, where Leaf introduced us to student-musicians. We met David Whalen, himself in the midst of developing his sip-and-puff Jamboxx instrument (Oliveros et al. 2011, Braasch, chapter 12).[7] In meetings back at DLI, we pressed Pauline for what she saw as the "research question" of the AUMI Research Project. Emblematically practical and enigmatic, she replied that her "priority" was "for the software to be used" and that how it was used would yield information. She meant this in a local sense—how musicians at Abilities First used it—and a global sense; she wanted it used expansively, to learn from users, and to loop that knowledge into further developments, radiating outward. It was years before I understood the significance of the "U" in AUMI. It was not only an adaptive musical instrument, or AMI, it was a *useful* one, in the broadest sense: to be used immediately, continuously adapting to and being adapted by those who used it. Users would contribute not only to software improvements, but to new knowledge and music.

At one meeting, Pauline announced Zevin's impending departure and the urgent need for new developers to sustain AUMI's "evolutionary" improvements. She shared a resume from an MA student in Florida, a programmer, musician, and electronic musical instrument maker. Serendipitously, this aspiring DLI intern was especially interested in AUMI. Ellen, Jill, and I planned another trip to observe and conduct preliminary interviews at a scheduled Open House at Abilities First in April 2010. While none of us was prepared to offer software development, Ellen suggested that ICASP, with its diverse bank of researchers and resources, might provide a source of technical support.

AUMI Tech from Zevin to Jackie to Ian

In January 2010, sound artist and music technologist Jaclyn (Jackie) Heyen rolled into Kingston on her electric blue Harley to begin her internship as the new DLI technical assistant. Pauline assigned her to the AUMI Research Project. Jackie immediately became an integral team member, contributing to many areas: optimizing AUMI adaptability to individual students, developing AUMI pedagogy, and making technological fixes and recommendations. Along with Leaf, she became a researcher/trainer on best practices for AUMI setup and group improvisation across a range of dis/abilities. Jackie, who knew Pauline as a perpetually cutting-edge electronic composer, was shocked at the humble setup at Abilities First: a donated tablet from RPI, a plug-in external camera, and tiny speakers from Radio Shack. Jackie drew up specs for a more robust system; as a result, Abilities First upgraded to three laptops, each with its own speaker, and a mixer.

As Jackie settled in, Zevin departed for Santa Fe, where he had deep roots in the arts community. He contributed on the programming end long-distance (while completing an MA), but by the summer was phasing himself out of AUMI operations.[8] Jackie—literally a Jackie of all trades—assisted Leaf in weekly jam sessions at Abilities First, handled programming tweaks, made technical notes in dialogue with Pauline and Leaf, and relayed changes for Zevin (also Doug Van Nort, then at RPI, and later Ian Hattwick at McGill) to implement. She helped Leaf develop a manual and offer training sessions far and wide, contributed to AUMI research presentations and publications, and documented activities at Abilities First. The open road beckoned, however, and she prepared the team for the eventuality of her departure and the urgency of pulling in more developers.
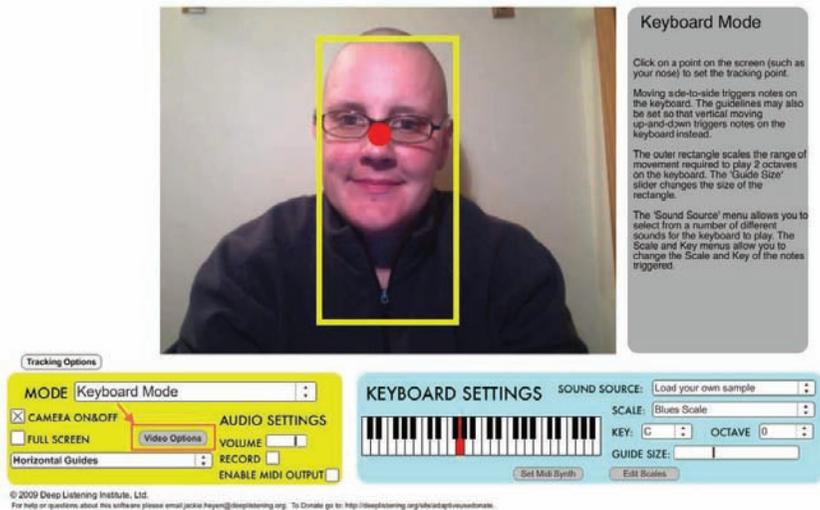
Figure 9.2. Screenshot, Jackie Heyen demonstrating AUMI. Courtesy Jaclyn Heyen.

Pauline reached out to her friend Henry Lowengard and asked him to develop an AUMI playable on iPads and iPhones. As discussed in chapters 10 and 11, this required an entirely new AUMI, due to extreme differences in operating systems.

But developers were still needed for AUMI desktop.

In a fortuitous combination of planning and synchronicity, Eric Lewis joined the IGB and AUMI Research Project in February 2012. Already a key ICASP member and McGill philosophy professor working with the Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT), Eric saw potential for collaboration between CIRMMT and AUMI through ICASP, and, potentially, through a subsequent seven-year grant (IICSI). In this transitional period, Eric hired McGill graduate student Ian Hattwick to work on the next level of AUMI development. Ian inaugurated AUMI Beta 3 (October 2012), which featured significant improvements: a whole screen image, an additional scale (pentatonic), easily changed octaves, more color variations for guide boxes, and an option to flip the keyboard horizontally.[9]

That same month, after two years at DLI, Jackie took off, her Harley now towing a teardrop trailer outfitted with solar panels and attachable tent, and ferrying two chihuahuas, a cat, and a laptop.[10]

The AUMI desktop story continues in the next chapter, as major play-

ers of the McGill years (2012–2019) recount the history of that distinct development period.

Notes

1. The Deep Listening Institute, formerly the Pauline Oliveros Foundation, was an incorporated nonprofit organization until 2015, when it became the Center for Deep Listening at RPI.

2. Lem and Paine's (2011) work on dynamic sonification software, improvisation, and Creative Music Therapy, for example, involved music therapists, programmers, and adults with disabilities working collaboratively. See Leu, chapter 8.

3. Zane Van Dusen, oral history interview with Sherrie Tucker, November 5, 2017, Brooklyn, NY.

4. Phil Mantione, "FrankenCircuit," June 13, 2009, http://philipmantione.com/frankencircuit/, "Pauline Oliveros on December 19 in NY," https://avant-musicnews.com/2007/12/02/, accessed July 21, 2022.

5. Leaf Miller, interview with Sherrie Tucker, Saugerties, New York, December 2017.

6. Miller, interview, December 2017.

7. Sip-and-puff is a category of assistive device for sending signals to a computer without using fingers. Instead of manually typing and clicking, the user sends commands by sipping and puffing air through a straw. For more on Jamboxx, see https://www.jamboxx.com/, accessed June 18, 2022.

8. Minutes, Adapt Use Research Group, July 19, 2010.

9. Minutes, Adapt Use Research Group, November 12, 2012.

10. Minutes, Adapt Use Research Group, August, 20, 2012; Jaclyn Heyen, *Blue Road* http://www.jaclynheyen.com/index.html.

TEN | AUMI Technology Development at McGill (2012–2019)

JOHN SULLIVAN, IVAN FRANCO, IAN HATTWICK,

THOMAS CIUFO, ERIC LEWIS

This chapter begins at a transitional moment in development of AUMI's original format: the desktop application. Chapter 9 covered the years 2007 through 2012, when AUMI development was centered at the Deep Listening Institute (DLI) under the direction of Pauline Oliveros. A new phase of AUMI desktop history began in the overlap year of 2012, still directed by Pauline, but with technical development centered at McGill University under the supervision of Eric Lewis, a philosophy professor and member of the AUMI Research Project and AUMI Consortium. Along with other kinds of determinations, tech decisions continued to be made collaboratively with AUMI researchers with many kinds of expertise and stakes (see table 10.1).

This summary of technical development during the McGill years is based on interviews conducted by John Sullivan with tech team members Ivan Franco, Ian Hattwick, Thomas Ciufo, and Eric Lewis. We discuss how developers strove to ensure that the technology would support the project's overarching goals, reflect on successes and failures along the way, and consider new directions for AUMI instruments. Full audio-recorded interviews and accompanying transcripts, containing the technical team's in-depth recollections and insights, are available online as a chapter supplement.[1]

Table 10.1. Timeline of Technical Team and Development Milestones.

Year(s)	Developer	Location	Role & Milestones
2006–2007	Zane Van Duzen	RPI	Developer, 1st prototype produced
2007–2011	Zevin Polzen	DLI	Developer, VI & 2 releases (Mac only) and updates
2012–2019	Eric Lewis	McGill	Supervisor, McGill joins AUMI Consortium. Supports AUMI desktop development with support of IICSI
2012–2014	Ian Hattwick	McGill	Developer, updates and controller prototypes
2013–present	Thomas Ciufo	Mt. Holyoke	Liaison for technical team, onboarding or new developers
2013–present	Henry Lowengard	Kingston, NY	iOS developer, 1st iOS release in 2013
2013	Aaron Krajeski	McGill	Developer, preparation of v3
2014	Chuck Bronson	McGill	Developer, v3 release (Mac & Windows)
2015–2016	Ivan Franco	McGill	Developer, preparation of v4
2016–2019	John Sullivan	McGill	Developer, v4 release and updates

Transition to McGill

What connected AUMI, DLI, and McGill was the multisited ICASP research initiative. As previously noted, AUMI had been a research focus of the Improvisation, Gender, and the Body (IGB) group, of which Oliveros was a member, since 2009. Eric Lewis, ICASP site coordinator at McGill University, became involved in the AUMI Project in 2011, and in February 2012 joined IGB, founding the AUMI McGill branch of the AUMI Consortium. Eric's McGill affiliations with the Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT) and the Input Devices and Music Interaction Laboratory (IDMIL) afforded a pool of developers and resources and an opportunity to apply for support through a subsequent research initiative called IICSI. Eric offered to sponsor AUMI desktop development at McGill; Pauline and the AUMI team accepted enthusiastically. Eric also set up a long-term pilot site for AUMI at the MacKay Centre School in Montreal, which would provide valuable feedback for the technical team to implement in AUMI development (see Lewis, chapter 29).

2012–2014

In 2012, Ian Hattwick became the first of a steady stream of music technology graduate students at CIRMMT and IDMIL to work on AUMI development. In the transition, Jaclyn Heyen (DLI) communicated changes to be implemented to Ian and also to Doug Van Nort, then at RPI. Along with initiating a beta AUMI 3 (see chapter 9), Ian often updated AUMI 2. Ongoing development focused on optimizing the user interface, accessibility, and other usability improvements, while small but meaningful changes were informed by feedback from AUMI users. Deeper customization options expanded adaptability to a range of user needs. For example, size and color controls for the onscreen grid lines and tracking dot improved usability for individuals with impaired vision or colorblindness.

2013 brought several changes. Pauline invited longtime friend and collaborator, sound artist Thomas Ciufo, to join the AUMI Research Project as a sort of liaison to help bridge technical development across different sites and developers. Between 2012 and 2016, AUMI development was handed over to a new student each year. Given frequent turnover, Thomas provided invaluable continuity, information, and guidance.

Aaron Krajeski undertook development in 2013, working toward release of a major update.[2] Chuck Bronson, who succeeded Aaron, finished and released AUMI 3.0 in March 2014. Like 2.0, it included several updates while remaining functionally similar to the original. This was the first version available for both Windows and Macintosh operating systems.

AUMI *Instruments*

Although AUMI is commonly referenced in singular form (Adaptive Use Musical Instrument), Pauline specified it was Adaptive Use *Musical Instruments*. This reinforces a central theme: AUMI is a host of different approaches, ideas, and even instruments that can support participation in musicking by people of all abilities. This multiplicity is never lost on developers of AUMI's various forms: desktop applications for personal computers, a separate iOS version for iPad and iPhone, AUMI Sings, an iOS application for inclusive choral practice, the forthcoming AUMI Together browser-based version, and a variety of prototypes, one-offs, and field tests that have come and gone throughout the many years of AUMI research (see Lowengard, chapter 11, and Waterman et al., chapter 23).

AUMI for iOS (for iPads and iPhones)

In 2013, Henry Lowengard prototyped and released AUMI for iOS to run on iPad and iPhone. This version is based on the same functional concept as the desktop application, where movement captured on a device's camera is mapped to the triggering and modulation of sound output. While the desktop and iOS versions share the same DNA, they have largely developed independently and diverge in terms of features and user interface (see Lowengard, chapter 11.)

Introduction of a tablet-based AUMI marked an important evolution in the way AUMI could be deployed. Most importantly, this made AUMI much more portable. For example, therapists, educators, and other practitioners who move among classrooms, schools, or other locations can easily arrive with several iPads and quickly set them up. To achieve the same mobility using the desktop application on computers would require prior AUMI download and setup at each location, or for the practitioner to carry and maintain several laptops, which would be more expensive and time-consuming. To aid rapid setup of the tablet-based AUMI, an important feature of the iOS application was its capability to add user profiles to save and recall various user settings. This feature would be added in a later desktop version.

A Brand-New AUMI Desktop (2015–2017)

Between 2014 and 2015, Pauline was closing DLI as a nonprofit and finding new homes for its various projects. AUMI headquarters moved to RPI's Center for Cognition, Communication, and Culture (see Braasch, chapter 12). The arrangement, however, did not include technical development. Fortunately, Eric's commitment to support AUMI developers at McGill extended through the IICSI grant period (2019).

In 2015, Ivan Franco took over development of the desktop application. While continuous updates had been made since AUMI's very first version, the interface and overall look and feel of the software hadn't been significantly altered. Similarly, the application code, written in Max, had been passed from one developer to another, maintained, improved, and added to, yet had not been fundamentally redrawn or reconceptualized. Rather than continue to build on the many layers of existing development, Ivan proposed a new AUMI from the ground up. This would leverage best practices for accessibility and user interface design based on current theories and methods of human-computer interaction

(HCI), an interdisciplinary field focused on designing computer technology and interactions between humans and computers.

A preliminary version of the new AUMI desktop app was completed in 2016. It was still written in Max, chosen largely for its familiarity and widespread use by the music technology research community (and thus optimal for future development by graduate student researchers within AUMI's ecosystem). The new AUMI featured a unified user interface containing color-coded sections, organized menus, and in-application help screens along with updated tracking performance. Most importantly, Ivan's design concept encapsulated functionality into modules of two types. Interaction modules determine the types and directions of movements that trigger sound events. Their output signals are mapped to sound modules that determine types of sounds (instruments or other sound libraries), pitch or sample selections, and other audio parameters. A basic proposition for this modular approach was that it would allow for ongoing development of new modules. By adopting the same messaging protocol between interaction and sound blocks, new functionality could easily be added and remain interoperable with other pre-existing modules.

Development was handed over to John Sullivan in fall 2016. After beta testing and completion of several features, it was released as version 4.0 in 2017. One important new feature was a full system for presets that allowed for saving, recalling, importing, and exporting full application settings for individuals and groups of users, based on the iOS version's successful functionality.

Later History (2018–2019)

Since the 4.0 release and through early 2020, regular updates continued to maintain the application's functionality on Macintosh and Windows operating systems. It has also served as a test bed of sorts, with different experimental modules being developed to test different scenarios. For example, a module was created that could use a haptic interface as a controller in place of the camera-based input modality.[3]

As time passed, the iOS version outpaced use of the desktop application, thanks in no small part to its enthusiastic ongoing development by Henry Lowengard, who continuously introduces unique features and releases frequent updates (see Lowengard, chapter 11). But perhaps the most vital contrast is the quick setup and ease of use that has made the iOS version eminently more practical in most real-world applications

(in areas where iPads are common). Still, the desktop application offers several benefits and remains useful for various situations. For one, it is designed to run efficiently on a wide range of personal computers, especially those with older operating systems or smaller memory capabilities. This makes it especially suitable for use in geographical and socioeconomic contexts where older computers may be more commonplace and available than iPads.

Another strength of the desktop application is its potential for testing and experimentation, as illustrated with the haptic interface module described above. That AUMI is developed in the Max programming language is especially helpful. For one, Max is well-known within the academic/research/arts communities around which its development occurs. For another, the visual paradigm of Max allows new developers to easily examine and understand how the application is built and to edit or extend the application as desired. Over the years of AUMI, several prototypes have been developed for and with the AUMI framework. One such experiment produced an eye-tracking prototype that could facilitate nonverbal communication. While commercial eye trackers may cost thousands of dollars, this prototype offered a free proof-of-concept device that would leverage an existing computer, web camera, and customized AUMI software.

Looking Forward

At the time of writing, the desktop application is "on pause" as we emphasize browser-based development. On one hand, there remains a demonstrated need for a computer-based AUMI. On the other, there are technical and practical hurdles to keep the desktop application viable. On the technical side, a primary concern comes with development in Max. While Max provides a "low entry fee" for new developers to work on it, it is less optimized as a basis for full-fledged computer application. Given Max's primary orientation as a language for creative audio and multimedia work, certain standard development tasks (such as compiling AUMI software as stand-alone applications for MacOS and Windows operating systems) are much more difficult than with a general programming language like Java or C++.[4] Regular operating system updates also come with new security features such as more sophisticated code signing and application validation measures that require reworking of certain parts of the app, especially around integration with a computer's peripherals (such as the camera and sound card) and file system access.

On the practical side, continued development of an AUMI desktop application requires a stream of developers to maintain it. The AUMI Project is shared across a consortium of several different university and community groups. Resources, personnel, and funding streams, as well as research directions and needs, are ever changing. Between the success of the iOS version and limited use of the desktop application, its active development awaits a time when research aims, needs, and personnel are aligned.

In June 2020, members of the AUMI research community gathered to discuss "AUMI Futures." We highlight two ideas that echoed throughout the interviews for this chapter.

A Web-Based AUMI

Over the years, tech team members discussed potential benefits and pitfalls of a browser-based AUMI. A web application removes some problematic aspects of developing and maintaining stand-alone apps. There is no need to create OS-specific versions requiring their own specific tweaks and configurations. Application is made relatively simple with several pre-existing web technologies and libraries that can handle basic building blocks of AUMI like use of a computer's camera; synthesis, playback, and manipulation of audio content; real-time video and graphic rendering in the browser; and computer vision. Potential upsides for users include the ability to run AUMI on any relatively modern internet-connected computer, tablet, or smartphone without downloading and installing an application.

Potential pitfalls were considered and addressed. One advantage of the desktop platform is that it can run on relatively old computers and without the need for an internet connection. Running AUMI in a browser leverages newer specifications for things like audio manipulation and real-time interactivity that wouldn't be possible on an older computer or web browser. Designing and maintaining such an app would also require individuals with web development capabilities. Historically, the AUMI desktop app has been developed by graduate students doing research in music and media arts, where proficiency with Max is commonplace. This is changing. In the last several years web frameworks and libraries for core AUMI functionality like computer vision and manipulating audio within a browser have become more widely available and accessible.

At the time of writing, Henry is working on our first browser-based AUMI, supported by a grant from the Craig H. Nielsen Foundation

through RPI (see Lowengard, chapter 11). Design decisions are informed by Henry's years on the AUMI tech team and in collaboration with the AUMI Research Group. For example, in response to concerns about internet access as a requirement for an instrument that aims for accessibility, Henry is designing the app so it can

> also run "off-line" as a "Progressive Web App." PWAs run out of browser caches and don't need to be connected to the internet except to load up initially, and in AUMI's case, to load up the instruments" [email from Lowengard, July 2, 2022].

So long as sounds are in the browser cache, they can be played while offline. To keep up with this project, see http://aumiapp.com/aumitogether.php.

Physical Interfaces

Another interesting prospect for future development builds on the desktop application's modular approach. AUMI functions in a relatively simple way: a user's tracked movement is displayed on a screen superimposed with gridlines, which trigger sounds when they are crossed. While this model is appropriate for many, it relies heavily on visual feedback and explicit motor control, potentially excluding users with vision impairment or involuntary movement. The beauty of the modular approach is the opportunity to develop different types of interfaces for different users. Extending this concept, it is common for some AUMI users to use physical assistive devices already: wheelchairs, alternative communication devices, haptic interfaces, text-to-speech readers, etc. Given the ubiquity and relative achievability of building simple hardware interfaces with basic sensors like switches, buttons, bend sensors, accelerometers, etc., it is an enticing prospect to develop a core AUMI device that could be fitted with different types of physical input devices that could be quickly customized for a user's particular needs.

Conclusion

At the time of writing, the AUMI Project is fifteen years old. AUMI, the desktop musical instrument, has changed, grown, and now paused. At its core, however, it is still a relatively simple—if ingenious—tool. Development and maintenance of the technology is but a small part of

the overall project. As illustrated throughout this book, AUMI instruments are nothing without the people around them: the teachers, the therapists, the organizers, the researchers, and most importantly the music makers.

Acknowledgments

Notes

1. http://idmil.org/education/aumi-book/.

2. Ian remained involved with AUMI through 2014, though less directly involved with the release software. He conducted exploratory research to develop proof-of-concept physical interfaces that could interact with the AUMI system. These experiments helped spur interest and provide preliminary data toward the possibility of creating bespoke devices discussed later in the chapter.

3. http://idmil.org/project/max-module-for-ultrahaptics-hardware/.

4. Applications built with Max are typically run inside the Max IDE; compiling them as a stand-alone application is an additional, frequently problematic step.

ELEVEN | How Adaptive, How Useful?

Technological Design Solutions in AUMI for iOS

HENRY LOWENGARD

AUMI had been running on desktop computers for many years when Dr. Pauline Oliveros contacted me in 2011 about creating a version for iPads and iPhones. She was familiar with my use of computers for making musical works since I participated in annual Dream Festivals at Deep Listening Space in Kingston in 2004–2005. For those performances, I used software instruments I had written on Commodore Amiga.[1] I started developing and releasing iPhone apps when the Apple App Store opened in 2008. She had used one of my droning iOS apps, SrutiBox, in a composition called DroniPhonia in 2009.

I had no prior experience developing apps for adaptive use. Software for the desktop AUMI version couldn't be used on iOS,[2] so I was given a blank slate. The only things taken from the desktop version were some sounds and scales.

The app needed to solve unusual design criteria to adapt to users' abilities and to be useful in groups or isolation. From a design standpoint that meant figuring out how to make it adaptable and how to make it useful, but also questions of *how* adaptable and *how* useful, and what that meant for different users.

I developed and continue to maintain and enhance AUMI's iOS version. Most design features I describe pertain to AUMI for iOS. Some are also available in the desktop application.

Figure 11.1. AUMI iOS developer Henry Lowengard.

Design Goals

AUMI can be controlled by detecting small movements in a video image. Its other main design goal is to accommodate use in institutionally run group improvisations. I summarize, then elaborate on, design implications:

- The app will often be on several devices maintained by an institution running the improvising group. Players might not be associated with specific devices.
- Players may only be capable of moving small parts of their bodies.
- The interface should not be complicated or distracting. High contrast for players with visual impairment is necessary.
- If used in clinical contexts such as musical or occupational therapy, statistics on a player's usage might need to be captured to help track progress over time.
- There is usually only a short time available for the group to play. Therefore, AUMI should not need much prior configuration.
- AUMI's sounds should be customizable by an ensemble and individuals.
- A wide range of sounds (not limited to music) is desirable.
- Capacity to add sounds is important.

- Layout should allow for customization.
- AUMI should compensate for high latency and inaccurate motion tracking.
- Privacy and legal concerns are paramount in some communities of AUMI use.

What follows is examination of these objectives and how AUMI for iOS approaches solutions.

The app will often be on several devices maintained by an institution running the improvising group. Players might not be associated with specific devices.

Not having control over which devices are assigned to which players influences design solutions for how quickly the device can be set up for a player in an environment. Investing time to make sure the room's light is good enough to illuminate player movements is crucial. Players may prefer to play software instruments with sound areas presented in a particular size, color, and layout. These can be saved and recalled for a particular device. Saved setups can be shared in several ways: iCloud or other networked storage and AUMI's own listening/sending technology, detailed below.

Another issue is that devices may have been purchased some time ago and not updated. AUMI can run on iOS devices starting with iOS 9.3 (released 2016), used on devices dating to 2012. Institutions can use a shared Apple account to install AUMI on several devices. This also makes it easy to install software updates automatically.

It's not necessary for players to use the same device each time. In cases where setups and logging for a specific player may be needed on a particular device, that information can be entered manually or transmitted.

Players may only be capable of moving small parts of their bodies.

The device running AUMI for iOS is often secured to a table or stand while the player is in a wheelchair. This may further constrain the movement a player can express. AUMI can choose different camera resolutions and zoom in to capture the player's movement. It can also be set up across the room to capture large-scale dance movement. The video motion tracking algorithm and its sensitivity can be adjusted to fit those needs, and the size of the sound boxes reduced so that small movement makes a larger difference. There is also a parameter called "multiply,"

which means small video movement is multiplied into a larger cursor movement.

AUMI's motion tracker does not care what moves. It makes no attempt to recognize body parts. The motion tracker tracks "features" of the image: high-contrast edges and corners. To help see the interaction between what the video motion tracker is actually tracking as opposed to what it *seems* to be tracking, AUMI can turn on a visualization of features in the image that are being tracked by the tracking algorithm. For instance, a visually contrasty background like patterns on wallpaper might interest AUMI's motion tracker even though nothing is moving there. In that case, masking the background or increasing the number of features will help it find lower-contrast parts of the image that actually are moving.

Although AUMI's face tracker can recognize and track the position of a face, in many cases it is less flexible than the motion tracker. Recognizing a face due to turning the head, bibs, respirators, helmets, and other headgear may be difficult. But in situations where it works, it works well!

AUMI has a color tracker that looks for pixels close to a selected color and puts the cursor on the centroid of the largest cluster of those colors. Tolerance range for the color can be adjusted and saved. The color tracker is fast and can easily and accurately track a brightly colored hat, sticker, or button.

Since the area of a color-tracked object is available, a correlation between the area and the distance to the camera can be made. Thus a crude kind of ranging is available, and the distance tracker takes advantage of this by using distance to position the cursor instead of the usual "Y" axis. This enables AUMI to detect back and forth "rocking" motion.

The interface should not be complicated or distracting. High contrast for players with visual impairment is necessary.

It is important to keep user interface menus simple and organized. Choices for virtual instruments are organized in sections and given icons to assist people who do not read. The play screen can be put in a "full screen" mode where only the video, cursor, and sound boxes appear onscreen. One can suppress the video image, which may distract or disturb some users.

The color and size of the cursor and sound boxes can be changed to enhance contrast and visibility. In some situations, providing many

sound choices works; other situations benefit from simplicity and clarity of just one or two choices.

An optional mode activates sounds by relative movement instead of absolute location. With this, any movement can play sounds without specifically moving the cursor.

If used in clinical contexts such as musical or occupational therapy, statistics on a player's usage might need to be captured to help track progress over time.

AUMI has an optionally enabled logging system using industry standard CSV files to keep track of how it is used. Log files can be reviewed and exported easily, then sent to other apps running on the iPad or transferred to programs on other devices using email or messaging. These log records are customizable with identifying meta-information in case several different programs, administrators, or players are using the device. This information should not be associated with particular players unless permission has been granted.[3]

There is usually only a short time available for the group to play. Therefore, AUMI should not need much prior configuration.

Large AUMI groups require quick setup time. Configuring each device individually takes time away from music-making parts of a session. AUMI has a feature allowing devices to listen for setups from another copy of AUMI under an administrator's control. The sending copy can send previously configured setups to up to seven listening devices that are within range. This means the devices can change their setups even in the midst of improvisation without manual configuration.

Other features of AUMI allow it to be used by people who cannot configure it themselves. For example, the cursor can be easily repositioned by tapping the screen, but some players cannot do this. Motion tracker cursors tend to drift; the cursor can end up stuck on the side of the screen. In this case, if the cursor is stuck for two seconds, it automatically repositions at the center of the screen.

AUMI's sounds should be customizable by an ensemble and individuals.

Sounds built into AUMI are customizable to better fit into improvisation. Some players need sounds to be shorter or to not overlap. Duration can be changed so that sounds don't linger and distract from making the

next sound. An optional monophonic mode allows one sound at a time.

Some AUMI instruments are configured as loops, which are always playing, but mixed together depending on how close the cursor is to a sound box associated with the loop. If the loops are all the same length and in the same key, limited movement can be used to cue a part of a piece of music in an ensemble piece.

A wide range of sounds (not limited to music) is desirable.

AUMI comes with many sounds, musical instruments, and voices, but also percussive noises, musical phrases, synthesizer blips, marsh noises, animals, and other noninstrumental sounds.

AUMI provides different ways to control its sounds. Usually, a sound plays when the cursor enters a box on the screen. Boxes can be laid out in horizontal or vertical rows in a grid of rectangles and in a circular pattern.

Melodic sounds can be selected using a variety of scales. Some are designed so an ensemble can play different parts of the same scale and blend harmoniously. Some scales are just simple chord voicings.

Percussive sounds can be laid out the same as melodic sounds, but without scales. They can be manually put in a specific order and spaced out with silence or duplicated to make specific patterns. Percussive sounds also include abstract, environmental, music ensemble, and animal sounds.

AUMI also has looping sounds. These are controlled much like a mixing console. Some loops are the same length and thus are synchronized and designed so their sounds blend. Others are more free-form and abstract.

AUMI can greatly expand the palette of available sounds by sending MIDI data to a synthesizer running on the same device or externally. This opens many sonic possibilities. When running monophonically, AUMI treats entry and exit from a sound box as MIDI Note On and Note Off events, respectively. This means a note can be sustained, which is something AUMI's sound engine doesn't do. MIDI can also be used to control lights or other devices: for example, servo motors, which can play physical drums![4]

Capacity to add sounds is important.

In some situations, the player might want to play a preferred sound or song. AUMI allows external audio to be loaded and treated as an instru-

ment. The current version as of this writing, 2.1.0, makes this easier by allowing AUMI to be a destination for sharing options in other iOS apps. Sounds can be grouped into instruments by using naming conventions. Melodic and percussive instruments are distinguished through other naming conventions.

AUMI can also load in sets of curated sounds as an AUMI instrument from a web page or as an attachment in a message. "AUMIinst" files greatly expand the AUMI's audio resources without filling the app up with bundled sound sets that might not be needed. Custom instrument sounds can be removed by using an option in the interface.

Layout should allow for customization.

There can be many constraints on improvised performance. AUMI has several ways to make interesting musical choices despite its trackers' limitations. AUMI instruments set the maximum number of notes available in boxes on the screen. There can be dozens of sounds or just one or two. In some situations, a limited number of choices more closely matches the improvisation's intent.

AUMI provides several sound box layouts to allow different kinds of improvised choices. With melodic instruments, sound boxes correspond to notes taken from a set of scales, some of which are unusually structured. The sound boxes can be arranged horizontally (left to right or right to left), or vertically (top to bottom or bottom to top). In these cases, notes tend to be chosen in sequence. Another arrangement puts the sound boxes in a grid where adjacent notes are somewhat related. This makes it easier to jump to nonadjacent notes. A circular layout extends this so that any sound box can be selected in any order.

With nonmelodic instruments, available sounds can be rearranged to correspond to sound boxes they represent.

AUMI should compensate for high latency and inaccurate motion tracking.

Motion tracking is no trivial task. Larger images take more processing time, causing more latency between the time of the motion and resulting sound. The more data to process, the longer the latency. AUMI can zoom in on the center of an image, which will consequently have less data to process and therefore lower latency. The motion tracker's accuracy benefits from a fast video frame rate, since the frames will differ less, which makes the search for moving "features" faster. More powerful devices may have no problem using higher-resolution video. Even the

fastest image processing, however, is subject to musical timing inaccuracy due to limitations of the video frame rate itself.

To address these issues, AUMI provides a time quantization queue so that choices for a new sound can be scheduled to be played at a regular interval. This means a player can intend to select a sound box and until the next beat occurs, other sound boxes' entrances and exits are ignored. Although the timing is not synchronized between devices running AUMI, if a number of devices are all configured with the same number of beats per minute, the devices will play at a consistent offset in time, which is also musically useful.

A consequence of using a scheduler is that a cursor entering a sound box can be interpreted in several ways. There are options to turn a single event into a note that echoes or a short sequence of notes, for example, a mordent or a random walk. An event can also schedule a chord or short arpeggio. This is another way for a little bit of movement to generate many musical events.

Privacy and legal concerns are paramount in some communities of AUMI use.

Because AUMI is often used in schools and in clinical situations for music and physical therapy, and because it uses a camera and data logging, there are privacy concerns. Many players are children, which raises additional privacy concerns. With version 2.1.0, AUMI addresses these concerns in several ways.

AUMI sends no information to data-collecting servers. Logs must be explicitly enabled. When they are, a message indicating logging is presented onscreen. Although names of players and other meta-information can be associated with saved setups and logs, there is no obligation to do so. Associating data with particular players should be cleared by whoever is in charge of the AUMI session.

Institutions maintaining several iOS devices have already sunk costs in these devices and in specialized software for students or clients. AUMI for iOS started with a small fee but soon became a free app, which removes any monetary obstacle from administrative acquisition.

Summary

AUMI development is continuous. AUMI for iOS is surprisingly adaptable for situations beyond its intended use. From time to time, feature requests come in. These are often easy to develop and include in-

program updates. More details about AUMI's operation and tips and examples of usage appear in AUMI's documentation, included in the app itself and online at http://aumiapp.com. Online documentation should be treated as the most accurately edited version.

Questions about AUMI can be sent to info@aumiapp.com.

Editorial Collective Note

As we go to press, Henry continues to improve AUMI for iOS. Currently he is working to make it more inviting "right out of the box" for those who have never played it. He is also at work on a browser-based version called AUMI Together, supported by a grant from the Craig H. Nielsen Foundation. Moving to browser-based AUMI ensures the same program will work on many devices, simplifying updates and maintenance and improving virtual AUMI collaboration. As he writes on the AUMI website:

> Over the years, AUMI has proved a useful tool for allowing people to improvise music together in groups whatever their abilities. But now as people are more isolated, there's a need for AUMI players to play together telematically. It's appropriate that Dr. Oliveros was passionate about both AUMI and telematic performances!

> Henry Lowengard, "AUMI Together," http://aumiapp.com/aumitogether.php, accessed June 18, 2022.

Notes

1. For more on these programs, see http://www.echonyc.com/~jhhl/software.html.

2. iOS is an operating system for Apple iPhones and iPads. Apple, iPad, and iPhone are trademarks of Apple Inc., registered in the United States and other countries.

3. There is a privacy policy to help resolve these issues.

4. Jesse Stewart uses this technique with AUMI-controlled solenoid strikers (chapter 21).

| Pauline's World of Virtuosos

*Expanded Instruments, Deep Listening, and
Stretched Boundaries*

JONAS BRAASCH

Pauline Oliveros defined "virtuoso" differently than most people. For Pauline, a virtuoso is someone who carefully listens with other musicians to the sonic environment and uses this insight to spontaneously adapt to many musical scenarios, bringing an innovative voice to an ensemble. This chapter describes a series of projects at Rensselaer Polytechnic Institute (RPI) centering around this kind of virtuosity in musicianship across abilities. Our late colleague started this initiative with AUMI in 2007. Pauline understood she could learn from people with severely restricted mobility to efficiently control more musical parameters than was possible at that time with her accordion synthesizer interface and her foot pedals. With the help of student programmer Zane Van Dusen, she was able to design the AUMI to track the nose of a musician to play melodies via a camera capture using a Max/MSP patch (Van Dusen, chapter 2).

Subsequently, our group became interested in the cultural implications of not only using adaptive instruments but considering unique backgrounds of some of our collaborators with severe mobility restrictions. With a grant from the National Science Foundation to build a musical agent, we realized we could use similar technology to design an instrument to code acoustical sound into vibrations that could be felt with the finger. Supported by an RPI seed grant, we built this instrument with Deborah Egloff and Doug van Nort. In 2011, the grant also

allowed us to organize a concert that we called Stretched Boundaries. The concert featured the work of Christine Sun Kim, Clara Tomaz, David Whalen, Neil Rolnick, and other artists of many abilities. In 2013, we started the International Symposium on Assistive Technology in Music and Art (ISATMA), supported by the Christopher and Dana Reeve Foundation and the Craig H. Neilsen Foundation. Our work in telematic music became an essential part of ISATMA to engage artists with limited mobility.

This chapter provides a historical and technical overview, as well as insight into Pauline's Deep Listening® philosophy in the context of our work with communities across abilities. Given the diverse backgrounds, sonic interests, and varying technical abilities of our collaborators, we found ourselves in Pauline's World of Virtuosos, a world her colleagues at RPI continue to inhabit, explore, and listen to.

On the Way

One sunny December day, Pauline and I were cruising along the Northway in my old Buick, en route to Montreal for the International Conference on Auditory Display (ICAD), when she explained to me the AUMI concept: "If we can find a way to help the most marginalized people to play a musical instrument, I can use this technology to expand the parameters vastly I can control with my electronic instruments."

By then, Pauline's innovations in electronic music were so impactful that the *New York Times* listed her as one of the godmothers of electronic music (Smith 2012). As part of her practice, Pauline was interested in controlling musical parameters in real-time ergonomically long before the field of human/computer interaction (HCI) emerged. In her seminal work "Bye Bye Butterfly" (1965), she controlled the frequencies of two Hewlett Packard oscillators by hand to create harmonics that interfered with each other in a musically meaningful way. The piece also involved a record player and tape delays, performed live and recorded on tape. Like many of her peers, she used tape machines extensively to create her work, making use of tape delays, loops, and other techniques. Even then, Pauline was concerned about the live control of multiple music parameters, a problem not possessed by many of her contemporaries who worked by splicing and reassembling tape. Later, when she moved on to digital systems and computers, she often used new technologies to substitute for analog devices to maintain her creative concepts. One of her favorite tools was the Lexicon PCM 42 delay processor (Winston

2012), which simulates the tape delay effects achievable with manipulated or multiple tape machines (Oliveros 2004).

Later, Pauline used computers to create her work. She was a devoted user of the popular Max/MSP[1] environment. In this software package, visual objects, representing audio devices or algorithms, can be patched together like modular analog synthesizers to create unique sounds and complex sonic environments. This led to the development of her Expanded Instrument System (EIS) shown in figure 12.1 (see Gamper and Oliveros 1998; Stiles 2005). The idea of EIS was to expand musical instruments, in particular her primary instrument, the accordion. Pauline felt that the accordion had severe limitations for her music, most notably its inability to modulate pitch on a microtonal scale. Consequently, the software implementation of her must-have Lexicon Delay was a central unit in EIS (see bottom-left "[lexicon-1]" and "[lexicon-2]" units in figure 12.1). Other important elements of EIS are random event generators, further delay lines, and sound spatialization algorithms (Pulkki 1997; Braasch, Peters, and Valente 2008). The random sound generators were extremely important for EIS—implemented in the "[delays-1]" and "[delays-2]" units shown in figure 12.1—because they added aleatoric elements that made the outcome of a performance unpredictable—something Pauline cared about. Full, direct control was never Pauline's main objective; this is important to keep in mind when discussing AUMI. Since Pauline needed both hands to play her accordion, she mainly operated EIS through a set of foot pedals, as depicted in figure 12.2. The pedal could be patched freely to any EIS parameter. She often used it to control the Lexicon units.

The concept for playing AUMI was fundamentally different. A camera tracking system is used to operate the musical parameter space, for example, to select and play a sound. This allows users with severe mobility restrictions to play music using small movements.

Pauline's long friendship and intellectual exchange with lawyer and entrepreneur David Whalen was also important for the initial development of AUMI. David had developed quadriplegia after a skiing accident in 1981. Years after he became paralyzed, the advent of new computing technologies raised David's desire to perform a musical instrument and paint electronically.

In 2005, David got in touch with Ruud van der Wel, a Dutch respiratory therapist at Rijndam Rehabilitation Institute in Rotterdam, Netherlands, and founder of My Breath My Music Foundation.[2] They collaborated on the design of the Magic Flute, a hands-free instrument
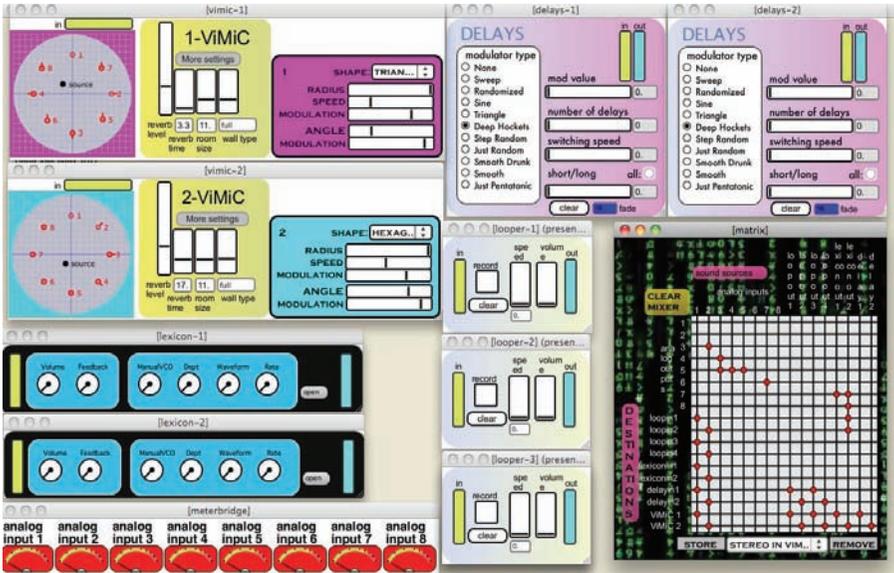
Figure 12.1. Screenshot of the EIS system with ViMiC spatialization units.

Figure 12.2. Pauline Oliveros performing with her EIS system for a telematic video demo (together with Doug Van Nort).

that senses the angular position of the mouthpiece using an internal gyroscope and converts these data to the pitch of notes. The volume is controlled by the breath of the player.

David then moved to work on his own device, the Jamboxx, also entirely head-controlled. The Jamboxx is a "sip-and-puff" instrument, where positive and negative wind pressure is sensed to control electronic devices. The Jamboxx mouthpiece can be slid sideways, and thus the controller resembles the function of a harmonica. The Jamboxx can also be rotated around its horizontal axis, providing a third parameter dimension. The Jamboxx can be used as a substitute for the computer mouse to control the cursor, where the slider moves the cursor left and right, and the tilt motion around the horizontal axis is used to move the cursor up and down. The mouse buttons can be activated with the sip-and-puff sensor. David uses a software application that generates a blue box around his cursor, so he has a finer Jamboxx control within the box. Once the cursor touches the edge of the box, he can use the Jamboxx to move the blue box around. David is one of the most prolific users of speech recognition systems I have witnessed. Using these devices, David is as mobile on a computer as any other professional user.

Pauline and I were always fascinated by David's eye for the essential to make assistive devices perform well and effortlessly over time. From an engineering point of view, it is easy to get distracted adding features and dimensions, but David knew that this is all worthless if you cannot operate the device over extended periods. Using the Jamboxx, David is able to create delicate digital paintings and play musical instruments (figure 12.3).

In many ways, AUMI is similar to the Magic Flute and the Jamboxx. All three are head-centered controllers that do not require the use of hands or feet. Unlike the Jamboxx or the Magic Flute, however, AUMI does not simulate a wind instrument.

Coteaching with Pauline

From 2007 to 2012, I had the opportunity to coteach Pauline's graduate seminars. Her class worked as an art collective, where ideas were discussed in a nonhierarchical way. Most importantly, by listening, Pauline provided the intellectual space for students to form their own artistic concepts. Pauline advised her students to form communities rather than make careers. Her student ensemble Tintinnabulate ("Tintin," for short) was a community where students could develop, share, and pres-
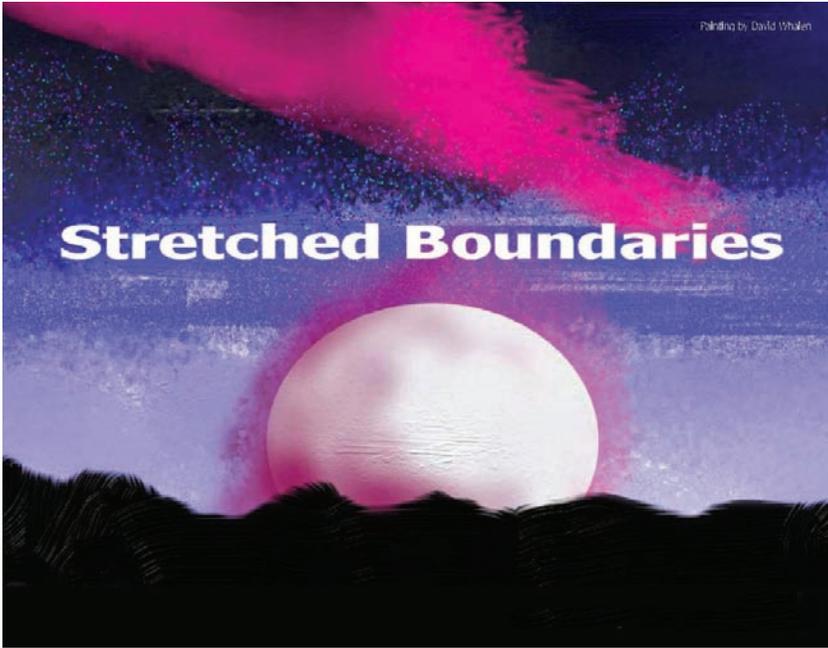
Figure 12.3. Poster for the First Stretched Boundaries concert (cover art by David Whalen).

ent ideas. In many ways, Pauline's approach to the AUMI Project was consistent with her general community-based approach. Pauline was keen to improve her capacity to control electronic music parameters while playing accordion, and she realized that she would find like-minded people among individuals with severe mobility restrictions, who had already spent much time and effort to find creative solutions to address similar projects.

On Judgments

Pauline's position on musical judgments is debated extensively. Some believe that Pauline's creative work was nonjudgmental (e.g., Osborne 2001). According to my personal experience, aesthetic and programmatic judgments were part of her work (Braasch 2019, 47–48). She just didn't adhere to a given set of rules or adapt to rules of existing genres. It is important to remember that Pauline grew up with her mother in rural Texas during the Great Depression. She must have realized early

on that the contemporary societal conventions—especially those geared toward clear gender expectations—did not align well with her own needs and beliefs. Another seminal experience was the composition class she attended at San Francisco State College with Terry Riley, Loren Rush, and others.[3] During ensemble rehearsals, she and her friends were disappointed that their radical ideas of New Music were not considered, so they played their own music after official practices, defining the future careers of all members of this small, self-organized community.[4]

In her Deep Listening® practice (Oliveros 1990a, 2005), Pauline encouraged participants to suspend their trained conventions and expectations, for example, by performing whimsical pieces, such as "Horse Sings From Cloud" (1977) or "King Kong Sing-A-Long" (1977) (Oliveros 1990a, 21, 24). There are two steps to Pauline's practice of unconventional or self-declared judgments. First, participants must remove themselves from societal expectations by engaging in a nonjudgmental practice. Pauline often used elements of silliness to help participants achieve this. In the second, equally important step, participants must replace the void left by rejected conventional value systems with a personal value system. Without this second step, it appears as a nonjudgmental practice. Pauline was not one to define her work through doctrines. She was a master of embodiment and tacit knowledge, where everything was discussed and negotiated through listening and performing music. Important to her value system was that everybody got space to listen and be listened to. She could get upset if someone completely filled this valued space, making it impossible for others to communicate through listening. She told a story about getting so fed up by her faculty colleagues at the University of California San Diego that she jumped on the table, flapped her arms like wings, and imitated the sounds of a cock before leaving the meeting. This was clearly not the outcome of a nonjudgmental process. I believe Pauline's alternative approach to traditional judgments greatly benefited AUMI's success.

In the beginning, I wondered why she would refer to the intended user group for AUMI as the "most marginalized people." The expression seemed antiquated to me. It took me a while to connect this to her own early career experience of feeling marginalized at times. She once told me that I could not understand how offensive it was for her as an expert in the 1950s to be frequently approached by male colleagues, who knew little about electronic music and the use of specific devices, grandiosely offering a tutorial on systems she knew by heart. At the time, the social system did not support Pauline and her peers.

About Virtuosos

Pauline's definition of good musicianship was largely based on some-one's listening skills, especially their willingness to listen to others and the environment. One day, Pauline was moved by a concert by children with severe mobility restrictions and other impairments at Abilities First School, conducted by Leaf Miller. She was deeply touched by see-ing the parents witness their children doing things they never imag-ined they could do. Leaf's ability to listen to the children, to under-stand their needs and abilities, and form a mesmerizing performance was what Pauline saw as virtuosity. Driving back from a residency at the Dunrobin Sonic Gym, Pauline said that Jesse Stewart met her defi-nition of a virtuoso, because he could adapt and perform with any-body. Indeed, Jesse's performance always brings the best out of his fellow musicians, whether he is performing with a senior citizen who has dementia or with world-renowned musicians like George Lewis or Pauline Oliveros. Both Jesse and Pauline believed that making music was a fundamental human right and must not be restricted to a select group of people. In many ways, listening was more critical for Pauline than acting. Listening enables a community to find balance in every-body's needs, desires, and abilities, not only within a music perfor-mance but for life in general. Often, listening renders unnecessary a verbal debate.

In 2012, Stan Chung (2015), a dean and scholar, visited our Ensemble recording with our Trio Triple Point[5] to better understand Pauline's art practice for his doctoral thesis. Stan's background was in theatre studies, and he was stunned that we never discussed musical ideas verbally during our session. It cracked him up that we would debate a lot of technical issues like noisy microphones and a better sound monitoring system. It is also important to highlight that Pauline's Deep Listening® philosophy offered an inclusive approach to society that considers members who do not hear or speak in conventional ways. Pauline's definition of brilliant listening skills was tied to social attitude and willingness to explore the unknown rather than attributes an audiologist would pay attention to.

In 2011, Pauline became familiar with Christine Sun Kim's work and invited her for a concert with Tintinnabulate. Christine, who was born Deaf, graduated in Bard College's Audio Program and had a sensational approach to sound, an approach that opens insights into what sound is. At Bard, Christine showed us her new sound installation: empty one-gallon milk bottles were mounted near loudspeakers to actuate them,

resulting in a vibrational haptic/sound experience. Christine's work is proof that one can be an excellent "listener" while being Deaf.[6]

In her 1970 article "And Don't Call Them 'Lady' Composers," Pauline asserts, "Women composers are very often dismissed as minor or light weight talents on the basis of one work by critics who have never examined their scores or waited for later developments. [. . .] Critics can quit being cute and start studying scores" (Oliveros 1970). Nearly half a century later, Christine Sun Kim raises similar awareness issues about people judging her based on her deafness. In an interview, she told *Guardian*'s Tim Auld (2015) she does not want to be labeled "a disabled artist. That's not what I'm about. I want to focus on my art, not on the fact that I am deaf." Aside from greatly valuing Christine's work as an artist, Pauline appreciated that Christine raises awareness for artists with disabilities in a similar way she fought for women's rights. Both are necessary to create the "equalitarian atmosphere" (Oliveros 1970). Further, in an interview with John Rockwell (1980), Pauline expressed her affinity with Buddhism, because she believed "everyone [should be] dedicated to the welfare of all sentient beings." This explains pretty much the essence of her artwork and her support for AUMI.

Stretched Boundaries Concerts

We were increasingly focused on how to create opportunities for artists of all abilities to create together. Pauline didn't draw boundaries between creative music and music therapy, as she found it to be an artificial division. Our discussions resulted in a series of two concerts in 2011 called Stretched Boundaries. As usual, Pauline kept the boundaries between her projects fluid, and so we found ourselves organizing the Stretched Boundaries concerts through Tintinnabulate.

The first took place on March 31, 2011, in RPI's West Hall Auditorium (see figure 12.3). Under the leadership of Pauline, Tintinnabulate conceived the following program text:

The term "disability" often implies a one-sided view of people with sensory or motor impairments and focuses on the idea of something lacking perfection. But what is usually called "handicap" is not only a physical or cognitive reality, it is especially a whole world of related emotions, exceptional experiences, and unique talents that can become the bridge between life and art. Stretched Boundaries offers the view of each disability as a work of art, and explores the unique-

ness of differently abled artists who have either embraced their missing functions with creative approaches and tools or realigned focus on other areas to perform.

For this concert, RPI's contemporary music ensemble Tintinnabulate, founded by Pauline Oliveros, features four artists: Neil Rolnick, Christine Sun Kim, Clara Tomaz, and David Whalen, who explore and present different facets of some of these cultures. Composer Neil Rolnick suffered the loss of hearing in one ear. His piece MONO Prelude refers to how he now hears. Christine Sun Kim's work focuses on the vibrotactile perception and physical interpretation of sound through the vehicle of both performance and sound equipment. David Whalen is a visual artist who developed an ergonomic computer interface which is controlled by the mouth as an alternative to hand-controlled devices. Clara Tomaz's current work explores themes of cognitive and physical diversity, perception of disability and process of acceptance.[7]

The second concert took place in New York City in June, and a similar event was held in Troy the following year.

International Symposium on Assistive Technology for Music and Art (ISATMA)

Soon after the launch of the Center for Cognition, Communication, and Culture in 2012, we decided to hold the first ISATMA, conceived as a day-long event that was dedicated to artistic and technological developments of assistive technologies for music and art. The first ISATMA was held at Rensselaer's Experimental Media and Performing Art Center, sponsored by the Christopher and Dana Reeve Foundation. David Whalen, Tobias Koslowski, Ruud van der Wel, and Erik "Robosax" Klein were featured, among other artists (Braasch, Peters, and Valente 2013). These continued annually. In 2017, ISATMA expanded to a three-day event, with a full day devoted to the tenth anniversary of the AUMI Project.

Assistive Technologies at RPI

AUMI was not the first assistive technology project at Rensselaer Pauline was involved with, but it was the most successful. One reason is that AUMI found a thriving community of support early on, including Henry Lowengard, the senior programmer who volunteered many hours devel-
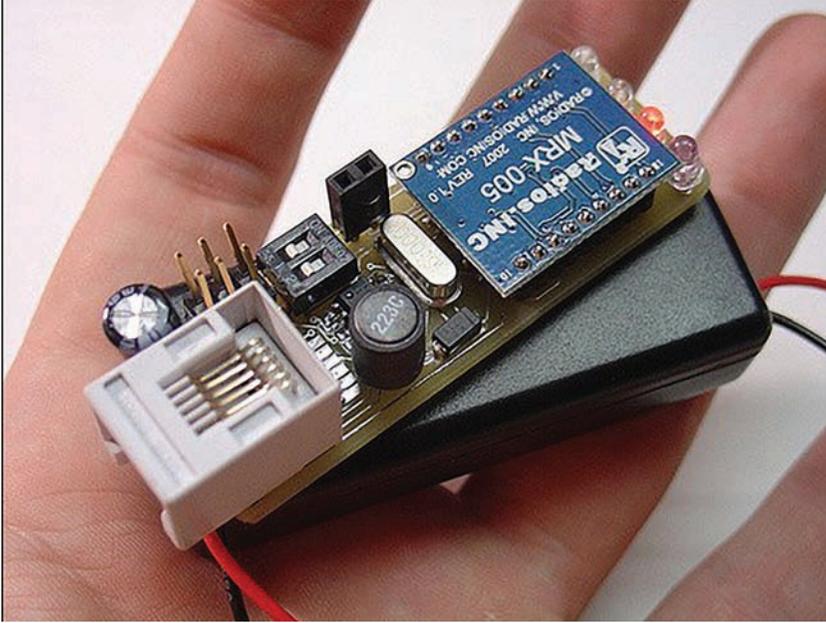
Figure 12.4. Vibrobyte prototype with open cover.

oping an AUMI iPad version (chapter 11), and Leaf Miller (chapter 1), who applied AUMI practically at Abilities First. The Vibrobyte and the Sensory Substitution System were the other two assistive technologies Pauline was involved with. The Vibrobyte is a small, mobile, wireless device (figure 12.4) that vibrates and can be used as a haptic display, for example, in the context of telepresence scenarios (McDonald et al. 2009). The goal of the sensory substitution system project was to support severely hearing-impaired and Deaf people in listening to and performing music (Egloff 2011; Egloff et al. 2011). The underlying idea was to present music signals haptically using the somatosensory system (see figure 12.5.)

Although one could directly address the sense of touch in the context of music signals using commercially available haptic transducers, this approach is not useful given the vast differences between the senses of touch and audition. Unlike the auditory organ, touch has no mechanisms to segregate individual frequency components. Further, the most sensitive region is lower in frequency for touch compared to the auditory sense. Our developed prototype builds on these unique characteristics. The sensory substitution algorithm transposes the digitized acoustic

music signal into the low-frequency range after removing the overtone spectrum, which is distracting for haptic sensation. The information can be spatially distributed using an eight-channel vibrotactile board.

One goal with the sensory substitution instrument was to understand to what extent the haptic and auditory sensory systems are comparable from a perceptual viewpoint? Western traditional music theory is based on several fundamental parameters, including melody, rhythm, harmony, texture, and form. While there is little doubt that the temporal resolution of touch is fine enough (and much better than vision) to resolve rhythmic patterns and form, the frequency resolution is not high enough to directly extract pitch information from haptically displayed audio signals. To our surprise, melodies could be better recognized through haptic frequency intervals if the signals were transposed into the low-frequency range. By doing so, however, the similarity was so substantial that we had to go through great lengths to ensure that the perceived events were not induced by bone conduction, the effect that the haptic signals can be conducted through the body to the inner ear, where the auditory system then detects them. Earmuffs were worn to exclude the possibility that this effect played a role in our observation. In addition, in-ear headphones were used to play pink noise at moderate levels to mask the auditory sensation.

Most musically trained participants have lower recognition rates for haptic signals than for acoustic signals when discriminating minor thirds from major thirds. To be able to perform this task for acoustic music signals, however, typically requires several years of training, and a minor/major third discrimination task is not something that can be easily accomplished by non-musically-trained participants. In the end, our team member, Deborah Egloff, who has experimented a lot with the sensory substitution device, became secure in distinguishing musical intervals through haptic display over time, and she was able to perform with our band Triple Point using this instrument to play piano sounds.

The Key to AUMI's Success

Both technologies matured to stable prototypes that were used in musical performances and published in conference papers, but the development of these systems did not continue, nor did they serve a large user base, like AUMI did. To understand why the development of AUMI and the other two systems took different trajectories, one has to look into the unique activity cycles at universities. Undergraduate students typically
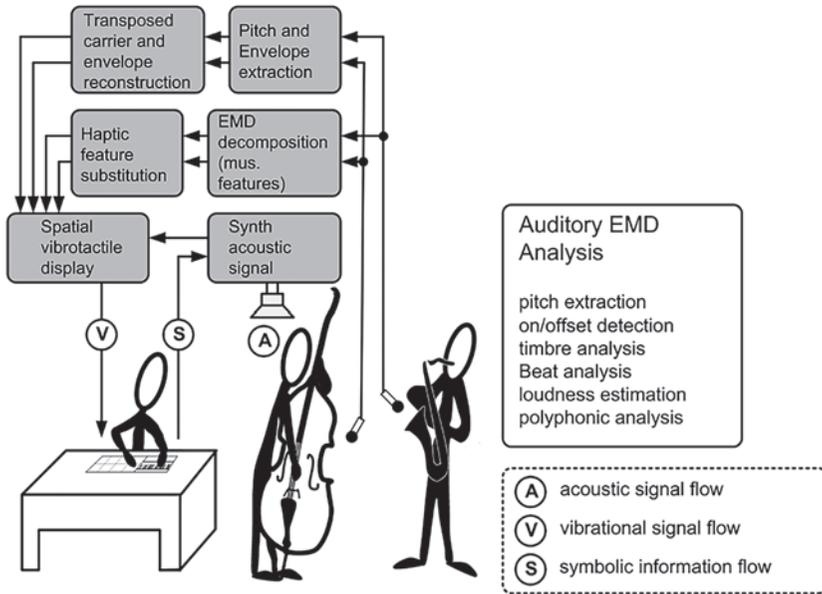
Figure 12.5. Schematic of the Sensory Substitution System.

work one or multiple semesters on a research project and often start not long before they graduate, and graduate students typically work one to five years on their thesis project depending on whether it is a master's or a doctoral dissertation. Zane's AUMI work was an undergraduate research project funded by the Malcolm S. Morse Foundation (Pask 2010).

Like all other student projects, Zane's work on the AUMI instrument was limited. AUMI survived as an active project because an external community picked it up, which resulted in a large consortium over the years that maintains the instrument. Unfortunately, something similar did not evolve for the other two instruments. Further, AUMI benefited early on from a stable prototype that could be distributed easily and used by those with little technical knowledge.

Final Thoughts

AUMI never solved Pauline's initial goal of finding new ways of controlling her electronic instruments, such as EIS. Instead, it took on a life on its own, thriving in a community Pauline was engaged with. For the

EIS system, Pauline kept using her foot pedal until the end, as well as for new, largely autonomous systems like CAIRA (Creative Artificially Intuitive and Reasoning Agent) and FILTER (Freely Improvising, Learning, and Transforming Evolutionary Recombination system). In Pauline's later career, much of the technical development for her creative work was handled by students and volunteers in a self-organizing manner. Pauline's approach was inclusive and open to everyone wishing to participate.

Even though her desire to gain better control over parameters for her EIS system was her starting point for AUMI, she never got around to integrating AUMI into EIS. As her legacy continues, fortune still needs to find someone to accomplish this goal.

Notes

1. https://cycling74.com/products/max/, accessed October 12, 2019.

2. https://mybreathmymusic.com/en/wie-zijn-wij, accessed September 18, 2022.

3. Pauline earned a BA in music composition from San Francisco State College in 1957. http://paulineoliveros.us/uploads/1/0/5/3/10530407/pauline_oliveros_cv_2012.pdf, accessed October 4, 2019.

4. Personal communication, 2013 Dunrobin Residency. Deep Listening Band, *Dunrobin Sonic Gems*, Pauline Oliveros (V-accordion, conch shell), Stuart Dempster (trombone, didgeridoo), Jonas Braasch (saxophone), IONE (opening invocation), Jesse Stewart (percussion), Johannes Welsch (gongs), recorded live on October 5, 2013, Dunrobin Sonic Gym, Deep Listening Records, 2014.

5. Triple Point, 2014, *Phase/Transition*, Jonas Braasch, soprano saxophone; Pauline Oliveros, V-accordion; Doug Van Nort, granular-feedback expanded instrument system (GREIS) electronics, audio compact disc, three CDs, Pogus Records 21078-2.

6. For an excellent article about Kim's work, see Holmes 2017.

7. http://www.arts.rpi.edu/pl/iear-events/stretched-boundaries, accessed September 25, 2019. Members of the Tintinnabulate Ensemble included Julia Alsaraff, viola; Matt Azevedo, voltage-controlled synthesizer; Curtis Bahn, dilruba/electronics; Jonas Braasch, soprano saxophone/video; Sam Clapp, cello; Deborah Egloff, prepared piano/electronics, Daniel Fiekowsky, iPhone; Tom Kinstrey, keyboard; James McEntee, theremin; Pauline Oliveros, V-accordion; Pete Schirmer, electric bass; Doug Van Nort, iPad.

AUMI Communities

> We are trying to build an understanding of, and respect for, the differences that people have. These are potentially a source of strength, rather than as a source of conflict. How can you welcome this view, and how can you bring it into a community?
>
> —Pauline Oliveros, "A Composer's Practice"

In Spring 2010, Abilities First School held an AUMI open house to introduce the inclusive drum circle to families, caregivers, and friends. The atmosphere was electric as visitors witnessed the inclusive jam. Students did things peers, teachers, and families did not know they could do. AUMI-enhanced jamming remixed social patterns and expectations. New ways of listening to one another and being listened to emerged. Principal Bob Kelleher observed that AUMI had "improved morale" among the staff.

Because AUMI begins from the premise that the instrument must adapt to all bodies, it encourages communities to consider difference "a source of strength." Pauline valued and fostered such communities throughout her life.

Feminist philosopher Sara Ahmed (2006) offers the peapod as a model of such community. Noting that the adage "We are like peas in a pod" usually equates sameness with community strength, she reminds us that all peas are not alike. It isn't "sameness" that makes peas into a community, it's the flexible pod! The pod takes its shape from the peas and changes as the peas change (100). A community based on a living

flexible pod is much stronger than a brittle container with a one-size-fits-all attitude.

The chapters gathered under "AUMI Communities" explore AUMI as a tool for encouraging flexible communities of difference. As noted in the introduction, many of these chapters could easily have been placed in "AUMI Performance," and vice versa. Many involve community performance or performances that transform community. They appear in *this* pod for the ways they nurture our thinking about AUMI, community, and what Petra Kuppers calls "improvising being-together" (2015), but we invite readers to think flexibly and organically across categories.

"AUMI Communities" opens with two interviews about community music projects involving AUMI; one in Thunder Bay, Ontario, led by musician and educator Lise Vaugeois (interviewed by Nicola Oddy, chapter 13), and a series of projects of improvisation studies scholar Rebecca Caines (interviewed by Ellen Waterman, chapter 14). Chapters 15 through 20 zoom in on one AUMI community in Kansas, starting with the story of how one AUMI community partnership came to be (chapter 15). In Chapter 16, theater director, improviser, and scholar Nicole Hodges Persley tells a personal story of what she learned while directing an all-abilities community performance using AUMI. The next three chapters reflect on aspects of Jesse Stewart's guest residency in Kansas. In poetry and prose, respectively, Julie Unruh (chapter 17) and Abbey Dvorak, Kip Haaheim, Ray Mizumura-Pence, and Sherrie Tucker (chapter 18) reflect on the community that flourished over the residency. In chapter 19, Michelle Heffner Hayes and Sherrie Tucker explore these workshops and performances from the perspective of dance. We close with Ray Mizumura-Pence's disability justice perspectives on a decade of AUMI community formation.

The chapters in "AUMI Community" describe challenges as well as bright moments. Inclusive community practice for neurodivergent members may require a sanctioned exit route from an AUMI jam. Singing familiar songs together can be an inclusive community practice, but it isn't AUMI's strong suit. What happens when communities are constrained by institutions? All ask: How do communities "expand" to incorporate and respect the differences among all who are there? And what can communities learn from using AUMI together?

THIRTEEN | Exploring AUMI's Potential in the
Thunder Bay Community

*An Interview between Nicola Oddy
and Lise Vaugeois*

In June 2019, music therapist Nicola Oddy interviewed community musician Lise Vaugeois about her use of AUMI in a song- and instrument-based practice in various settings in her community of Thunder Bay during 2015–2016 through the AUMI Artist Collective.

Lise is a composer, musician, academic, educator, and workshop leader. Her fifteen years of work in the community informed her work with AUMI. She had been composer-in-residence for the Ontario Arts Education Institute and traveled throughout Canada on behalf of Orchestras Canada to lead workshops on creative music projects for professional musicians. Nicola is a music therapist who has worked with people in clinical settings in long-term care, in community-based programs for people with special needs, in group home settings, in palliative care, and in mental health. It was from these two perspectives that the interview took place and Nicola learned about how Lise led the AUMI-inspired community music project that took place in Thunder Bay, with all its trials and errors.

The Interview

Nicola Oddy: Tell me about what led to your involvement with
   AUMI?
Lise Vaugeois: I started out as a french horn player, studying in
   Germany, Sweden, and the University of Toronto. When I

began my career, I had the opportunity to play with the Great Lakes Brass, through the National Youth Orchestra of Canada. The late Vincent Cichowicz, a former member of the Chicago Symphony, was the highly influential brass teacher there. That quintet did a lot of performances in hospitals, nursing homes, and prisons. This obliged us to figure out how to communicate with people, as they might well be responding, but were not necessarily able to show it the way that someone could who had no mobility or cognitive impairment issues. The quintet was a labor of love where we wrote our own shows, sang sometimes, told stories, and read poetry. The group was quite successful professionally. They represented the Province of Ontario at the Japanese World's Fair in Osaka in 1990, were featured in many broadcast performances with CBC Radio, and toured extensively throughout Canada and the United States.

Later in my career, when I was in the symphony at Thunder Bay, Orchestras Canada had brought people over from the Guildhall in London, England, to do Changing Arts Practise workshops. Because of that I improvised and put together mini-compositions for the first time in my life. As a result, I took a sabbatical from the symphony and did some training that had a direct influence on the fact that I became involved with the AUMI Artist Collective. I was fortunate to get generous support in the form of grants from the Chalmers Fund (Ontario Arts Council), the Canada Council, the British Council, and the Guildhall, in order to attend the Guildhall School and participate in their postgraduate program, Performance and Communication Skills.[1] The idea was to merge classically trained musicians with people from a variety of cultural and musical backgrounds so that we could learn from each other. We worked in schools and community centers and worked with rock bands, jazz bands, and even a tabla ensemble. We were learning how to create musical events with different kinds of music and musicians. It was based on improvising over what is called "Musical Backbones." This is a model that uses a group of musical ideas around which a piece of music can be built. It might be a riff, a rhythm, and/or other elements but is not genre-specific.

NO: How did your experience there inform your career?

LV: When I came back from the Guildhall, I started a program

called "Creative Music Projects" with a colleague from the symphony. We began working in the schools, creating compositions with students based on different themes, centered on what they were studying in other parts of their curriculum (e.g. social studies, geography, history, etc.). Then we would collaborate with them to do performances at the Community Auditorium, in tandem with symphony performances. Subsequently, I did nine years of projects with elementary and high school classes in Thunder Bay, which was also very interesting and challenging. As a result, I was known around the community for doing these "enrichment" projects with the support of the Ontario Arts Council, at a time when school music programs were being eradicated due to government cuts.

NO: How was the AUMI Artist Collective implemented?

LV: Because of these programs, Gillian Siddall and I knew loosely of one another. She was the dean of Social Sciences and Humanities at Lakehead University, where I later taught. She was very involved with ICASP (Improvisation, Community, and Social Practice) based in Guelph and contacted me about a research project for the AUMI research collective. Gillian was looking for a way to bring AUMI to Thunder Bay and was able to get funding to have AUMI expert Leaf Miller come to do two days of training with musicians and caregivers in using the software with people with mobility impairments. I approached several musicians from a variety of backgrounds and together we formed the AUMI Artist Collective. I then applied to the Ontario Arts Council for a grant to run a pilot project working with the AUMI software to develop programming. We wanted to include a broad range of music from a wide variety of cultures. To incorporate these interests in diverse musical experiences, we included a French-speaking percussionist-educator Derek Khani, and Lorrina Belluz, violinist, fiddler, improvisor, composer. Colleen Kennedy added voice and oboe. I was the project coordinator and used guitar, voice, and percussion. We all worked on repertoire and activity development together. Maureen Ford, PhD (counselor, scholar, and amateur musician) became our technical support person for all of the workshops that took place in 2015–2016. She was in charge of helping participants (and training additional staff and volunteer helpers) at the computer stations. This technical role proved

to be vital to the success of the project. Indigenous singer-songwriter, ElizaBeth Hill, attended both of the training workshops with Leaf Miller in 2014 and also completed the long-term care placement orientation; however, she was unable to participate in the workshops that took place in 2015–2016. Gillian Siddall was involved with the public workshops.

NO: Can you describe the activities that took place?

LV: In spring 2014 we held two training workshops with Leaf Miller to provide professional development workshops for the AUMI Artist Collective and other interested musicians, caregivers and support staff. Then, in the fall and spring of 2015–2016, we developed and delivered a series of workshops, entitled "Music in Motion," with people in long-term care (mostly, though not exclusively, older people) and people with a range of developmental and physical challenges (ages seventeen and up) attending nonresidential programming for people with special needs. We also did an additional workshop at the March of Dimes as part of a Tangled Arts[2] Festival pre-event.

The goal of the workshops was to integrate people with a range of physical and cognitive challenges in music-making events. In particular, our program was intended to explore the use of AUMI—a computer-based instrument that is set up to generate sounds based on whatever movement the player is able to control. For example, if a person does not have the use of their arms but can move their head, the instrument is set to generate sounds in response to subtle head movements. We wanted to find out whether the use of the computer instruments allowed people to engage in music making who might not otherwise be able to participate. We also wanted to discover the creative possibilities of the instruments and the scope for creative engagement made available to participants through the use of AUMI.

NO: What was it like to integrate AUMI into your sessions?

LV: From our previous experience, we were aware of the pleasure many older people have in singing familiar songs. Because of these factors and our own skills as instrumentalists, we wanted to explore the possibilities of building AUMI instruments into melody-based types of music. In addition, we wanted to discover whether our training as instrumentalists and the use of instruments such as oboe and violin would enhance the musi-

cal and creative experience for participants and integrate well with AUMI. We also wanted to explore whether this kind of community-based music making would provide satisfying artistic growth opportunities for us as professional musicians.

There was a steep learning curve involved with using AUMI effectively. The computer and iPad versions are completely different. Getting to know the available sounds, the key and octave parameters, the percussion libraries, how to set up the computer screen for the needs of individual players, the different characteristics of the computer and iPad programs, required a significant investment of time. Learning the music, setting keys, creating forms that could integrate the AUMI instruments and then choosing AUMI sounds for each specific piece was also time-intensive. As we progressed through the first series of workshops at the long-term care facility it became evident that the parameters for each song needed to be available in list form in front of each computer station so that the players and their helpers could quickly change the parameters for each piece; however, once participants and their helpers became more familiar with the songs and the use of AUMI, they were able to make choices about their preferred sounds. In both workshop locations, singing was the constant that linked the elements of the programs together; however, in each instance, the music making was enhanced with instrumental solos, the AUMI instruments, and the hand percussion instruments available to everyone.

NO: How did you go about choosing repertoire?

LV: Our first task was to get background information on the musical interests and general physical and cognitive abilities for the members of each group. We then researched and gathered potential repertoire, brought the pieces back to the musicians to test out and rehearse, and then explored various AUMI sounds that might work with each piece. At the long-term care facility, sessions were built around the *Sing Out!* (Baker 1997) book of songs from the 20s–50s. Because we were there in December, we also used Christmas songs. In addition to this material, I taught the Cherokee Morning Song,[3] which became a favorite, Colleen and Lorrina created improvised pieces that responded to sounds being made with AUMI by participants, we created soundscapes based on different themes, and Derek

led improvised drumming pieces. In addition, we drew on a number of response-based activities (dynamics, different qualities of sound, different instruments, etc.) to develop musical skills and understandings. We also produced a song book for use during our weekly sessions. We used one laptop with AUMI, two iPads with AUMI, the oboe, violin, acoustic guitar, djembe, hand percussion, and voices.

At the facility for people with special needs, our staff contact gave us a list of favorite songs of people attending the program, including songs by Bob Marley, Elvis Presley, Johnny Cash, Queen, and the Beatles. Each of us took a portion of the list and chose songs that seemed possible to integrate with AUMI. We tested and rehearsed these together, kept some, dropped some, chose the sounds, and went to our first session. We thought that we had more than enough repertoire but quickly discovered that we would need quite a bit more, so the following week was spent researching and preparing another seven pieces. We also put all the lyrics on chart paper and produced a song book for participants. Instruments we used here were oboe, violin, electric bass, acoustic and electric guitars, djembe, hand percussion, iPhones, voices, and two laptops and two iPads with AUMI.

In a typical session, three to six different people would take turns using the computer-based instruments. Many participants also used hand percussion instruments in addition to using AUMI. We planned some elements and left others open.

NO: Overall, what did you learn?

LV: The grant was intended to allow us to explore the use of AUMI, and we wanted to see whether it could be used outside of the drum circle. Our general approach in community music making was to use pieces that engaged with melody, harmonies, and song forms, so we wanted to use AUMI in that context to see what we could come up with. It was labor-intensive to go through every sound and every aspect of the AUMI software for both the computer and iPad versions, and we put a lot of energy into seeking out what might work. I don't think we were very sophisticated users of the adaptive part. If we put the button on the nose, people were lifting their heads up and down quite a bit, and they found that fatiguing after a while. If we were more sophisticated users, maybe we could have found less

arduous ways to help people activate the sound. The iPads were more successful, and people using the iPads wound up using their hands and the touch screen. A touch screen laptop might have made the difference in their ability to use the computer.

NO: Did you give them instruction about how to participate musically, or did you just let them go for it?

LV: We created musical forms that allowed for opportunities to include the AUMI sounds. Having a musical structure meant we could cue the AUMI players. We tried different things, but found that it was crucial to have a person whose sole role was to help the people at the AUMI stations. This was partly due to space limitations. The computers, iPads, and other gear were on a long table and the people in wheelchairs were behind that table. We were in front of the table with our instruments, engaging with people at the AUMI stations, but also engaging with the people sitting out front. It was next to impossible for us to move behind the table to help people with instruments in our hands so we were pretty much bound in place.

NO: So your hands were tied in a sense.

LV: Yes. We couldn't run around and help so what wound up happening is, Maureen Ford took on that role. And then, as their staff became more familiar with the software and the songs, then they were also able to help. We also had a song list and we would say which key it was in, and what settings would work. The helper helped them to set up the device. As the participants became more familiar with the software, they would choose the sounds they wanted to use.

NO: I've heard that AUMI can be used with a master control center so that if the group leader is going to do something in a certain key, they can change everyone's iPads at the same time. I understand that can make all the difference when working in a group where people have their own iPad.[4]

LV: I'd be very interested in knowing how that works. Along with that issue, there was the problem of sound filtering. When Leaf Miller came, we didn't have monitors, so all of the sounds were filtered together into one sound system, and the participants couldn't tell which sounds they were making. It was chaotic. We learned that to mitigate this, Leaf uses monitors. To follow her lead, we got small speakers for each station, which was great.

NO: Were they able to distinguish their own sound once you did that?

LV: That helped, but there was still a problem. I could control the master volume as well as the volume of each computer. The monitors, though, were plugged into the individual's computer, so they were still live and anytime an AUMI player moved, there was still sound coming from their monitor.

NO: It's hard when people have sensory difficulties to begin with, and then there's a mashup of sound.

LV: Every time someone walked past the computers behind the participant, so if Maureen was walking past when she was help-ing, then it would make sound. It was very sensitive. For exam-ple, I was taking photographs of the session one day, and when the flash went off, the sounds went off too. It's like when I work with kids and I take in all of my instruments, I have to have a high tolerance for chaos.

NO: When we're working with people with sensory needs, we have to be careful with that, because we're not there to make their day more difficult, and we have to be sensitive to the level of chaos. I think that one of the important things with working with people in music is to order the music in some way so that it comes out in some sort of aesthetic, so that we're helping the people to create something that comes out satisfying, beauti-ful, or at least cohesive.

LV: We were wanting that all around. Some of those technical issues were mitigated, but not entirely solved. With the seniors, I would say that they loved the sing-along better than anything.

NO: Perhaps if AUMI were used more intentionally with a smaller group the music would be less chaotic?

LV: It would make a lot of sense. There are certain things we were able to do, but not do, because we didn't have the knowledge of a music therapist and didn't have any opportunity to work with staff outside of the actual sessions.

NO: Where to from here?

LV: The project ended in 2016 and since then, I haven't been in a position to include that kind of work in my schedule.

NO: Would you use AUMI if you went back to that kind of work?

LV: In some respects, it's easier without it, a lot less setup. An hour to set up, thirty minutes to strike, help to move the gear, a place to store it or it all goes back in the car. Some people really

enjoyed the software but there are others who would have been equally happy if they did not have AUMI and we did what we normally did before the project took place.

NO: I think that originally AUMI was developed for children who could not participate in the music making when conventional instruments were used. Perhaps the people you worked with didn't have the movement issues that AUMI was developed for?

LV: Some seniors did have movement impairments, for example as result of strokes. Staff felt that the experience benefited the participants and said that the participants looked forward to our sessions. For this group, I would use AUMI again, but only the iPad version, which can be set up to respond to movement and can also respond to touch. Possibly, with new touch laptops, the PC version might also be more reliably used.

As well as being beneficial for those with movement issues for some of the young people we worked with, it provided some novelty for one young woman who enjoyed experimenting with it. I can hand out percussion instruments, which are not pitched and which will only do a certain number of sounds, so she and a couple of others had a lot of fun with the AUMI software making more unusual and creative choices. During our session preparation, Colleen rewrote the words for "Another one bites the dust" to "Another one rides the bus." This was about having a disability and having to ride the bus. That was a huge hit! "Monster Mash" and "Walk Like an Egyptian" were also great hits! Several participants had every last lyric memorized and they would get up and perform while others would insert AUMI moments into the songs.

Benefits and Challenges

Lise offered the following summary of what worked well with AUMI and what did not, in the context of this song- and instrument-based community practice:

Successes:

1. People enjoyed the variety of the different sounds they could make.
2. We were able to create some lovely musical moments with the in-

tegration of AUMI sounds, melody instruments, percussion, and voice.

3. We were able to work with a range of styles and dynamics, making the music accessible and pleasurable without producing any sensory overload.

4. We had the opportunity to get to know people through musical interactions and develop relationships. It would be beneficial to have programming that happens every week in a given setting so that musicians and participants know they can look forward to getting together every week with the social strengthening the musical and vice versa.

5. We demonstrated that it is possible to use AUMI together with melody and with certain harmonic combinations. This opens up a lot of musical possibilities.

Challenges:

1. AUMI was sensitive and the smallest movement would cause a sound that was perhaps unrelated to the music making. This occurred, even though the degree of sensitivity could be adjusted.

2. Troubleshooting the collective sound so that it did not sound chaotic was challenging. This was mitigated, but not solved, through the use of individual monitors.

3. It was challenging to integrate AUMI, which is an improvisation tool, into a song- and instrumental-based practice, but we had a number of strong successes.

4. For those using the face as a tool to make AUMI work, it could be tiring.

5. Equipment accumulation, transfer, and storage was a challenge.

Vaugeois concluded by expressing her appreciation for the opportunity to do this pilot project. She said that for future community music-making projects using AUMI, she would work first to solve some of the sound, storage, and administrative challenges. The year after the Thunder Bay AUMI project, she and her and colleagues were asked to return to the facility for people with special needs, but applying for grants to run programs is labor-intensive, as is the reporting that follows receiving a grant, and no one had the time available to take on these tasks. Vaugeois feels that stable funding along with instruments and gear that could remain in each location would make the continuation of this

kind of programming viable. In her own words, "The actual sessions with participants were always a joy. We met and made music with wonderful people we might not have known otherwise, and I know that all the AUMI musicians would welcome the opportunity to return to this form of community music making."

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Notes

1. The program is no longer offered, but the practices have been integrated into the music curriculum as a whole.
2. http://tangledarts.org/about-us/who-we-are/.
3. A traditional Cherokee song, recorded by Robbie Robertson and Rita Coolidge.
4. Oddy refers to the "send setups" feature Henry Lowengard added to AUMI for iOS in 2014.

FOURTEEN | Building and Sustaining Ethical
Communities Together

*An Interview with Rebecca Caines
by Ellen Waterman*

Rebecca Caines is a socially engaged artist and professor. At the time of this interview, May 14, 2020, she taught Creative Technologies at University of Regina in Saskatchewan, Canada, and directed the Regina Improvisation Studies Centre. Trained in theater and performance studies, Caines has cocreated improvisational sound-art projects in collaboration with diverse groups including Indigenous communities and people with disabilities. Her practice addresses this question: How can we build and sustain ethical communities together? In her experience, AUMI is an inspiring and enabling technology that nevertheless presents technological, institutional, and social challenges.

Ellen Waterman: How did you begin using AUMI?
Rebecca Caines: AUMI was a tool that I came across first when we were building the Creative Technologies program at the university in 2012. We were looking for classes that would bring together computer science and fine arts. The class and accompanying research project were started by three teachers/researchers: me, David Gerhard, and Pauline Minevich (who on retirement was replaced by Helen Pridmore).[1] Based on the history of laptop orchestras, we thought it would be kind of interesting to have a tablet orchestra at the university (and build a connected research project). The interdisciplin-

ary class included students from Campus for All, a program for students with cognitive differences, and that's been a huge part of the class! When we're talking about improvisation and difference, and trying to understand how to juggle difference, the Campus for All students were much more aware and able to help us think through that than other students who had never considered there was difference in the world because they were sitting in positions of privilege. AUMI allowed for different kinds of playing, using different kinds of gestures. We've always had it on the iPads among many other apps since the first year of the class. But then, we don't teach to the app. We allow students to discover what they are interested in, and then they develop assignments to work with the apps they get caught up in. So, some years people have gotten very excited about AUMI and some years it's just been another one on the list of things they can try.

EW: What are one or two particularly resonant projects you recall?

RC: I really liked the year when we had a classical pianist who was doing a computer science degree but had a private piano practice. She came into the class and got totally excited about collaborating with the AUMI as a kind of comusician. She tied the iPad to the top of her upper leg and, sitting out a bit from the piano keyboard, she used the gestures of her piano playing to trigger the music. And that was really interesting because she said it made her play differently. It made her start to think about improvising on the piano, which she hadn't done before, and then she started to notice her body in a totally different way because she hadn't really thought of herself as an *embodied* player. And suddenly having this thing on her leg made her realize how much she moved and where her hands went. That was kind of beautiful and her performance in the concert, where she improvised with AUMI, was really fantastic.

Last year we had a dancer who got really fascinated with creating a kind of choreographic vocabulary. She worked on what gestures would trigger what sounds, developed dance moves that would trigger the sounds, and then created a choreographed piece based on those moves. So she worked with the AUMI until she heard the things she liked and then she looked at what her body was doing and emphasized that until she built a kind of gesture that would create the sounds she wanted.

EW: She took a kinetic approach to AUMI.

RC: Yeah. And I think she ended up with eight gestures as a vocabulary to then build a dance from which she then performed with AUMI. You heard what she wanted you to hear and saw the performance that she created. So that was very cool.

EW: It's a kind of inversion of the initial premise that AUMI was built on. That proposition was: we need to create an instrument playable independently by people with very limited voluntary mobility. And here the proposition is: AUMI can respond to a precise embodied vocabulary.

Can you tell me a bit about your work with AUMI and people with disabilities? I understand that you collaborated on a project in a rehabilitation context in Saskatchewan, along with a music therapist and a health educator, working for Native Health Services. How did AUMI fit into that work?

RC: We created a research project in 2014–15 that included two three-month series of weekly improvisation sessions (Caines 2019, 2020).[2] We got together for an hour on Fridays to jam, and we brought the iPads. There were several challenges to the project from the outset. A lot of the clients were not able to ambulate themselves into the area, so they had to be collected by staff and brought. I tend to feel like some people were being forced to come every week; when people are not verbal and have memory issues, you can't really know sometimes whether they're choosing to be there or not. (They formally consented at the beginning of the project and were asked again to consent at the weekly jam sessions, but it was unclear to me if they really wanted to come at that moment, and if they wanted to stay for the whole session.) We had to exclude anyone who wasn't Indigenous because the focus of the project [funding] was around cultural expression. So that's the setting: we weren't sure everyone wanted to be there, we had to turn away some people who did want to be there, and there were also three different reasons to be there because the music therapist and the health educator with Native Health Services had their own reasons for bringing the group together.

AUMI was an obvious solution for people who couldn't drag their hand up and down precisely on a touch screen, but it didn't necessarily offer what everyone needed. For example,

some people didn't like to see their faces in the app.[3] They're in a rehabilitation hospital because they have severe medical issues that need constant attention, but no family able to give them that attention. These are people disconnected from their communities, from their families, very isolated. There was a huge variety of ages, economic backgrounds, and interests. One person would come in with every possible technology in the universe and the other one would have a piece of paper with the alphabet on it and be pointing to the letters on the paper because they have nothing else, right? To bring iPads into that situation was really weird.

There's a case study that I want to share that to me is really sad and also beautiful. Simon[4] could only move his eyes, he could only blink, and so he had "yes" and "no," one blink and two blinks. That's all the communication he had. He was the candidate that we thought AUMI would be the best for, because he had apparently had an interest in music before the accident that put him in the hospital. But we didn't know what kind of music. And I had no information about whether he was one of the more or less wealthy candidates. I didn't know anything about his family. He just would be wheeled in and be with us. And you could tell when he was engaged or when he was angry. He would just close his eyes and drop out. That was his only way of telling you he didn't want to be part of things; it was like, "I'm out." But if his eyes were open, and he would answer yes to things, you felt like he was engaged. You know?

We spent ages trying to get AUMI to work for Simon! It was a little cluttered music therapy area. The lighting was terrible, and there were heaps of crap always behind everybody, which made the screen too busy. And you couldn't really have it where someone was isolated from someone else because all the wheelchairs were very close together. It was very hard to isolate the screen so that it was just him in it. The iPad version of AUMI was failing all the time in those circumstances. I just couldn't get it to function, so we switched to a laptop. There's only so much you want to push someone to try something if it's not working, before he's like "I'm out—this is fucking stupid." Okay, so I would stop. We would try different angles, but we also couldn't take the whole hour to try for one person when

everyone else was there to jam. It was just this constant struggle to find something that would be exciting to him or that he would want to be interested in.

But the first time Simon made a sound with his eyes, by blinking, was a huge moment. Like multiple people burst into tears, right? It was just the first time he could actually contribute something on his own will. And he—his eyes opened wide! We don't know how much we're reading into it, but it certainly was a *something*. A *something* moment. I find it hard to read into individuals, but in a group, you can feel when people gasp and there's an expression of "whoa!" at this kind of moment. Right? That was a dramatically powerful moment in the group. One of the big things that came out of the project that we weren't planning for was the group's empathy for each other. A lot of them didn't know each other; they rarely saw each other. If they saw each other in the hallways they might have kind of grumbled at each other, but they didn't have a friendship between them, and they didn't have a sense of each other's worlds. There were quite a lot of moments like that when the group would suddenly show empathy for somebody and their situation. When we interviewed the participants, they talked about the moment when Simon first made a sound as being something they really remembered.

There were a couple of other moments that I think are interesting in terms of AUMI. We bought an iPad for the group and one of our team members wanted Simon to have it in his room to see if he could start using it in other ways. We had been looking at some of the games that you could use with your eyes. When we took the iPad to the ward there was a relative of Simon sitting there, and I introduced myself. It was his aunt. And I said, "Oh yeah, we've been hanging out with him, at these sessions, he's just made some sounds with his eyes, it's super cool." And she said, "Oh! How come he's not using his hands?" And we said, "What?!" Simon generally holds a hand towel in both hands against his chest. I said, "We've never been told he can move his hands, in fact we've been told he *can't* move his hands." And she said, "Oh no, at school he puts his hands down on the desk." And I said, "Oh my God! I had no idea. I feel so stupid. I've been trying to make this poor guy fuckin' deal with this iPad with his eyes and I could have had

him using his hands!" This was also news to the music therapist and the Indigenous health educator. It's like information in the health system doesn't go anywhere!

We put the iPad on the table and Simon would bring his hands agonizingly slowly down, and move across, and set off the AUMI. He had much more control, because it wasn't just his eyes, which were hard to get the camera to focus on. Suddenly he could do things! So that was the second huge moment. When we said in the group, "Guess what everyone? It turns out that it's not torturing Simon to see if he wants to move his hands!" Simon did move his hands then, and he triggered some sounds. We would give him instrument options; he would tell us which one he wanted. That was just amazing.

And then we had the opposite moment.

Every so often the hospital would give us a staff person from another unit, such as Occupational Therapy, to help us out. And we didn't know who they were, we didn't know when they were coming, and they would just turn up. So this staff member turned up one day and said, "I'm here to help." She knew Simon and offered to work with him. We explained that he had just started using his hands and had started gesturing and making sounds. And she said, "Alright." So we start doing our improvising. We use little exercises such as going around in a circle: somebody adds something, and the next person adds something else etc. Some people would take a really long time, so you would have these moments of pause while everyone waited in a really beautiful way for the person to come to whatever they would be doing. And they would. That had been established as part of what we did, and everyone was really into it—that we waited until we saw the letter the person was trying to tell us, or the note was sounded, or until the person said the word they wanted to say. We were going around the circle and we got to Simon. We were waiting to see if he wanted to make a gesture or not. Sometimes he would just close his eyes and opt out and sometimes he would do something. So, we were waiting for what it would be this time. And the staff therapist grabbed his hands and pushed them down. I said, "please don't do that. Simon's going to decide if he wants to do this." And she said, "Oh he needs encouragement to move his hands." And I said, "Oh, he'll probably *choose* to do that if

he wants to do that." And so, she let him go. He was so pissed off. We kept going around the circle. We came back to Simon, and she did it again! I was just *so upset*. And he was so angry, he totally opted out. He wasn't with us for the *whole* rest of the session. And she *kept trying*! Every time we did an exercise she would keep trying. And none of us felt we had control over this person, to be able to tell her to leave, to stop doing that. The staff person kept insisting "AUMI is a good way to train these people to use their arms more. You know, to make them stronger." And I'm just like, choice is gone! Like it's out of the window at this point. And the whole group was so upset on his behalf. You know? It was really like "this is not okay." But somehow none of us felt like we could stop it. Working with AUMI with Simon was both beautiful and really hard.[5]

　　We did the final concert inside the hospital in the main walkway. Simon played and it was really powerful. And again, by choice. We know when he doesn't want to—he just opts out. The fact that his eyes were open the whole time, that he was responding to other people, he was doing things at moments, that was massive change from someone who came in so angry and shut out from everything. By the end he felt like he was part of a group of people. I think AUMI was the one way that we might have had a chance to get to know Simon. And that, I think, we did a little bit, more than we could of before, at least.

EW: I've always thought that AUMI is aspirational. The dream was independence. That was the founding idea with Leaf and Pauline. Find me something that does not require hand over hand, that is not invasive, not expensive, that somebody can use independently. But that term independence is a fraught term for the very people AUMI was designed for.

RC: I think it's a really problematic term for everyone, and disability helps us realize how stupid it is. If we can't acknowledge interdependence, we're in a really bad place to start with. The big disability argument of the 1960s was turn on the tap, where did the water come from? You didn't get the water! So now you are completely dependent on somebody for providing that water for you. But you will *never* acknowledge it. You're an independent person who runs their own life! But you literally cannot drink water without someone else providing it for you. I think that's why in the iPad Orchestra, having those Campus

for All students is always so amazing when we're talking about improvisation and the philosophy of improvisation and what does improvisation mean. It's obvious to people who have had to improvise all of their lives just by trying to live. And then on top of that, people who are never allowed to forget difference because it's always thrown at them. It just changes the conversation about independence completely.

And yet, the thing that AUMI offers that I love is the moment when people get excited and think, wow! I might be able to do things I didn't think I could do. Every single time I show it to anyone in a profession that works with people with different bodies that can't play ordinary instruments or whatever, there's this level of excitement that AUMI just has. People get so buzzed to think that you can make music when you didn't think you could before.

Notes

1. Creative Technologies research outputs include papers, presentations, and concerts led by team members: Rebecca Caines, David Gerhard, Pauline Minevich, and Helen Pridmore.

2. Rehabilitation context research outputs include showcases by participants, presentations by team members Rebecca Caines, Rick Kotowich, and Amanda Schenstead, and publications (Caines 2019; Caines 2020).

3. In 2016 Lowengard added a feature that allows the AUMI player the option of hiding their face on screen (chapter 11).

4. Simon is a pseudonym. We withheld the names of the hospital, other research team members, and the participants to protect their privacy. The research was conducted under an ethics certification from the University of Regina, which included review by the Regina Qu'Appelle Health Region. There was also an informal review by staff at Native Health Services to ensure Indigenous ownership, control, access, and possession, and the project received the permission and support of elders and knowledge keepers, some of whom visited the project.

5. We recognize that this description should be read in context of the underfunded nature of rehabilitation services in public hospitals in Canada, including low-paid insecure employment, long hours, and the lack of communication between units that hampers *all* staff, including the staff member under discussion.

| There's No Place Like AUMI

Building a Community Partnership in Lawrence, Kansas

JIM BARNES, KIP HAAHEIM, RAY MIZUMURA-PENCE, SHERRIE TUCKER, AND RANITA WILKS

This is the story of how people at a university, an independent living center, and a public library formed an AUMI-inspired community partnership. We tell the story from various perspectives to animate how we came together and what we did. We hope our stories offer readers ideas on how to create mutually beneficial AUMI partnerships and, in turn, how AUMI improvisation may help strengthen and expand our existing communities and build new ones.

How AUMI Got to Kansas

Sherrie Tucker

My coauthors say I need to "go first" because I brought AUMI to Lawrence. True. But I had no experience in building community partnerships. I had become passionately involved with AUMI and wanted a community to play with. My previous work in community partnerships was by invitation, as an oral historian. But I hadn't a clue how those partnerships came to be. I started by contacting people (some I knew and some I didn't), trying to explain what AUMI was, and asking if folks wanted to join me in starting an AUMI group. It was a deeply humbling experience for someone who spent most of her time writing in isolation, who wrote about music but didn't play it.

My AUMI introduction in 2007 came as part of the ICASP research initiative. Before my involvement with AUMI, what communities I had were largely academic or academic-led. I was fortunate that several of these spanned beyond a solely academic membership to include artists, activists, and professionals in other areas. I was invited based on my individual research, but I discovered that I loved working collaboratively, among people who did not see universities as the center of the universe.

Through ICASP, I was assigned to the Improvisation, Gender, and the Body (IGB) group. We were charged with coming up with collaborative research projects. One member was none other than the esteemed composer Pauline Oliveros, who offered many projects as potential IGB research. She told us about AUMI in 2007. I hesitated, doubting that I had useful skills for this. But Pauline was persuasive. Her pitch to me was that, as an oral historian, I had training in listening to how people make sense of their lives through telling stories. Referring to the mostly nonverbal AUMI players at Abilities First School, she said, "these children have stories, too." This haunted me. Finally, at an IGB retreat in Quebec in 2009, Gillian Siddall, Ellen Waterman, and I joined the AUMI Research Project.

We traveled to Kingston in 2009 to meet with Pauline at the Deep Listening Institute (DLI), then housed in an old shirt factory building. She took us to meet Leaf Miller ("Leaf, like on a tree," Pauline reminded us several times, "not Leif Erikson"). We were blown away by Leaf's drum circle at Abilities First School. I would have the good fortune to return that spring for the Abilities First (AF) open house, when the AUMI improvisation class was in full force, and many parents and caregivers witnessed the inclusive jam sessions for the first time. Quiet children were loud. Loud children were listening. Teachers, therapists, volunteers, and administrators improvised with the students. If that isn't oral history, I don't know what is.

We couldn't wait to return to conduct research at Abilities First. But that's when Pauline let us in on a detail of the research that had not sunk in. She wanted us to return to our own communities and start AUMI improvising groups! OMG. Where to begin? I wasn't a musician. Lawrence is where I *moved to work.* Like many academics, I didn't feel like I was really part of "the community." I wasn't aware of communities of disability in Lawrence, or, I am sorry to say, *anywhere.* Enter the snowball of shame. Not only did I not know where people with disabilities were in Lawrence, I also realized I had no idea where children with disabilities went to school in my hometown in Arcata, California. Where were they?

How had their absence never occurred to me, even though I had spent most of my career writing about segregation? It dawned on me that there existed a cohort of people in my generation, in my hometown, who grew up parallel to me and my friends, but whom I had never known.

I turned to my colleague, Ray Mizumura-Pence, the only disability studies scholar I knew. Ray introduced me to Dot Nary, disability researcher, activist, and faculty advisor for AbleHawks and Allies, a student-led disability rights organization (that I didn't know existed, even though I thought I knew all the student activists). The president of AbleHawks, Elizabeth Boresow, a music therapy major, invited me to share the AUMI at the next meeting. I did, and Elizabeth and some of her colleagues became AUMI collaborators. Elizabeth would, in fact, use AUMI throughout her music therapy internship in the Lawrence public schools. She also wrote articles about AUMI. Her involvement was invaluable in connecting AUMI activities at KU with goals, perspectives, and hard work of student disability activists and advocates. The partnership also benefited AbleHawks in inspiring creative performance and dance components to the ever-heavy load of advocating for access throughout the institution.

I reached out to colleagues at KU who might be interested in improvising across abilities. I was surprised to learn that my friend and colleague, dance professor Michelle Heffner Hayes (see Hayes and Tucker, chapter 19), had experience with mixed-ability dance companies. She was *in*. I reached out to Nicole Hodges Persley, a theater professor, director, improviser, and scholar of improvisation studies. A true improviser, Nicole not only said "yes"—she said "yes *and* . . ." bringing many ideas for AUMI performance and pedagogy (see Hodges, chapter 16). I didn't yet know composition professor Kip Haaheim, but I was a fan, having attended many new music recitals where his pieces were performed (see Haaheim, chapter 26).

Kip Haaheim's Entry into the AUMI Partnership

Initially, working with the AUMI interfaced nicely with my primary research interests. I'm a composer whose primary focus is electro-acoustic music. One of my main interests within that field is developing nontraditional methods of live electronic music performance that don't involve traditional synthesizers or computer keyboards. The AUMI was a perfect match. My interest in enabling technologies and community building arose naturally from the process. Sherrie approached me about

forming an interdisciplinary group to explore the possibilities. I became a founding member of AUMI-KU InterArts.

Sherrie

Kip was in! Ray was in! Dot was in! I reached out to one of my students, Pete Williams, who was researching embodiment and experimental music in Kansas City. Pete was in! In 2011, we founded AUMI-KU InterArts, a consortia site of the AUMI Research Project.

Ray and Dot introduced me to Ranita Wilks, then a peer counseling specialist at Independence, Inc., our local and active independent living center. Ranita entered the partnership in 2012, bringing her long history of music making at Independence Inc., and her longer history of the goals of the independent living and disability rights movements. So here is one piece of advice for those seeking to build community partnerships: never assume you are bringing something to your potential partners that they are not already doing!

The History of the Music Appreciation Group-Not Especially Talented (MAG-NET), Independence, Inc., Lawrence, Kansas

Ranita Wilks

The primary vision of Independence, Inc. (founded in 1978 as part of the independent living movement) is that people with disabilities have equal access to communities of their choice, the same as anyone else. In addition, the organization is based on the disability rights movement's "Nothing about us without us!" concept: people with disabilities are the best experts about themselves and should participate in decisions that involve them. "Nothing about us without us!" leads to bringing people with diverse disabilities together to connect and share common interests for peer support. Over the years, Independence, Inc. has created opportunities for people with disabilities to come together and share common interests through various peer support groups. These groups reflect the interests of participants and are primarily led by individuals with disabilities.

In 2002, consumers of Independence, Inc. expressed interest in starting a peer support group for individuals interested in music. At the time, the agency had no real instruments, so, the first "jam session" required extensive imagination and used kitchen items (spoons, bowls, cheese graters, etc.) as improvisational instruments. As interest continued

in a "music"-themed peer support group, we circulated a request for donated items. This attracted the attention of a local writer for *Downbeat* music magazine, Tom Alexios, who had recently lost a friend to a terminal illness. The friend had received services from Independence, Inc., and Alexios wanted to honor his friend's memory and give back to Independence, Inc. A believer in the therapeutic benefits of playing music, Alexios was passionate about creating such opportunities for people with disabilities. He reached out to the wood shop class at Lawrence High School and asked them to make drumsticks. He collected plastic buckets and ragtag percussion instruments, simple things people could bang on or use to create their own sounds. We now had basic instruments but were still missing a name and someone with musical ability to lead and organize us.

Eventually, based on everyone's lack of "trained" musical ability, we decided to call our peer support group MAG-NET! (Music Appreciation Group-Not Especially Talented!). We circulated monthly fliers inviting people to come jam with MAG-NET! One day an interesting young man named Shining Mike showed up for a MAG-NET jam session. He was a local musician, known for playing percussion instruments at South Park (in downtown Lawrence). He'd seen a flyer for MAG-NET and was curious. Shining Mike revealed to the group that he was losing his eyesight and wanted to connect with people with disabilities, his peers. Similar to Tom Alexios's friend, Shining Mike had also received services from Independence, Inc. when he began to lose his sight. He'd been assisted with several adaptive devices. Like Alexios, he wanted to give back.

With leadership from Shining Mike and support from Tom Alexios, MAG-NET evolved into a beautiful collective of people with disabilities (and some without) coming together as part of a drum circle every month. Your ability didn't matter. What mattered was your passion and willingness to be a part of something. Shining Mike enjoyed teaching the group rhythms, beats, and chants. Tom Alexios felt his instincts were right about music's impact on people with disabilities. Under Shining Mike's leadership our little group expanded from six to around twenty people each month. We would get so loud banging rhythms on our buckets and other percussion instruments that anyone still working in the building would have to leave or come join the fun.

A year later, Shining Mike found romantic love and moved away, and the drum circle dissolved. Over the years, MAG-NET drifted for a while and reinvented itself from a drum circle to monthly "free-form" jam ses-

sions. By this point we had various donated instruments, from acoustic guitars to keyboards, but no formal leader like Shining Mike.

In 2012, Independence, Inc. was approached by Dr. Sherrie Tucker from the University of Kansas about a musical concept unfamiliar to us at the time, the AUMI. We considered the idea of bringing together individuals involved with MAG-NET to explore AUMI.

Sherrie

When reaching out to a potential AUMI partner, it is good to presume that an interesting history is already underway, which may or may not lead to the partnership you have in mind. It is good to remind oneself that partnership is mutual (if it isn't, it is *not* a partnership). When I met with Ranita about AUMI, she invited me and Pete to attend a MAG-NET jam session at Independence, Inc. to see if people were interested. As it turned out, some MAG-NET members were interested in AUMI; others were more interested in continuing to play guitars and other instruments. I recall one man using his guitar to activate guitar sounds on AUMI. We started in the accessible computer lab, where Pete downloaded AUMI desktop to all the computers. It was great to have so many computers equipped with AUMI, but the room setup meant that musicians had their backs to one another. We then moved into the conference room, where we used laptops and could face each other.

By then, the early KU contingent figured out how to translate what we were doing into grant proposal language to help get us up and running and continuing to grow organically. An internal grant from the Hall Center for the Humanities allowed us to hire Pete as the first KU AUMI research assistant, and to purchase two MacBooks and external speakers. Pete facilitated in-service trainings at Independence, Inc., led jam sessions, and helped organize a large public AUMI training that brought Leaf Miller and Jackie Heyen from New York to lead workshops at Independence, Inc. and KU.

Kip

The workshops were highly successful and generated a short-lived "buzz," but it was clear that we needed to focus on "application": in other words, actually using the AUMI for its intended purpose of enabling music making for anyone. Our first project along these lines was a pub-

lic performance in 2013 featuring people of many abilities (see Hodges Persley, chapter 16, and Mizumura-Pence, chapter 20). "(Un)Rolling the Boulder: Improvising New Communities" (UTB) was a profound success, directly illuminating the power and efficacy of community; we are still in contact with almost everyone who participated. Several people continue to participate regularly in our ongoing events. Since that time, our focus has been to develop and expand our community in partnership with a base of interested individuals and established partnerships in Lawrence and beyond with Independence, Inc, and the Lawrence Public Library (LPL).

In our events, my primary role is as a facilitator. We create a vision of what we want to do; my job is to make sure the technology we need is in place and functioning properly. Sometimes this involves setting up and operating a sound system or editing and uploading user sound files to the AUMIs and creating user instruments. This can be interesting and challenging, but the more profound reward from doing this work has been community building. As we have developed our community and partnerships, my role often involves more than just technology. I resemble an ambassador or advocate for something bigger than just using innovative technology to make some music.

Sherrie

In 2014, Abbey Dvorak, a new faculty member in music therapy, appeared on the scene. By this time, I had lost all shyness about pulling people into the AUMI loop. I was this woman who made a beeline toward Abbey at receptions and workshops, talking about camera tracking and mixed-ability improvisation. Abbey taught a music therapy methodology course and became a mentor to and coauthor with Elizabeth Boresow. Abbey was in! (See Dvorak, Maxson, and Knott, chapter 30).

AUMI Goes to the Library

Sherrie

We continued doing AUMI demonstrations and informal jam sessions, but it was difficult to match the excitement of 2013. One day, I was sitting in Ranita's office, talking about what to do next. I felt concerned that KU didn't feel like a community space for people not affiliated with the university. I preferred activities at Independence, Inc. Then,

Ranita said something that had never occurred to me: as wonderful a space as Independence, Inc. was, people with disabilities lacked opportunities to interact with other communities. We needed another space, more central and visible. Just then, the parent of a music-minded teenaged Independence, Inc. consumer chimed in that our newly reopened, rebuilt LPL had a recording studio on its lower level!

Ranita and I looked at each other, then got in our cars and raced to the library. We didn't even call first! We were lucky to find Ed Rose, manager of the SOUND+VISION Studio, between sessions. Ed is an acclaimed local sound engineer who turned out to be a fan of Pauline Oliveros. He downloaded AUMI, started playing it on the spot, and loved it. Ed was in! We held our first "Do You AUMI?" jam and recording session in October 2015. It was such a success that we continued monthly for the next four and a half years (figure 15.1). When Ed left for another opportunity, he trained the studio's next manager, Jim Barnes, in how to support our monthly jam sessions. We continued these jams with Jim until the COVID-19 shutdown in March 2020. We look forward to resuming when it is safe.

Jim Barnes

In 2014 LPL reopened after an eighteen-million-dollar renovation. This update transformed the library from a 1970s-era concrete building into a vibrant civic space designed not only to be a repository for traditional books, but also envisioned as a modern multimedia community hub. With technology an ever-increasing force in delivering information, it is only natural that libraries offer more technology-based community services like computer access and software classes. But a library is more than simply accessing information. It is a place meant to inspire creation and creativity. To this end, many modern libraries incorporate makerspaces, offering communities a place to create all types of projects using 3-D printing, vinyl cutting, electronics building, and audio-visual spaces.

With construction underway on library expansion, director Brad Allen had a decision to make. In the blueprints, there was an area on the lower level designated as a makerspace, but with several independent makerspaces already thriving in the Lawrence area, the library didn't want to directly compete with their missions. The idea emerged for an audio-visual-specific makerspace, a full recording studio complete with musical instruments offered for free to the public. Lawrence has long had a rich musical culture incorporating many types of artists, from folksy

Figure 15.1. AUMI Jam in progress, Lawrence Public Library. Photo by Meg Kumin.

bluegrass pickers to college indie-rock bands to budding hip-hop MCs. For the town of Lawrence, Kansas, it was natural to make the library a place that encourages all types of artists to express themselves creatively, through music using state-of-the-art technology.

Music creation as community activity has its challenges, however, as recording projects typically are done in private soundproofed rooms sequestered from others. Yes, bands of five or six people commonly work together, but the library found itself eager to increase the communal aspect of its recording studio to include all types of people, even nonmusicians. People coming together to create in an open, encouraging environment where expression and collaboration are the goals. People who may not know each other beforehand, but who can confidently connect and improvise together through music. So when AUMI-KU InterArts sought a new venue for jam sessions outside of Independence, Inc., LPL was a perfect fit.

In early 2017, I came aboard to manage the LPL's musical makerspace. As a Lawrence-based recording engineer and musician with seventeen years of working with small groups of musicians in studio settings, I felt a strong desire to engage with my community in a more meaningful way. Working at a public library, this opportunity presents itself every day through helping patrons with personal music projects, podcasts, and

videos. Participating in AUMI jam events, however, is undoubtedly one of the most communal aspects of working at the library.

Kip's Description of the Library Jam Sessions

Each jam utilizes two library workspaces: a generic conference room and the SOUND+VISION studio. The conference room is set up with four omplete AUMI stations and has a large video monitor connected to a computer with internet access. The session begins with "meet and greet" and eventually divides participants into three- or four-person "bands." Workstations allow participants to get a brief training session if necessary and to choose sounds they want to use during improvisation. Next, participants move to SOUND+VISION's fully functioning recording studio, where there is a matching set of four AUMI workstations. Participants then perform their improvisation, which the audio engineer records. When the improvisation is complete, participants get to watch the engineer mix the recording as they decide on a name for their band and a title for their song. The recording engineer completes the mix, then immediately uploads the result to the library's SoundCloud page. To achieve a kind of closure, participants then move back to the conference room to listen to their work. There is often discussion of the improvisation or some part of the process. (https://doi.org/10.3998/mpub.11969438. cmp.21) (https://doi.org/10.3998/mpub.11969438.cmp.22)

Conclusions

Kip

Everyone who is exposed to AUMI thinks it is "neat." The process of making music and performing has its own rewards. But I think that what keeps people engaged enough to keep participating in our events is the feeling of belonging to the community we've created. All people in our community face the usual challenges of living, but many also face extraordinary physical and mental challenges in a culture that often marginalizes them. The notion of creating an environment that minimizes challenges to meaningful engagement seems obvious, but is all too rare. There is something deeply satisfying about being involved in something that contributes to the greater good.

Lastly, I want to admit that one of my most important reasons for belonging to and actively fostering this community is that it pushes me

into confronting my own prejudices and beliefs regarding "disability." I consider myself reasonably enlightened socially, but being a part of this community has shown me I'm not immune to prejudices, erroneous assumptions, judgmental thoughts, fears, confusions, etc., that affect us all. A willingness to confront and transform these problems is a good thing, for me and for all.

Sherrie

This partnership didn't blossom because some academic said, "I need partners for this grant I'm writing so I'll make a couple of calls." Pauline's prompt—"take AUMI to your own community and start an AUMI improvising group"—demanded change in my academic routine. I had to get over myself enough to talk to people I didn't know and ask them unusual questions like, want to play with me on an adaptive instrument that can be played by all bodies? Some politely declined. But many said yes and had unexpected reasons for wanting to do so. Those different pathways and desires enriched the project! And we are still doing it! That's what it is, I guess. It's doing something with other people who know things you don't know and see things you don't see. Maybe we come to it for the same reasons, and maybe for different reasons. One thing I learned is the limits of "narrative" for listening to stories. We needed to listen differently and expansively to one another, in order for our time, care, and energy to yield something that isn't there yet. I am so grateful for all my coimprovisers in Kansas.

Ranita

What began as "curious" exploration of a new way of creating music has developed into an ongoing partnership that expanded to new and wonderful community partners. The LPL SOUND+VISION studio provided numerous ways for people with disabilities to come together in their community and create music. The monthly AUMI jam sessions are true to Independence, Inc.'s vision of a community of where all citizens can come together no matter their differences.

Jim

Each month, AUMI jam sessions showcase core principles the studio was founded on: community, inclusion, and creation.

Timeline of AUMI-KU InterArts in Kansas, 2012–2021

The next five chapters address highlights from activities of AUMI-KU InterArts through various lenses. Below is a timeline to assist readers in tracking these events.

2012

- *September*: The first AUMI-KU workshops and demonstrations held in Lawrence, Kansas, at two sites: KU and Independence, Inc.

2013

- *September–October*: A series of rehearsals culminating in a live public performance titled (Un)rolling the Boulder: Improvising New Communities, held on KU campus.

2014

- *May*: AUMI-KU InterArts cosponsors Accessi-BALL, a music and dance event organized by the KU disabled students' group AbleHawks and Allies, on KU's campus.
- The Disability Studies Seminar at the KU Hall Center for the Humanities is launched. Several sessions have featured presentations by AUMI-KU participants.

2015

- AUMI-KU begins hosting monthly AUMI jam sessions open to campus and community participation at LPL. These became regular programming at LPL for the next six years.

2017

- *August*: Improvising Inclusive Communities: Jesse Stewart and the AUMI Workshop Ensemble perform on KU campus and at LPL.

2018

- *December*: AUMI-IONE Dream Ensemble performance on KU campus, livestreamed to RPI, Troy, New York.

2019

- *November*: AUMI-based performance for a session of the national conference of a2ru (Alliance for the Arts in Research Universities) on KU campus.

2020–

- The COVID-19 pandemic lockdown curtails public AUMI-KU InterArts activity, but participants sustain the project through jam sessions on Zoom.

SIXTEEN | Love, Actually

Using AUMI to Transgress Ableist
Directing Habits

NICOLE HODGES PERSLEY

> No matter where the oppressed are found, the act of love is a
> commitment to their cause—the cause of liberation. And this
> commitment, because it is loving, is dialogical. As an act of
> bravery, love cannot be sentimental; as an act of freedom, it must
> not serve as a pretext for manipulation. It must generate other
> acts of freedom; otherwise, it is not love. Only by abolishing the
> situation of oppression is it possible to restore the love which that
> situation made impossible.
>
> —Paolo Freire, *Pedagogy of the Oppressed* (1993, 11)

Love is the least referenced resource I hear in the ecosystem of directing, both in academia and professional spheres.[1] In *Pedagogy of the Oppressed,* Paolo Freire (1993) suggests love is a revolutionary platform upon which transformative education and praxis can be taught and nurtured. He argues, "No one can be authentically human while he [*sic*] prevents others from being so" (85). Furthermore, Freire contends we must recognize when we have incorporated strategies and tactics of oppressive regimes disguised as acts of love, when, in fact, they are a form of lovelessness used as pretext for manipulation (85). Discovering and dismantling such forms of oppression is integral to developing what Freire calls "conscientization" or "critical consciousness," the process of gaining knowledge about systems and structures that create and sustain inequity. Freire's ideas permeate my approach to scholarship, teaching, and creative work.

bell hooks (1994) builds on Freire's concept of critical conscious-

ness, arguing that creating radical change requires radical restructuring of teaching paradigms. In *Teaching to Transgress*, hooks reflects on the moment she connected teaching to possibilities of liberation that challenge systemic hierarchies embedded in the educational system. Commenting on school experiences as a young girl, she writes, "Almost all our teachers at Booker T. Washington were black women. They were committed to nurturing intellect so that we could become scholars, thinkers, and cultural workers—black folks who used our 'minds.' We learned early that our devotion to learning, to a life of the mind, was a counter-hegemonic act, a fundamental way to resist every strategy of white racist colonization" (2). Like hooks, my early teachers were African American women who truly shaped my life as artist and scholar. In my experience as a theater and film director, things have not been so inspiring. I had no mentors who looked like me. Unless my colleagues were friends, my directing work was pigeonholed as "niche" or "racially specific" because of my focus on Black theater and film and African American experience. Instead of examining my work as part of a larger whole of American theater and film practice, cultural gatekeepers often categorize and marginalize my work based on its subject matter and my subject position.

Freire and hooks helped me develop a form of praxis as an artist-scholar who fights against anti-Blackness and other forms of discrimination in arts and education. Despite my commitment to social justice—or perhaps because of it—I have found areas of pretext, sentimentality, and manipulation in my directing process that constitute a form of ableism I very much want to confront. Working with AUMI has helped me critically examine these ableist assumptions and expand my critical consciousness as a director and educator.

This chapter is testimony about how I transgressed personal areas of inadequacy in my discursive and technical capacity as director and scholar while working as part of AUMI-KU InterArts at the University of Kansas (KU) (See Barnes et al., chapter 15, and Mizumura-Pence, chapter 20). I explore how AUMI expanded an engaged pedagogy that centered my love of the acting craft and community engagement while encouraging me to rethink how I could incorporate more intersectional, critically conscious language of directing into my practice. Working with AUMI allowed me to be vulnerable because I did not know how to use the software any more than did the community members I worked with on the project. Using improvisation in devised performance[2] allowed me to foster an empathetic environment where

we co-developed holistic evaluation methods that challenged ableist assumptions about performance aesthetics and what constitutes theatrical success.

The Language of Love

I began by claiming love was an "under-referenced resource" in academic and professional directing. This differs from saying the word "love" is scarce—far from it. Language surrounding theatrical practice is riddled with surface ideas of love: love of craft, love of acting, love of directing. One love language that is lacking is engaged pedagogy that allows us to think about effects of knowledge production in musical, embodied, or tactile forms. When learning theater in college, I studied, learned, and heard predominantly white Eurocentric acting and directing scholarship that never mentioned race, gender, sexuality, or disability as things to be considered. I also learned very little about improvisation or devised performance.

Students can still graduate from most predominantly white institutions without addressing race, ethnicity, gender, sexuality, or disability as part of their critical analysis of scripts or craft. Theatrical language used for teaching and directing theater generally does not have to approach topics of race or disability unless prompted by a "diverse" play (i.e., a work by a non-white playwright or one dealing directly with disability or other marginalized identity markers). Though I could readily recognize racism and sexism embedded in discourses of theater acting and directing practices, I was less attuned to the widespread tendency in academic and theatrical discourse to assume students, actors, and technicians are *not* living with disability.

In 2013, I was invited to direct a devised performance initially called "Four Rehearsals and a Performance" (FRAP), a community-based performance created to bring awareness of AUMI software and ableism at KU and in the broader community. In my directing practice, improvisation has been an important tool for confronting many racist and sexist assumptions I have encountered in American theater pedagogy as it pertains to acting and directing. I immediately said yes to the project because I knew my understanding of Disability Studies as a field was minimal, but I had years of improvisation experience and actively worked in diversity, equity, and inclusion efforts on campus. I accepted the opportunity to take a deep dive into an area that could fortify my teaching and practice as a director. Little did I know that improvisation and AUMI

would open opportunities to face my own ableism and embark on a journey to gain greater fluency in disability. I took the opportunity to "consciously uncouple" from inherently ableist discourse embedded in my vocabulary and praxis as a director.

Loving the Process

As a director, I always tell actors: "love the process." In each project I explore in theater, film, or television, my job is to facilitate storytelling: a writer leaves a story blueprint on paper that a director brings to life in collaboration with a production team and actors. In the case of my AUMI work, however, there was no script. In FRAP, the research team created a call for performers from the community and targeted places to post the announcement to attract volunteers with wide-ranging abilities and mobilities. I usually hold casting sessions requiring actors to read or perform monologues from parts of a script I am producing. With AUMI, however, I surrendered to the moment by creating a performance with everyone who volunteered, regardless of background and ability.

I couldn't work from my usual assumptions (whether prescribed by a play text or by the directing field) because these skills did not prepare me to work with physically- and neuro-diverse people without acting experience. I had to abandon expectations of what actors would be able to "do" and instead focus on who they were and how they self-presented from moment to moment. I drew on critical consciousness and engaged pedagogy approaches I use in classrooms and applied it to working with FRAP volunteers. Meeting performers where they were, I used AUMI to help me see, feel, and hear their experiences, and to learn what they wanted the performance to say, instead of my perception of those experiences and how they could be neatly tied into a performance narrative.

Over four rehearsals, we worked as a collective to devise a script that synthesized experiences of our mixed-ability group of performers and music enthusiasts. I sought approval from the group after each rehearsal by "playing back" the work we did each day verbally. We had frequent wellness check-ins to make certain performers felt comfortable. Our growing love for the co-creative process fostered positive energy. Our performance script became a skeleton upon which collective improvisation provided flesh and muscle. My directing process shifted dramatically because instead of using my normal theatrical language, I had to surrender to the language of possibility we were developing together.

Figure 16.1. Lorie Sparks and JoAnne Fluke (foreground) experimenting with AUMI at rehearsal for "Four Rehearsals"/"(Un)Rolling the Boulder," October 2, 2013. Spooner Hall, University of Kansas. Photograph by Ray Mizumura-Pence.

For example, instead of walking in stage right or stage left, actors sometimes rolled in or called in vocally from parts of our simple stage. In this devised performance, we also adopted new, more flexible senses of timing, rather than relying on scripted cue lines or counting in tempo. I re-examined assumptions in my directing language in ways I had never considered before.

As performers engaged iPads set at various heights around the room to accommodate wide ranging ability and access, they decided how AUMI could work with their particular bodies and abilities (See figure 16.1).

The inventiveness of my collaborators in performance taught me to make no assumptions about what given bodies could do or feel. I did not rely on actors interpreting their training to manipulate their bodies or voices. Instead, I asked questions about how they would like to

use the space and how they planned on getting to the given area of our performance space, individually or with the collective's support. These questions helped performers think as a unit and support one another as we solved challenges we faced together in moving about the space.

Engaging with the AUMI stations and improvising within parameters of our emerging performance design helped me imagine new ways to block space (the embodied or verbal process of the director mapping where actors move onstage to deliver the text). I learned to seek multivalent experiences from the performers that reflected each member of our production. Improvisation as a call-and-response practice can enable artists to create meaning together using sound, gesture, embodied feelings, music, found objects, and generative combinations of visceral, emotional prompts. We embodied a broad variety of disabilities, visible and non-visible, that *animated*, not *hindered*, the performance.

Love Revelations

Before working with AUMI, I never considered conditions such as chronic pain, anxiety, or psychological experiences of alienation to be part of a disability spectrum. I never considered how many spaces exclude communities by their very design. I never considered incorporating light and sound sensitivity, haptic options, or sign language as part of scripted productions. My ableist reliance on play and script texts filled with stage directions and dialogue accessible only via reading excluded many performers. People live in their bodies in a multitude of ways. We all experience life through various expressive capabilities and ranges of movement. I was a bystander who had unknowingly participated in constructing performances that reinforced monolithic interpretation of disability. Confronting my limited understanding of wide-ranging needs and expectations of people with disabilities, and limited possibilities available to artists with disabilities in mainstream performance, forced me to ask if my omissions were any less egregious than those I had suffered as an African American female director.

The collective of performers renamed FRAP "(Un)Rolling the Boulder: Improvising New Communities" (UTB) to recognize the extent to which living with disability in an all-too-often unaccommodating world feels like a Sisyphean task. UTB was a call to deprogram the ableist world. The parenthetical prefix "(Un)" in the title reflected a shared desire to challenge dominant society's inaccessibility by co-creating truly inclusive performance that valued and respected all bodies.

I adopted a multimodal approach to empower actors to self-present and engage movement in ways that felt authentic to them. Through improvisational, prompt-based movement exercises inspired by words or music, as well as call-and-response patterns activated by various gestural and tactile engagements with AUMI, we created a collective happening that allowed all to become improvisers and co-directors. Instead of engaging a hierarchical approach that positions the director atop the pyramid, I employed a lateral approach that allowed each actor to show me how AUMI software made sense to them.

Love Altered

After directing this performance, I vowed to deprogram my directing vocabulary and approach to devise a process that considers ability and disability mutually constitutive while using improvisation to help me work with the community to develop comedy and drama. My engagement with the devised AUMI performance was a gift that allowed me to rewire my directing. I learned to think holistically about working with actors in ways that incorporated not only race, gender, class, and ethnicity, but also disability as a vital component of art that offers a wide range of physical and emotional access. I revised my directorial language to consciously couple understanding of disability and mobility within intersectionality's prism.

My love for the directing process was completely altered. It became less about me and my love for the craft and storytelling and more about communities I serve, the playwrights, screenwriters, actors, and community devising partners I engage. My work became less about my artistic vision, and more about how I could alter praxis to ensure all kinds of performers had access to participate in productions onstage and off, on camera and behind the scenes. The love center of my practice in engaged classroom pedagogy was extended to include rehearsal and production.

Revealing Biases through AUMI

AUMI was created to open opportunities for people with varying mobility ranges to create music. This work revealed my unconscious biases. It taught me that the ways directors encourage actors to engage in movement and meaning-making using the body and the voice assume ideas of "standard" or "universal" movement. Even learning more about relations between ability, the body, creativity, and improvisation within a spe-

cific cultural context does not guarantee that a director acknowledges or accepts people with disabilities. Using terms such as "blind spots" and "able-bodied" in my praxis as professor and director limited my capacity to tap into more creative, affirming spaces.

By engaging my background in critical consciousness and engaged pedagogy, I revised my language and behavior to align with my core intersectional beliefs instead of the study field and directorial practice that alienates me as an African American woman and regards equitable and inclusive theater- making a niche idea. Black theater- makers are taking white producers and mainstream unions to task in the age of Black Lives Matter for their perpetuation of anti-Blackness and white hegemonic practices, challenging Eurocentric "norms." Similarly, UTB challenged "able-bodied-centric" theatrical space and direction. In dominant assumptions about disability, bodies considered "disabled" must be marked in legible ways requiring so-called "able-bodied" or "able-minded" people to acknowledge, include, and accommodate instead of reimagining pedagogy, directing, and processing time for lessons and actions through an intersectional lens.

Through directing UTB, I realized my love for theater, great stories, social justice, and holistic living was wildly ableist and entitled. Before AUMI, unless an ability, mobility, or capacity was mentioned in the text of a play I was directing, or a student or actor required accommodation, I never consciously considered that assumptions I made in my day-to-day life were actually bereft of love and downright problematic.

Unrolling Ableist Rhetoric

Though I've spent the past fifteen years creating, teaching, and directing Black theater and developing critical consciousness and holistic teaching, it never dawned on me that theater directing and acting practices I am connected to are inherently ableist. My Black teachers prepared me to be an artist who was proud of my culture and of being a Black woman in a largely white world. The tools of critical consciousness I used to challenge racism and sexism, however, did not equip me to deconstruct systemic ableist practices in theater discourse that unconsciously riddled my everyday work. Lydia X. Z. Brown (2021) contends that ableism "runs deep in theatre and other performing arts communities. It shows up not only in the stories we tell but also in how we tell those stories—and it shows up in the spaces where we learn, rehearse, and perform." I discovered that my process, no matter how focused on

liberation and equity, could not be love-filled unless it redefined the very process of teaching and practicing theater from a holistic viewpoint that was equitable by design.

I had to relearn how to think about the infinite range of possibilities, mobilities, emotional statuses, and sensorial experiences continuously at play in our everyday lives. American research universities and theater have much in common. Both institutions represent mainstream society as always already white, prosperous, and aspirational while positioning non-white groups as targets to be "included" or as people to "diversify" assumed heteronormative white "wholes."

In developing critical consciousness about disability, I learned through direct involvement with communities whose life experiences are very different from mine how to work collectively to build social connections and achieve community objectives. To surrender to your weaknesses and insecurities is part of developing critical consciousness. In working with AUMI, I was able to identify oppressive language and conditions that shape my knowledge about directing. For example, technical language for directing actors is riddled with instructions that not all people can embody. Stage directions such as "walking in from stage right" or "she listens closely at the door" or "he sees her at the coffee bar and stares until he catches her eye" all assume various abilities and mobilities.

Without careful translation, adaptation, and reconsideration of such stage directions, directors can make actors feel marginalized within casting, directing, rehearsal, and performing processes. For actors with legible and illegible disabilities, accommodations such as multimodal and sensorial rehearsal spaces, time considerations, and multiple access points and occupation of space (including sound and tactile environments) are essential considerations that can create empowerment for all. If the director has no linguistic, emotional, sensorial, and egalitarian approach to developing performance, many actors are diminished and made to feel "exceptional" within a white, heteronormative, ableist theater world in ways that reify power dynamics of exclusion.

Love, Actually

This chapter's title comes from *Love Actually*, the 2003 film by one of my favorite directors, Richard Curtis. In this ensemble film, different stories of love in crisis play out during Christmas holidays. Each tests boundaries of what love can endure. The film allows audiences to peer into the very complicated lives of everyday people. We watch them learn how to love.

How to love life. How to be better parents, friends, mentors, and partners. We watch them fail over and over until they learn what they need to know to arrive at better versions of themselves. I love the film because it teaches us that, even with best intentions, love often goes wrong. It is what we do when it goes wrong that teaches us how to be better humans.

When I joined KU-AUMI InterArts, I would have taken issue with anyone accusing me of being ableist. I've spent my adult life loving art and using it to enable social justice conversations about equity onstage. I've spent more than fifteen years teaching students and inspiring them with my love for the craft of acting and directing. I love my work and I love my students enough to tell them hard truths that can help them grow. Despite good intentions, I could not see that immersion in academia and in acting and directing led me to absorb ableist habits. In my pedagogy and directing, I was guilty of reinforcing ideals counter to the liberation pedagogy and engaged teaching I pride myself on as a scholar-director. My love for my work and my craft was insufficient. I owed myself more. I owed my students more. I participated in a flawed system that urgently needs a makeover. When I elected to work with AUMI, I embarked on a journey I continue today, regularly asking hard questions about empowerment and equity in classrooms and rehearsal spaces. I stand for others more than myself. I ask for representation. I teach Critical Disability Studies in my classroom and practice it in my rehearsal spaces. I seek out colleagues and students who know more than me, and I ask for help to create spaces that reflect multimodal living. After more than a decade of working with AUMI and doing disability justice work, I still consider myself a beginner.

In projects such as UTB, success is not tethered to cast members' performances, but rather to the production's capacity to meaningfully engage the cast and crew in enacting social justice through performance. My goal is to use the stage as a platform to present opportunities for, and examples of, empathy that inspire humanization and liberation of the oppressed. Love is essential when performers confront their oppression through a problem-posing theater process that enables self-reflection and opportunities to reflect on others' experiences.

I also realized I was complicit in encouraging an Aristotelian model of storytelling basic to Western dramatic performance. As much as that structure has disciplined my body and consciousness into moments of self-loathing and what Jose Esteban Muñoz calls "*disidentification,*" I realized the only way to change my behavior was to invent a new language for directing. The whole exclusionary and ableist field of mainstream direct-

ing language requires all directors dedicated to liberation of oppressed people to reimagine and rearticulate how to do the work. Muñoz's disidentification (1999) is connected to Freire's critical consciousness because it offers rich opportunities to reimagine meaning:

> Disidentification is about recycling and rethinking encoded meaning. The process of disidentification scrambles and reconstructs the encoded message of a cultural text in a fashion that both exposes the encoded message's universalizing and exclusionary machinations and recircuits its workings to account for, include, and empower minority identities and identifications. Thus, disidentification is a step further than cracking open the code of the majority; it proceeds to use this code as raw material for representing a disempowered politics or positionality that has been rendered unthinkable by the dominant culture (31).

In my rehearsal and directing process for UTB, I had to permit myself to disidentify with encoded meanings of "ability" and "mobility." Cultural texts surrounding disability are fraught with hierarchies of power, particularly racial and gender inequalities. Disability, as it was raced and classed in my consciousness, was a term used to describe normatively white bodies. From my African American community experience, the notion of disability is purposely disconnected from ideas of incapacity. It incorporates the range of ability present in a body within everyday living, doing, and loving. People with limited mobility in my family are treated the same as any other person. Making the family member feel "different" because they experience life and mobility on different scales than other family members is regarded as an unloving, unwanted act. I never thought of applying these lived principles from my life to my direction until the AUMI-devised performance.

   In theater classrooms, spaces are designed to teach "abled-bodied" performers. There is no "accommodating apparatus" to help students with disabilities participate. In some respects, accommodation is akin to integration because it assumes an emotional weight of tolerance versus acceptance and invitation. Furthermore, predominantly white institutions assume "normative" students will be white and without physical, neurological, emotional, or psychological disabilities. To explore those coded messages of exclusion, I made space in "(Un)Rolling the Boulder" for each performer to present as they wanted to, and to use their bodies in whatever capacity felt right to them. In the words of

Muñoz, we "crack[ed] open the code of the majority" to examine how we could edit the narrative of need at the institution to one of self-love that demands accommodation as an act that recognizes shared humanity across abilities.

My goal was to guide performers to be themselves unapologetically despite constraints of the space, which had accommodations for wheelchairs, but not for sight- and sound sound-impaired humans (we requested haptic and ASL interpreter access be added[3]). We allowed the performance to reveal limitations of how we think about access and equity. The very idea of accommodation suggests the person being helped is insufficient, requiring supplementation to function and live in the space for any given time. Instead of creating spaces inclusive of all types of human mobility and sensory experience, we continue to normalize some human experiences over others regarding how bodies move, feel, hear, touch, and experience space. I wanted performers to fill the space with themselves as they are in their wholeness, not through projections cast onto their human experience through conscious and unconscious biases.

Improvisational moments inspired by AUMI afforded multivalent use of music, suggested by each member. The performance included elements of European classical music, jazz, and Latinx music, as well as samples of cello, drums, keyboards, and other forms of physical music-making triggered by movements of performers who used their bodies to make different shapes and sounds via AUMI. We also incorporated a Zumba dance routine taught by dancer, Zumba instructor, and wheelchair user JoAnne Fluke. In so doing, we broke rules of engagement that theater directing constantly enforces to make certain types of performance legible as theater that can be categorized and rewarded as "universal." As our performance made clear, not all theater fits neatly into a category. Notions of a universal anything imply that something or someone is not, which reproduces hierarchies of inequity that fuel the very binaries AUMI seeks to dismantle.

When faced with truth of oppression, love is a courageous act that enables us to find freedom to dialogue about humanization. In UTB, we found that freedom by improvising with one another through devised performance without boundaries or expectations of particular notions of excellence. While working with AUMI, I learned to love, in new ways, what I do as a director and educator, by loving and trusting students and community partners enough to introduce me to a better version of myself so I can serve my community as it needs and wants to be sup-

ported. I hope that, by sharing my process of re-education and interrogation of my ableist behavior, I can inspire and empower other scholars and artists to allow themselves to be vulnerable enough to make change for the better.

Notes

1. I consider love a revolutionary act of creative, personal, and collective revision that can inspire social justice minded change. For more on love and social justice see Cheng 2020.

2. Devised performance is a theatrical method where the script or performance score is co-developed through an ensemble's collaborative, improvisatory work.

3. Haptics is the technology of transmitting and understanding information through the sense of touch. ASL is American Sign Language.

SEVENTEEN | Wooden Snapdragon

JULIE UNRUH

Invented Musical Instruments
Commanding figments on the screen to play
with the movement of the body
  dreams filled with music that
  floats above our heads at night,
  as the woman in green boots plays
the drums with conviction.
Dancers spin around
as music pours out of the
poetry pounded on the computer
keys that appear on a white
  slide, above their heads.

Being one of the performers that would play the abstruse musical instruments, I wanted to capture it all in a picture, how our ensemble's music affected everyone, even the performers. Not being much of a person who can draw, describing it in words as a poem was my only way to show it in pictures. So the words gathered in my mind fell out of my pen onto the paper.

EIGHTEEN | Improvising Inclusive Communities

Shared Reflections on the Jesse Stewart Residency in Lawrence, Kansas

ABBEY DVORAK, KIP HAAHEIM,
RAY MIZUMURA-PENCE, AND SHERRIE TUCKER

Julie Unruh's "Wooden Snapdragon" (chapter 17) takes its name and inspiration from an ensemble that coalesced during a week-long artist residency of Jesse Stewart in Lawrence, Kansas, in 2017. This was the most ambitious project to date of the partnership between AUMI-KU InterArts, Independence, Inc., and Lawrence Public Library (LPL) (chapter 15). By this point in the partnership, we had clarified shared goals. We wanted to know how mixed-ability AUMI improvisation facilitates inclusive community practice. This is not to suggest that AUMI *always* accomplishes this, or that *only AUMI* improvisation can expand inclusivity. It was something we noticed in our work together, and we wanted to learn more about how and why this happens when it happens and to reflect on specific conditions and practices that seem to contribute to the community-expanding potential of AUMI performance. How, for example, does a diverse group of individuals—relative strangers, despite living in the same community—so quickly become the intimate ensemble of Julie's poem?

In its opening lines, Julie's poem offers a stirring interpretation, evoking performers' active roles in creating the movement-generated music: they "play drums with conviction" and "spin around." At the same time, the poem acknowledges the action of the music on performers: the music "fills" their "dreams" and "floats above their heads." Who is

"acting" and who is "acted upon" is blurred, dreamy, interactive. This emphasis on creative interactivity is echoed in Julie's explanation that she wanted to "capture . . . how our ensemble's music affected everyone, even the performers." The poem's name, "Wooden Snapdragon," is the ensemble's name but is also a trace of events and conversations shared by a group of performers in the process of becoming a band. For one performer, the ceiling of the auditorium looked like a wooden dragon; another had recently learned how to snap his fingers, inspiring a communal finger-snapping motif. It is not just the name, but the naming, that demonstrates movement of individuals into an inclusive community of music makers.

This chapter explores AUMI and inclusive community practice through observations of Jesse's residency. We share what we learned through rehearsals and performances and as expressed in post-performance reflections of performers and audience members.

Overview

Supported by a National Endowment for the Arts Multidisciplinary ArtWorks grant and a KU Commons grant for interdisciplinary research, events that made up "Improvising Inclusive Communities with the Adaptive Use Musical Instrument" took place August 6–13, 2017. It began with Stewart's five workshops, culminating in two performances by all community members (including organizers) who wished to participate. We documented these activities by filming performances and rehearsals and conducting postperformance interviews with performers and audience members.

At week's end, we held a two-day symposium of the full AUMI Research Consortium, whose members attended one rehearsal and both performances. The convergence was both intensely local, centered in LPL (site of ongoing AUMI jams), and expansive, connecting the Lawrence AUMI community with members of the AUMI Research Consortium, who traveled from other AUMI communities across Canada and the United States to share findings and help with data collection. Together, we pooled our thoughts, feelings, and experiences about how it is that AUMI improvisation is so often experienced as contributing to inclusive community practice. Pauline's passing prevented her physical presence, but she was a coinvestigator on the grant, and her leadership and vision were palpable. IONE traveled to Kansas, along with many out-of-town

Consortia members: Ellen Waterman, Gillian Siddall, Laurel Forshaw, Henry Lowengard, Jonas Braasch, and, of course, Jesse Stewart.

Jesse is a multidisciplinary artist and founder of We Are All Musicians (WAAM), an organization dedicated to fostering inclusive music making (see Stewart, chapter 21). He is experienced at working with mixed-ability groups and has contributed to many performances involving AUMI. Based in Ottawa, Ontario, Jesse is an AUMI Research Consortium member. For this residency, he conducted five ninety-minute workshops (Monday–Friday) followed by two performances, in which fifteen community members with and without disabilities participated. Most workshops and one performance were held at LPL; one workshop and a second performance were held at Spooner Hall at KU. After each performance, audience members were invited to complete surveys and participate in brief interviews, called "audience intercepts," led by Ellen Waterman, working with a team of volunteers. Participants in workshops and performances were invited to share insights and experiences in interviews with one another. Opportunities for postperformance reflection were geared toward learning in which moments the performers and audience members felt most connected to others, and in which moments they felt least connected. Disability rights advocate Ranita Wilks participated in question selection and design to ensure they were appropriate for interviewees across abilities. She also conducted many of the interviews.

Setting the Stage: Jesse's Workshops/Rehearsals

Jesse began the first day touring sites where rehearsals and performances would take place. Rehearsals began later that afternoon.

Though Jesse had originally requested three-hour rehearsal time blocks, Ranita recommended ninety minutes as a maximum daily rehearsal time for a community that she knew well. Our rehearsal time—3:30–5:00 p.m.—made it difficult for people with 9-to-5 jobs, but the 5:00 p.m. end time was important to ensure that participants could catch the last accessible bus. Identification as a person with disabilities was not a requirement, nor was disclosure. But because our advertising specified "all abilities welcome," described how AUMI worked, listed Independence, Inc. as a cosponsor, and was distributed to agencies serving communities of disability, those signing up represented a diverse mixed-ability subset of the local community.

For each session Jesse preloaded eight AUMIs on iPads (henceforth

AUMIs) with pitched sounds and percussion instruments. Each was tuned to the same major pentatonic scale. In a sense, this ensures a kind of consonant, "pleasing" sound environment, no matter what shape a performance might take. Each AUMI had its own small speaker. Some were on music stands that could easily be repositioned for individual users as needed or desired. Others were attached to tables facing a common space to allow participants to move freely about the room for larger movements or dancing. Both venues were small enough that no central sound reinforcement system was needed. Jesse also brought a large box of small hand-held percussion instruments (e.g., wood blocks, gongs, bells) for participants to play.

The first rehearsal began with a get-to-know-one-another session. The group had a wide representation of abilities, personalities, interests, sensory preferences, and comfort zones regarding playing music, performing in public, and social interaction. There was a particularly broad range of musical or performing experience among participants, ranging from none to extensive, even professional. As the week progressed some folks with musical training brought instruments (flute, accordion). A small majority of participants were experienced with AUMI through other events we had held, primarily the monthly AUMI jam sessions at LPL.

Jesse then began several four- to eight-minute improvisations. After each, he solicited feedback and provided encouragement. His purpose was to assess performers' interests, sound preferences, and abilities so everyone could find comfortable roles in the musical experience. Improvisations focused on three participation methods: (a) with AUMIs, (b) auxiliary percussion instruments, or (c) body movements and dance (see Hayes and Tucker, chapter 19).

The first improvisations were collective free-for-alls, in the best possible sense. For each subsequent improvisation, as people became more comfortable, Jesse introduced some new element or small amount of structure. For the second improvisation he distributed small auxiliary percussion instruments and didn't use AUMIs. Before another improvisation Jesse asked how the piece should start and end. Someone replied, "Start with the accordion and end with a gong." This may seem minor, but it introduced a structuring element while getting everyone listening and focusing on the experience. By the end of the first rehearsal Jesse had introduced the notion of a "director" who controlled the improvisation's shape in real time through cueing dynamics or eliciting responses from specific participants.

Everyone was encouraged to take a director's role and to feel their ideas mattered. Every suggestion was acknowledged and implemented, immediately if possible. Nothing anyone said was dismissed. This, in fact, is how Joe Steffi's finger-snapping motion became incorporated as part of the group's improvisation and identity. Eventually it became an important bonding gesture that people began using to express approval (like applause). Julie, the group's poet, mused about how she might contribute to the sound through writing. Jesse had a computer with visualizing software (a digital synthesis program called DIN) that allowed for someone typing on a computer keyboard to create animations of colorful shapes. This became a significant aspect of the LPL performance. It makes an appearance in Julie's poem as music that "pours out of the poetry" and appears on the screen "above our heads."

For the rest of the week rehearsals followed a similar pattern, gradually developing groundwork for performances. Each performance was entirely improvised but had a clear formal structure, something easy to remember for performers and clearly perceivable by audience members. Often the focus was on interaction between performers. One example, in which performers took turns making hand and arm gestures while others mirrored those movements, is elaborated in the next chapter (Hayes and Tucker, chapter 19). During workshops and performances, these interactions arose spontaneously in unexpected ways both in movement and musical performance, providing the most compelling moments for audiences and serving as bonding moments for performers.

Cocreating Inclusive Performance

We scheduled two performances, each in a different venue, selected for accessibility and successful history of prior AUMI activities. Because Jesse was encountering these spaces for the first time, we were surprised when he created a unique performance for each, rather than adapting the first performance for both sites. He provided continuity by placing the audience around the perimeter for each performance, while performers used the inside space, near tables set with AUMIs and other instruments (see figures 18.1 and 18.2). Both shows ultimately involved people playing acoustic musical instruments along with AUMI, and using AUMIs as pitched instruments activated through dance and gestures. Jesse played drums and "directed" in both, with space for leadership to be passed around at various moments. The differences, mentioned below, were subtle but significant in optimizing physical properties of each space

and increasing opportunities for creative exploration for the ensemble members.

LPL's auditorium, a fairly large space without natural light, is carpeted (so acoustically subdued). The performance in that venue used a video projection screen to display animations Julie created by typing. At first, AUMIs were played specifically by performers. As performance progressed, AUMIs were flipped over and aimed generally at the "dance area" to pick up movement there. Thus, at first, AUMIs contributed a more focused "intended" sound. Once flipped, AUMIs picked up general movements or gestures made incidentally. For the LPL performance Jesse distributed small percussion instruments to performers: wood blocks, small gongs, bells, shakers, etc.

Spooner Hall's performance space is slightly smaller than LPL's auditorium. Natural light streams in from tall windows on opposite walls. Plaster walls and a wooden floor contribute to the room's acoustical vibrancy. Another interesting feature is the pillars spaced evenly in the room. These visual "dividers" are focal points, for better or worse: "in the way" if not factored into composition, or adding interest if used creatively. Jesse took advantage of all these elements with strategic placement of performers' tables and AUMIs. AUMIs were placed against walls, behind the audience. They picked up the room's general movements unless someone moved in front of an AUMI and took control of it. This setup encouraged audience members' participation. Another important difference was Jesse's incorporation of a set of pitched chimes borrowed from KU's Music Therapy Department. By this time, the ensemble had achieved a level of sensitivity to one another and the collective sound. Jesse selected which chimes would be available (ensuring compatible pitches) and designated a section of the performance when these would be used, but it was up to performers to take it from there.

For both performances, the audience formed a semicircle around the performers, close enough to the action to perceive relationships among individual performers interacting with one another and the larger group. Performers did not face the audience, but rather the center of the circle. With their backs to the audience, they could face Jesse's drums (where cues for starting the next collaboratively developed theme were gently disseminated), or one another, in sections of performance where interactions that emerged in workshops were developed as part of the program. A glimpse of how audience members engaged the performance is offered in Oliver Hall's film, linked below, assembled from footage shot by KU librarian Tami Albin. (https://doi.org/10.3998/mpub.11969438.cmp.26).
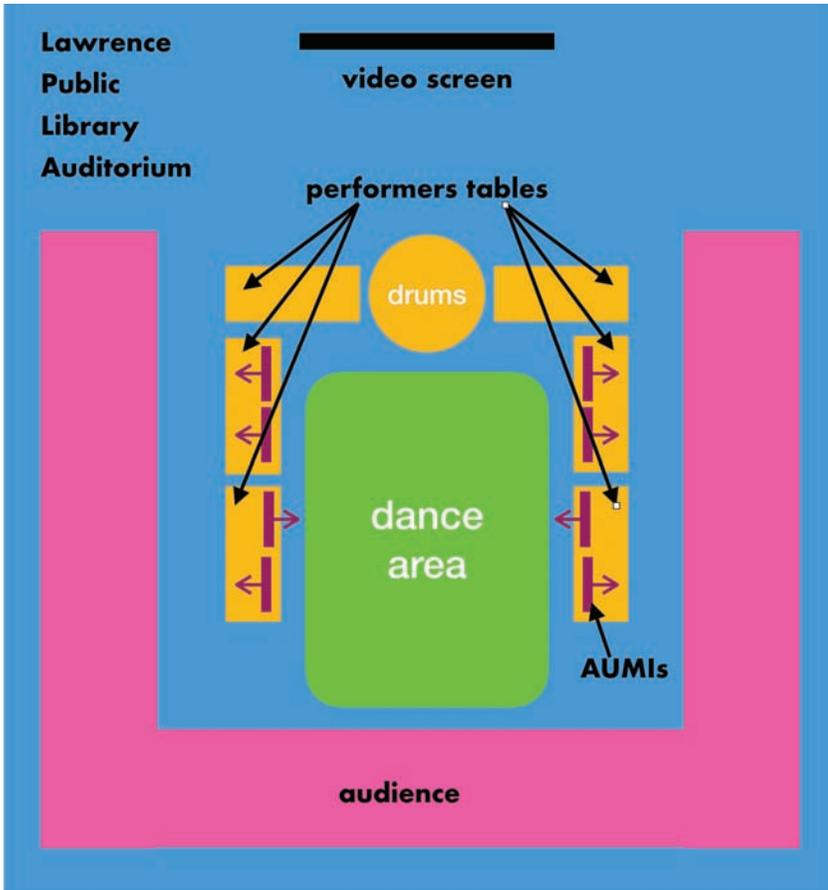
Figure 18.1. The Setup for Lawrence Public Library.

Audience Reflections

Bonds musicians established in rehearsal grew stronger throughout the two performances. But what of the audience? Did they also feel connected to the performers? How did they understand what they had just witnessed? In surveys and interviews (approved by the KU Human Research Protection Program), audience members emphasized *connection*.

Survey questions asked audience members to rate the degree to which they agreed with these statements:

1. This performance helped build community through the arts.
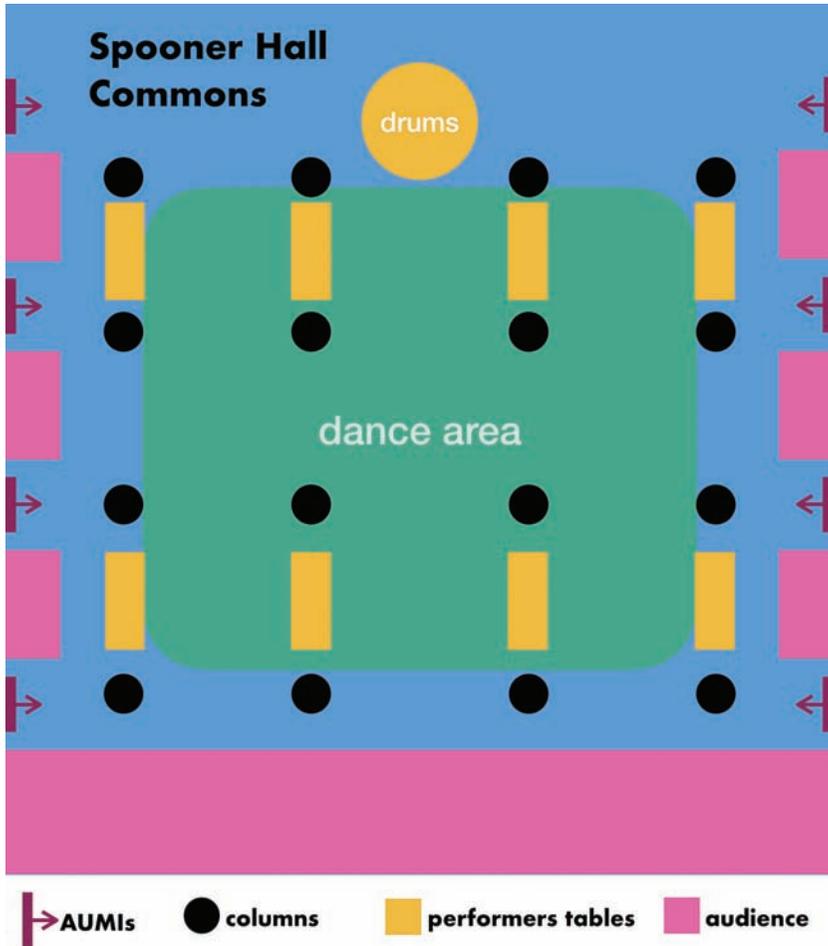
Figure 18.2. The Setup for Spooner Hall.

2. In this performance, all performers participated equally, regard-less of ability.
3. I experienced a new level of connection to my community through this experience.
4. This experience has changed my perspective about music in some way.
5. This experience has changed my perspective about ability and dis-ability in some way.
6. I benefited by attending the performance.

7. I was affected in some way by attending this performance.
8. I enjoyed my experience as an audience member.
9. I would attend a similar event in the future.
10. I would like to perform in a similar event in the future.

Due to the nature of the questions, it isn't surprising that most audience responses were positive. Distinctions are in the ratings. Most responses landed in "strongly agree" or "somewhat agree" categories. Mean scores ranged from the lowest for "I would like to perform in a similar event in the future" (M = 3.23, SD = 1.42) to the highest, tied with "I benefited by attending this performance" and "I enjoyed my experience as an audience member" (M = 4.89, SD = .32). Audience members also included open written responses such as "Beautiful, powerful, empowering!!" "Such a great setting for both performers and audience! Love the communal aspect." Connection and community were common themes in survey responses, but they were not matched by desires to participate as a performer.

Audience intercept interviews were quick encounters with attendees between the end of the show and their departure from the venue. Questions included: "What are your impressions of what you have just experienced?" "What caught your attention?" and "What brought you here this afternoon?"

Some audience members speculated what it might have been like for performers. One member observed, "Everyone got a chance to do a hand gesture or a dance by sitting down, so everyone got to be empowered, you know to lead a group, and that must have felt awesome to do." Another said, "Nobody looked like they were thinking about what they were doing. They looked like they were just immersed in what they were doing and fully enjoying it as if it was fully an expression of each of themselves."

Others echoed survey results, sharing feelings of connection and community experienced as audience members. Our requests for "what caught your attention" elicited expressions of appreciation for "interactions" among performers as "pleasurable to watch." Said one, "It was joyous because everybody participated, and it was really uplifting to see so many people in wheelchairs, the disability population that is often ignored in all these activities, so it was very, very joyous because it was all inclusive."

The performance drew an audience with more people with visible disabilities than most community events. We did not ask audience mem-

bers to self-identify, so we do not have a record of which answers were from attendees who identify as people with disabilities. What was clear, however, is that while some who attended would consider participating as a performer in a future event, more were hungry for opportunities to experience explicitly mixed-ability creative activities *as an audience*; the audience experience was also one of connection and community.

Reflections from the Ensemble

Many new insights on the potential for innovative, mixed-ability performance to create more inclusive community experiences emerged from postperformance interviews among participants. The opportunity for performers to participate in interviews with one another was optional, but twelve of the fifteen performers shared thoughts about the experience. These interviews were more open-ended, but began with common questions: What are your impressions? What was your experience of community in this performance? What brought you to these workshops? When did you feel most connected to other people? When did you feel least connected to other people? Of the four authors of this chapter, Ray, Abbey, and Sherrie participated as performing ensemble members, and Kip did sound technology. All participated in all rehearsals and performances and participated in postperformance interviews as interviewees and interviewers. Therefore, we do not separate our own interview quotes from the rest of the ensemble.

In answer to the question about how they experienced community in the events, ensemble members often highlighted pleasures of differences as well as commonalities: musicians and nonmusicians, disabled and nondisabled. This theme of shared experience across different perspectives speaks to the power of communities built on strength in difference.

"I felt like *we* brought the community to *them*," said Drew White, for whom "we" referred to the disability community and "them" meant those outside the disability community. "Instead of *them* bringing the community," he said. "I felt like we brought it to them." Drew framed the disability community as the source of community for everyone, including the general community space of LPL.

Ray Mizumura-Pence defined community as "showing up for one another," noting that although people participated in workshops for different reasons, nearly everyone showed up each day. "We were committed volunteers." But something changed over the six-day period. As

Ray put it, "The more time we spent around one another—the more we started to see *one another* as reasons for why we were here." Individuals became a community when they found themselves "showing up" not just for workshops, but for one another.

Julie Unruh, too, spoke of changes in the community-building process that took place, specifically music's role. "When we all came together we all had barriers up. No one would talk to anyone. But the music is how we talked to each other. We broke the barriers down. And that's how we communicated, with our music."

Many talked about surprises and lessons learned. Sherrie Tucker was surprised by how "quickly the focus on learning each other's preferred sounds, learning each other's pace, learning how to listen to different ones of us" created a genuine sense of caring for one another and "just how intimate that can be." In this way, practices conducive to listening and free improvisation also created new avenues for developing intimacy and care.

"Even though I've been working with people with disabilities for years," said Abbey Dvorak, "this, more than anything, reminded me that we are all a part of this community and that we can all make music together and how powerful that experience can be for everybody involved."

Longtime musicians spoke to what experiences of playing in a mixed-ability community ensemble meant to them *as musicians.*

Oliver Hall described being deeply affected by the experience. "I've been a musician all my life but I really feel it now. And I really see the full power of what music can do for people."

Stephanie Barrows appreciated the "communal part" of AUMI performance, "because even as a musician it can feel like an isolated experience to the point of feeling alone."

Jeremy McClain, who played accordion in the events, talked about his appreciation of the openness of the group of many abilities and experiences with music. When musicians of similar experience levels play together, he observed, "we make these choices when we make music because we know what we like and what we don't like. And I think sometimes we can catch ourselves getting stuck because we already, we think we already figured it out. We think we know exactly what we like. And we're not open to new experiences."

These reflections offer insights about AUMI improvisation and inclusive community, but they also emerge from a particular community experience. We expect that it would be different in every time and place and group. We close with four insights and conclusions drawn from our expe-

riences of "Improvising Inclusive Communities." We hope that these are helpful to others using AUMI performance to expand inclusive practice in their own communities.

First, an experience of intimacy and trust can be fostered through equitable access to improvised sound and movement, and there are benefits to making such access central and visible to the larger community. One such benefit is furtherance of a more inclusive conception of who makes up "the larger community." An inclusive community is not identical to community that "includes others."

Second, mixed-ability AUMI improvisation does not guarantee inclusivity. Sometimes it reveals areas needing improvement. In retrospect, we realized the experience could have been made more inclusive through increased sensitivity and exit strategies for individuals with sensory sensitivity (one performer found it necessary to drop out before public performances). In the future, we would make clear that it was okay to leave the room at any point, even during a performance, and provide acceptable exit strategies.

Third, concepts such as isolation and community are not easily or singularly defined, nor do people with and without disabilities define or experience them in the same ways. One participant, whose work and social interactions occur primarily within an active disability community, enjoyed meeting "other people" in a more broadly public space. This differs from conflating isolation and disability. Another participant, a skilled musician battling illness, worried that his disability would be too different from those members of the disability community. "I didn't know if I would be a good candidate." Fortunately, he didn't rule himself out, but showed up and found other participants' openness to all abilities socially and artistically beneficial. He found that openness to all abilities translated to a refreshing "openness" to "sound exploration," thus facilitating a profound return to social and musical pleasures of playing with others after four years of illness-related isolation.

Fourth, an improvised mixed-ability performance can draw an enthusiastic community audience as diverse in disability/ability as the performers. The performances not only taught us how to create more inclusive communities, they created a more inclusive community in the moment, indicating a need, as well as broad community support, for ongoing activities that could sustain skills, visions, experiences, and models for inclusive community building.

Although AUMI is geared toward facilitating improvisation among those who may experience less opportunity to participate in musical,

dance, and theatrical performance than others, benefits are not limited to isolated individuals. Additionally, such performances may facilitate integration of communities too often isolated from one another and provide incentives for communities to build skills in mixed-ability sociality. AUMI performance builds appreciation for activities that benefit from full involvement of all participants. In our case, it was through together creating and presenting to our wider community a performance that located pleasure in "improvising across abilities," that performers (including this chapter's authors) and audiences practiced and experienced a more inclusive community.

NINETEEN | Sending and Receiving

AUMI Bodies and Dance Improvisation

MICHELLE HEFFNER HAYES AND SHERRIE TUCKER

DEDICATED TO DANCER, TEACHER, ACTIVIST,
FRIEND, MELISSA MONROE (1976–2021)

Melissa glides her fingers in the air, slowly, luxuriously, making the move-ment her own. She twists to face the next person in the circle. With a wave that sequences through elbows and wrists to fingertips, Melissa passes the movement to Lena. Lena's head drops to her chest; a breath. She rotates her head slightly and looks to Melissa. Their gazes connect, and the moment seems to stretch as sounds of percussion shimmer in the air. A murmur. Melissa nods, then the two initiate a new movement, and the group responds in kind.

We are two longtime collaborators, two founding members of AUMI-KU InterArts, and two of the improvisers sending and receiving movement and sound in the circle with Melissa and Lena. We have taught together, written together, presented together, and performed together across our respective fields of dance and American studies since 2008 (Tucker and Hayes 2020). Several of our collaborations have involved AUMI. Because AUMI improvisation requires physical movement, and because AUMI is designed to adapt to every body, it holds interest and possibility for practitioners of mixed-ability dance improvisation, as well as musicians. Preset the sound, move in whatever way your body moves (a wave of fingers, a rotating head, a nod). Sound relationships emerge, and so does choreography. The relationship between movement and

Figure 19.1. Lena (l) and Melissa (r) passing movement to the next player, while three audience members behind them look on. Still from film footage by Tami Albin, in "Kaleidoscope Communities: Improvised and Inclusive" by Oliver Hall.

sound is not precisely predictable, following the tradition of Oliveros's music technology preferences, calling attention to the many ways that bodies experience cause and effect. Players cannot depend on mastery of the instrument, but rather on sensitivity to relationships between bodies and sounds as they unfold. In this way, AUMI improvisation fosters inclusive and relational notions of cause and effect, as everyone explores ways of sending and receiving movement and sound.

In this chapter, we reflect on the capacity and expressivity of bodies at play with AUMI—or what we have come to think of as "AUMI bodies"—as the moving/sounding bodies of players engaged in AUMI improvisation. We also think of AUMI ensembles as AUMI bodies. We even think of audiences who may also be moved by such a performance as AUMI bodies. We think of Pauline's composition "Sending and Receiving" as a methodology for AUMI bodies, which we will elaborate through the concept of kinesthetic empathy.

Drawing from footage and memories of rehearsals, performances, and postperformance interviews from Jesse Stewart's artist residency in 2017 (see Dvorak et al., chapter 18), we reflect on AUMI improvisations of movement and sound through methodology that emerged over a period

of years. These reflections reveal how idealized bodies and conventions associated with formal dance training yield to diverse body typologies and new definitions of virtuosity in movement. The practice of listening and awareness of codes established by divergent bodies produce a level of attentiveness and care for the well-being of all participants. This abiding sense of connection extends beyond the moment of performance and into community interactions in day-to-day life, along with intentionality and skills at building what Sins Invalid (2019) calls "Collective Access" (26). In writing about how to create collective access through "webs of care," Leah Lakshmi Piepzna-Samarasinha (2018) offers the model of "*solidarity, not charity,*" building access for one another "out of mutual aid and respect" (41). When individuals "send and receive" out of "mutual aid and respect" for our many different bodies, the action of mixed-ability improvisation in music and dance becomes a form of community building, culture shift, and social justice activism.

Disability and Improvisation

"Disability," writes Piepzna-Samarasinha (2018), is itself "a set of innovative virtuosic skills" (126). Many of our fellow improvisers came to AUMI already highly skilled in mobilizing innovative virtuosic disability improvisation in mixed-ability group collaborations through Independence, Inc., group homes, schools, and families. Designed with such skills in mind, AUMI yields new vocabularies and generates choreographic and compositional strategies for music and dance. The scale of movement changes, and a new field of information emerges for play in meaning making. These improvisations, echoing Cynthia Novack's analysis (1990) of contact improvisation in the 1970s, function as a means of building community with the capacity for activism.

Leroy Moore, Patty Berne, and other architects of the disability justice movement disrupt the notion of disability as an isolated issue, insisting on an intersectional approach that understands relationships between "able-bodied supremacy" and other "systems of domination and exploitation" (Sins Invalid 2019, 23–24). In our experience, open calls for mixed-ability performers (no experience necessary) to improvise together in accessible space have yielded multiply diverse ensembles consisting of people experienced at improvising access and care for selves and others under discouraging, oppressive conditions. Indeed, our open call for "Improvising Inclusive Communities" in 2017 drew par-

ticipants across various intersectional identities, including race, gender, sexuality, disability, illness, size, age, and class.

By "centering" AUMI bodies in performance, it is possible to create new possibilities for virtuosity in music and dance, not despite, but *because* of the engagement of multiple bodies traditionally excluded by bias and systemic barriers to performance. AUMI is not the only vehicle, but it is an interesting one, for performing Sins Invalid's 10th Principle of Disability Justice, titled "Collective Liberation," which reads: "We move together as people with mixed abilities, multiracial, multi-gendered, mixed class, across the sexual spectrum, with a vision that leaves no body-mind behind" (Sins Invalid 2019, 26).

Bodywork and Dance

Bodywork and dance were significant to Pauline's compositional and listening practices throughout her life, intimately connected with her expansive, inclusive exploration of the many ways human beings send and receive sound. She frequently collaborated with noted choreographers and dancers like Merce Cunningham and Anna Halprin, among others (Mockus 2011, 2). In the 1970s, she began studying karate and t'ai chi. She emphasized bodily awareness, movement, and energy in "Sonic Meditations," which she began to compose in the late 1960s (first published in 1971) as "a body of work that could be done by persons without musical training" (Oliveros 2005, xvii). Sending and receiving sound among people of diverse embodied experiences and different musical orientations, including nonmusicians, was important to Pauline, both as an imperative for inclusivity and for expanding knowledge of listening, sounding, and transformations of consciousness. In 1991, Pauline began working with Heloise Gold, who, at the first Rose Mountain Retreat, began sensing and describing what she would call "full-body listening," or the "sense that we have ears sending and receiving signals all over and through the body" (Gold 2012, 150).

Sending and Receiving

The concept of "sending and receiving" occupied Pauline's attention throughout her life. She wrote about it in terms of technology (e.g., the space between the recording and playback heads on a reel-to-reel tape recorder); of different lengths of reverberations in sonic space, of

practices of listening (deepening awareness of sound relations among people, among people and environment, among performers and audience members); and in expanding consciousness ("awareness of stimuli and reactions in the moment") (Oliveros 2015, xxi). Her piece "Sending and Receiving" was and remains a staple of her Deep Listening® practice. The instructions were simple: "Use this mantra: With each breath I send sound and receive sound" (13). Attention to breathing—as a practice that all living beings perform—and to breath as a sound that is sent and may be received, worked on the sensitivity required for inclusive receptivity.

For the remainder of this chapter, we return to Jesse Stewart's 2017 residency to focus on "sending and receiving" as a way of being together in the space that valued the contributions of each member. This, regardless of musical or dance training, according to our choices, and supportive of our individual differences. When individual AUMI bodies became a "sending and receiving" AUMI-body-*ensemble*, there emerged a sense of an infinitely generative space of creative dialogue in music, dance, and community building.

Reimagining Place, Space, and Roles

The world isn't set up for AUMI bodies; it takes intention and planning to craft a world where AUMI bodies can do their work. At the outset, we were mindful in designing the residency to reflect what had emerged as "best practices" in our history of community-based improvisation. We privileged issues of place, space, and participant roles.

In conventional rehearsals for a music or dance performance, participants gather in a specialized space and perform hierarchized roles as conductor, choreographer, musician, dancer, actor, etc. Access means more than the legally mandated width of doors, curb cuts, and bathroom locations, although those elements are necessary. Moving beyond accommodation means being mindful of everyone's access to roles as shapers of the rehearsals and performance. It means considering the logistical planning and labor required for people across abilities to attend community events. Barriers to participation in an extended residency include time away from paid work, arranging child care, scheduling with caregivers and transportation services, and more. Those barriers become more complicated when the site is new and unfamiliar. Lawrence Public Library (LPL)'s SOUND+VISION Studio served as a comfortable, welcoming, and familiar site. It is accessible from public

transit, provides ample, appropriate parking, and offers spacious gender-neutral, accessible bathrooms.

For us, the concept of space refers to less tangible elements of a place, important factors that are difficult to quantify. Familiarity is important, which reduces the stress of finding the actual site. LPL, a regular AUMI jam site, serves several different populations, so it is possible to see someone from other aspects of daily life during a visit. The presence of other people you know is reassuring in creation of "safe space." Further, it was important to dehierarchize the space so that it didn't intimidate and exclude people who were not trained musicians and dancers. Rather than choosing a formal rehearsal studio or a theater in a performing arts facility, we worked in multipurpose rooms. Despite efforts of many arts organizations to create more inclusive spaces, many people find formal concert halls intimidating (Omholt 2019).

Guest artist Jesse Stewart cultivates inclusive rehearsal practices in his work with his organization WAAM (see Stewart, chapter 21) and other collaborations. Roles of individual participants were flexible, with Jesse acting as guide rather than director. Then he invited participants to play according to basic parameters. For example, Jesse invited us to jam with him as he played an ethereal instrument called the waterphone, a metal, stringed instrument invented by Richard Waters. Or he would set up a basic rhythm on a drum kit, then disassemble the kit and distribute the instruments among the group. We played with the density and qualities of sound using the AUMIs and other instruments or objects. Since one participant was a writer, Jesse provided a program for her called DIN that used a keypad to trigger sounds and colored lights. Then the group reflected on what was compelling in each session. By week's end, we had agreed on an improvisational score for two performances.

Strategies for Passing Roles

How did we make community with nonhierarchical roles, where all participants were contributors and creators, and decisions were made not by the director or conductor, but through group dialogue? Instead of telling us what to do, Jesse opened discussion. At one point, he asked the group to consider how movement or dance would figure into the performance. He then asked Michelle if she could lead the group in an exercise. As a dance professor, her title indicated expertise. But for Michelle, her years of moving with the AUMI had revealed many experts, so she replied, "Well, there are a lot of dancers in the space . . ." She looked around,

because Melissa, Joe, Lena, and others had danced together in previous projects. It felt important to Michelle to "pass" on the role of "speaking for," thus "passing it on to someone else." In this moment, Melissa suggested some movement possibilities, adding, "Chair dancing is fun for those of you who stand when you dance." Jesse himself collaborates with dancers with disabilities, including wheelchair dancers, but he did not know at this point who the dancers were in the room. By passing speaking roles, much like we did in improvisation exercises when we passed leading and following roles, we confront moments when our assumptions emerge. Through our history of community-based improvisation, shared experience with AUMI translates into a different definition of expertise, one that privileges abilities cultivated through collaboration.

Changing Expectations of the Dancing Body

Until someone witnesses movements created with AUMI, historic associations of specialized "dancerly" virtuosity and athleticism dominate, even among diverse participants. There is a particular kind of triumph in testing audience expectations of bodies in performance and discovery of what is possible in your own body. In her interview, Lena recounted, "It's like experiencing like you're still human even if you got one hand. It doesn't matter what your disability is. You can do anything any other person can do even with one hand. I think some people get the opposite idea in their mind when they see that, when we see a disabled person . . . they're not going to be able to do much. But we can." Performances with AUMI do not present bodies as unable to achieve an impossible ideal or "overcoming" disability. Instead, AUMI introduces limitless possibilities based on capacities of individual bodies. It is powerful to inhabit a moving body in its possibilities, to move as one does, and become the body that is being looked at, an articulate body, exactly as you are.

Sound brings a new element of sending and receiving to performance, even for people who have danced together previously. AUMI bodies reflect levels of attentiveness and care that emerge based on the premise of listening and being heard. Michelle had danced with several ensemble members in past projects, including Joe, who opted not to use his alternate communication device during the workshop and performances. Dancing together in the past, Michelle and Joe connected across eye contact and hand signals. Use of AUMI brought a new dynamic to Michelle and Joe's practice of sending and receiving. In a postperformance interview with Sherrie, Michelle commented:

I just remember this moment of intense concentration and I could hear Joe playing his gong very intentionally. And really listening to what came back to him . . . I could tell that he heard me and he was listening and that he responded. There was something really powerful about that moment of connection because even if we weren't making eye contact or moving in sympathy with each other as we had done in the past, it was a new way of connecting.[1]

Care Work and Kinesthetic Empathy

Decisions change when the well-being of every person in the group is a priority. When working in an inclusive environment, we must attend to issues like sensory overload and trunk fatigue, for example. Neurodiverse participants can be overwhelmed by the volume of instruments or by the presence of many bodies in a space for hours at a time. Performers working from wheelchairs may tire from hours of upright activity. People need to be able to leave, take breaks, and return without being excluded. Children and personal attendants wander in and out of the process as needed. Parameters for performance must be flexible. If someone cannot perform their role at a given time, another performer picks it up or the group makes a different choice.

During Jesse's residency, a few participants had to miss individual rehearsals or performances. In a more "formal" performance setting, a player or dancer would be "cut" and replaced. Due to the nature of our collaboration, however, roles are more flexible, and the group can retain the idea but shift the person who performs an appointed task, like signaling a new section. We arrive at these decisions through consensus, so everyone knows the structure and contributes. Since everyone is listening, both sending and receiving, we can respond in real time to changes.

One particularly interesting interface between dance, AUMI, and care work occurred in the organic emergence of the mirroring exercise in the second rehearsal. One participant would move and the rest would mirror the movement until the lead was passed to the person on the movement leader's right. This familiar exercise for dance improvisation students (mirroring, following, and "flocking") was made significantly different through the element of group sound. Each leader's movements, translated, adapted, and reflected by each mirroring member of the circle, also triggered sounds from the iPads, thus increasing dimensions of creative feedback.

We knew it felt good to mirror, but turned to dance movement ther-

apy (DMT) literature to understand why. Maralia Reca, Sabine Koch, and other practioners of DMT have found that mirroring between therapist and client results in increased "kinesthetic empathy," so long as mirroring is consensual and performed in the spirit of "dialogue," rather than "mimicry" (Reca 2017, 652, 658). Mirroring is related to "mirror neurons." To mirror, or to be mirrored by another, "enables us to understand actions, goals, and emotions of other people" (Koch et al. 2017, 868). It is thought to aid in the (re)integration of self for people with trauma and dementia and to increase "resonance, attunement, social skills" and "perception of boundaries" between self and others among people with schizophrenia (868–69). Effects of mirroring need not remain in the individual therapeutic realm or hinge on presumptions of norm and other. The practice suggests inclusive benefits for nonhierarchical community integration through rotating leadership, as all participate in and produce dance and music that emanate from our bodies in dialogue.

Wayne Siegel (2009) writes of how dancers using interactive systems that enable their movements to generate sound—"to dance the music, rather than dance to the music"—reported experiences of "control and freedom" and "heightened their own consciousness of how they move when they dance" (199). We found this to be true of dancers' experiences with AUMI to some extent. That is, its imprecision and unpredictability yield not so much "control" as a sense of dancing sound that eludes control. Writing about gesture and spatialization using electronic instruments that do not offer fixed relationships between movement and sound, Garth Paine (2009) observes that "when sonic elements can be characterized as having some autonomy," they can be perceived as more a "collaborator than a subservient part of the overall composition" (227).

This topic came up in group conversations immediately following our first experiment with mirroring in rehearsal. Melissa, a dancer who had often found AUMI frustrating, shared her revelation: "Every time I'm with the AUMI I'm like, 'I want to dance with it, but it won't do my thing.' It took this moment for me to go, 'I *am* dancing and it dances *with* me,' as opposed to trying to control it. . . . So I finally got my wish with the AUMI and I loved it." Melissa also pointed out that small movements, such as those contributed by Drew, another improviser, were some of the most beautiful to watch and listen to. Once, when Lena noted that her arm was sore, Jesse added that no one should do anything that is uncomfortable and that it is "totally cool" to "lay out" or "modify," connecting this choice to the beauty of stillness and silence. The caregiver who accom-

panied Joe to rehearsal commented on how mirroring is something Joe does all the time, but that taking the lead, as Joe did when his turn came at the very end of the circle, was a breakthrough. Several improvisers commented on the beauty, creativity, and intimacy experienced while following and appreciating each leader's movement choices, expressing appreciation for the ways our different bodies and movement parameters shaped varied collective sounds that emerged.[2]

Audience as AUMI Bodies

When we chose to include mirroring in performance, we did not anticipate the degree to which it would expand kinesthetic empathy throughout the audience. Spontaneously, some attendees joined in mirroring from their seats. Audience bodies were AUMI bodies too! Recognition was palpable in responsive bodies of spectators, participating in an "exchange of information," the "generation of new possibilities, through community dialogue" that "marks the success of the improvisational event" (Heffner Hayes 2003, 115). Some told us afterward that they felt emotionally moved by the intelligibility between the circle of moving bodies facing the iPads and the shimmering sounds that issued forth in response. Said one audience member: "I really enjoyed the way that we heard AUMI respond to everybody's movements, and yet people weren't trying to make AUMI make sounds, they were simply imitating each other making movement, and then AUMI was responding like its own participant in the performance."[3]

Granted, this was an audience member familiar with AUMI. But another, unfamiliar with AUMI said, "I liked the part where you could tell that there was a leader, and the leadership was being passed around, how they were doing the different arm movements to activate the sound on the iPads."[4] In performers' postperformance interviews with one another, dance often came up as a significant factor for ensemble members. When Ranita Wilks asked Oliver Hall about the times when he felt most heard within the group, he replied, "When we were dancing and people were interacting. I mean, we're sitting at the tables and performing is one thing but when we start dancing, people start smiling and looking at one another. That's it." For Lena, responding to the same question, a different dance portion of the performance came up. As she told Ray Mizumura-Pence, "I knew I was being heard when people started dancing to the music that we played, and the sounds that we made, and the rhythm we were doing."[5] Performers and audiences alike

focused on the sense of connection through interaction, the most basic and powerful element of community building.

Connections and Conclusions

In the description that opens this chapter, we recount a moment that embodies strategies of the performance and its underlying collective values. By the second of two performances at the end of the week-long intensive, the work demanded great energy. During the mirroring section, Melissa "passed" the movement to Lena. The flow of "passing" halted as Lena signaled she was fatigued. Melissa received the information, and in the next breath she and Lena, together, "sent" the movement to the next person down in the circle. Many disabled artists and writers have asserted the power that may come from doing one's work from an unapologetically disabled space, when artists' work does not attempt to hide disability, fatigue, or illness. When coupled with the disability justice ethos of "collective access"—an approach to access not as a "service" provided to disabled people by nondisabled people, but as what Piepzna-Samarasinha (2018) describes as "collective joy and offering that we can give to each other"—this moment of sending and receiving is one of the most moving of the performance (17). The new person, Ranita, received the leading role, and the movement sequence continued without disruption. What's more, since the entire group was attentive to the "sending," actively "receiving" Lena's message, there was support, acceptance, and "collective joy" for her decision as part of the performance flow. This sense of connection, of coherence as a group "leav[ing] no bodymind behind" (Sins Invalid 2019, 26), was powerful and meaningful to all participants. (https://doi.org/10.3998/mpub.11969438.cmp.28)

Expansive and inclusive dialogue is possible in this space, but it takes deliberate construction. From the choice of location to parameters for rehearsal roles and improvisational scores, group members determine outcomes. "Centering" movements of bodies across a spectrum of difference changes public and self-perceptions of what is worthy of being seen and heard. Use of the AUMI, the practice of "sending and receiving," "mirroring," and "passing" the leadership role emerge as "building" strategies for inclusive improvisation. "Kinesthetic empathy" connects people across a spectrum of intersectional identities in a dialogue among performers, but also between performer and audience, and among audience members.

Sending and receiving, mirroring, kinesthetic empathy, and joyful collective access all contributed to what adrienne maree brown (2019) calls "pleasure activism," which "asserts that we all need and deserve pleasure and that our social structures must reflect this" (13). AUMI is designed to meet pleasure needs of all. The performance's emphasis on dance played a strong role in the "somatics" of pleasure activism, or, as brown puts it, "what happens when a collective of humans is unafraid to feel life together" (brown 2019, 273). We began in a circle, tables before us, with iPads on stands facing outward toward the performers. Encircling the circle was the audience, who watched as backs swayed, heads bobbed side to side or up and down, and arms, shoulders, fingers defined the space. At one point, several performers, some in wheelchairs and some standing, danced into the inner circle, while Sherrie turned the iPads to face the moving bodies so AUMI could continue responding with sounds of chimes and marimba. It was even less clear now whose moving body interacted with which iPad, yet the excitement in the audience indicated their continuing connection with, and *as*, AUMI bodies. Performers pivoted to beckon spectators, a dozen of whom, some with disabilities, joined performers in this middle-space, a convergence of AUMI bodies, sending and receiving, transforming familiar space into new possibilities.

Notes

1. Michelle Heffner Hayes, interviewed by Sherrie Tucker, October 7, 2017.
2. All quotes transcribed from rehearsal video.
3. Audience intercept interview, conducted by Alice Zhang.
4. Audience intercept interview, conducted by Abbey Dvorak.
5. Oliver Hall, interviewed by Ranita Wilks; Lena Foster, interviewed by Ray Mizumura-Pence.

TWENTY | Communities of Generosity
and Gratitude

AUMI-KU InterArts' First Decade

RAY MIZUMURA-PENCE

Introduction: Interstellar Places

> In performance improvisation
> Making music through meditation
> Earth staged, light years away
> Places called Elsewhen night or day[1]

Our sextet had a purpose but no name. We represented AUMI-KU InterArts, a multidisciplinary improvisation research project at the University of Kansas (KU). Three of us—Oliver Hall, Julie Unruh, and Ranita Wilks—worked outside KU. The remaining three, Abbey Dvorak, Kip Haaheim, and I, were KU faculty members. United by trust, we affirmed AUMI-KU as a community-building endeavor that welcomes everyone.

On November 8, 2019, we met at KU to perform at the Alliance for the Arts in Research Universities (a2ru) conference (See Haaheim, chapter 26). The audience would share our AUMI experience as we explored the cosmos, responding to sounds and images of Jupiter, Neptune, Pluto, Saturn, and Venus that Kip downloaded from NASA's website. Although we had rehearsed earlier, the chance to improvise in public renewed our thirst for discovery.

Abbey, Julie, Oliver, Ranita, and I took positions behind AUMI-equipped iPads. Kip flipped the switches, releasing celestial sounds, and we responded. Julie's spoken poetry enlivened the mix. Beautiful noises and silences filled the auditorium. Spirit was palpable too. All of us knew the presence of Pauline Oliveros, whom JoAnne C. Juett (2010) credits with bringing "technology into the physical experience of human listening to achieve a transformative consciousness of self and world" (1). Our excursion pulsed with "heightened awareness of the vast musical soundscape of the universe" (1–2). No matter that most seats in the big room were empty. With full hearts and tranquil minds, we made generous movements. Caught up in loving currents, we connected via AUMI's wellspring of impromptu community.[2]

We didn't know this would be the last major AUMI-KU event before COVID-19. After a2ru, there were two more AUMI jams at Lawrence Public Library (LPL). AUMI-KU went into hibernation in March as the pandemic surged. By fall, web-based meetings sprang up. Within Zoom's limits, AUMI-KU members sustained mutual commitment. We didn't always make much music, but technical glitches and screen appearances of furry pets kept us amused. Although AUMI adapts to all bodyminds,[3] it didn't always fit Zoom.[4] Some of us played conventional instruments: harmonica, flute, saxophone, bass guitar, ocarina. Others played jars of coins, crinkly cat toys, candy wrappers, even a rice cooker. When all else failed, smiles and laughs prevailed.

Such pleasures shape this chapter. Reflection raises a question: "When are we going to be in the same room, any room, together again, face-to-face without cyber-filter, getting serious with AUMI?" Rather than await an answer, I shall explain why I miss the full AUMI experience. If I bring you into circles where AUMI formed communities and kindled joy, often in times of difficulty or hardship, then I am on the right track. If I sound utopian, it is because I am grateful for witnessing how AUMI-based activities dilute the dystopian. These convictions enliven my text, a montage of memories from my first decade with AUMI-KU. If the chapter moves readers, it is because of camaraderie that melded work and play. For me, this community began forming when Sherrie Tucker and I first spoke about AUMI in 2011. At that time, conditions at KU and in Kansas endangered values that AUMI-KU represents. Yet the project went forward and became unstoppable.

I start with context for AUMI-KU's emergence, then share how I got involved. Next come my impressions of our first two major public events: a 2012 demonstrational workshop and a 2013 performance. To close, I

offer gratitude for what AUMI-KU gave me, professionally and person-ally. AUMI-KU contributes to transformation that nurtures roles for criti-cal disability studies and disability justice. Looking to our next decade, I tell a collective continuing story.

AUMI's Place in Negative Space/s

AUMI-KU's impact would be positive regardless of conditions at KU or in Kansas, but campus and state trends in the 2010s were inimical to the AUMI ethos. On one hand, AUMI is a free public resource that facilitates creative agency among people of all abilities. Pauline Oliveros created music in ways favorable to social justice. On the other, KU had moved away from the public university paradigm and toward a business model. In Kansas, white Christian nationalism and unregulated capitalism have pride of place in political culture. Against this backdrop, establishing and sustaining AUMI-KU was counterhegemonic work.

In 2006, Katharine C. Lyall and Kathleen R. Sell warned against priva-tization of public universities. They foresaw a diminished "role of uni-versities as instruments for social critique, social justice, and economic change" (Lyall and Sell 2006, 6). Their analysis was on target at KU. With the 2007–2009 recession, state funding for universities plummeted, creating problems that remain unsolved. Along with financial woes came cultural and social distress. Long known for Republicanism, Kansas became a showcase for Tea Party tactics in the 2010s (Gowen 2011). Sam Brownback, the state's governor (2011–2017), cut taxes for the wealthy and social programs in a bid to make Kansas a magnet for business and a fount of job growth (Leachman and Mai 2014; Mohr 2019). Privatization drove the "experiment," imperiling the most vulnerable Kansans: the poor and ill, the very young and very old, the disabled. Battles over edu-cation spending raged. By 2015, KU employees faced furloughs. That same year, KU's chancellor Bernadette Gray-Little received national attention for arguing that public universities might not survive the cen-tury (Semuels 2015).

The chancellor struck a chord not just because of her cogency, but also because of increasing media attention to Kansas (Colson 2014; McKee, Ostrander, and Hood 2017; Smarsh 2015; Wright 2015). Along with being a laboratory for supply-side economics, Kansas was a culture war battlefield. For the GOP-controlled legislature, a "family values" agenda complemented its economic program. Casting themselves as defenders of American traditions, Kansas Republicans built ideological

walls around the state. They were unable to fully impose their priorities on KU, but it was not for lack of trying. One fight they won despite fierce opposition was a 2017 measure legalizing the carrying of concealed guns on campus.

Henry Giroux (2017) argues that public universities must provide "spaces, pedagogies, and modes of thinking" that "energize [students] to connect what they learn to what it might mean to hold power accountable, address social injustices, and both imagine and struggle for a more just world" (McLean 2015, 305). Whether they stem from Giroux's indictment of universities as neoliberal "disimagination factories" or respond to George Lipsitz's (2001) "moment of danger" in American studies, questions about what academics do with their resources demand answers. Does the work of the public intellectual involve turning back the tides of reaction? I say it does because I found such work in AUMI-KU InterArts.

Invitation to Improvisation

When Sherrie invited me to learn about her new research in 2011, I was elated. We had been faculty colleagues at KU for several years, sharing interests in music and disability studies. Like many, I saw Sherrie as a role model, in demand as a mentor, advisor, committee member, and invited speaker. Her offer meant something special was in the works. Sherrie's information about AUMI and why KU should be a site for its use exceeded my expectations. I had been doing disability studies for more than a decade, but nothing prepared me for this resource with transformative potential for everyone who used it, especially children with severe disabilities. Soon, I learned that AUMI nourishes improvisational performance that says "no" to ableism and "yes" to diversity, equity, and inclusion. Oliveros and her collaborators encoded principles and values within AUMI that dovetail with critical disability theory and disability justice.[5] I would discover how AUMI's ethos harmonizes with these.

In her AUMI-KU grant proposal, Sherrie listed me as a KU faculty member with expertise in the social model of disability and mentioned my contacts with Lawrence's disabled community. This was a compliment and a challenge. As an adjunct lecturer with few publications, I wondered if I should take a role alongside Sherrie and colleagues. I was also dubious that AUMI needed a social model specialist. Some of my first encounters with disability studies involved distinguishing between social and medical models of disability. The medical model locates dis-

ability in bodyminds of individuals. Its response to disability is professional intervention, along with the disabled person's will to overcome, be cured, or rehabilitate, to fit into an unquestioned social world.

In contrast, the social model seeks change in the social world to fit disabled people. It targets social barriers—abstract as well as concrete obstacles—for critique and elimination. Problematically, the social model draws a line between impairment and disability. The former is considered natural, biological, and neutral, a property of individual bodies. The latter is socially constructed, a form of oppression imposed on those with impairments. Indeed, for social modelists, disability *is* oppression. Tom Shakespeare (2017) sees "a clear agenda for social change" (198) in the social model, which "has been effective instrumentally in the liberation of disabled people." Flaws include "narrow understanding of disability," a product of "authorship by a small group of activists . . . white heterosexual men" whose disabilities were mostly physical (199), and lack of nuance on impairment and disability. Another drawback is the "barrier-free utopia" concept some social modelists suggest will end disability (201). Noting that disabled people "face both discrimination and intrinsic limitations," Shakespeare upbraids social modelists for overemphasizing the former and neglecting the latter.

Like Shakespeare, I have benefited from knowing and using the social model. Still, I join him in wondering whether its cons outweigh its pros. Critiques by feminist scholars who reject the social model's indifference to embodied experience are compelling. Cultural and other differences among disabled people matter little in the social model. Disability experiences like mine, which are episodic and stem from chronic illness and depression, fall outside the social model. Ultimately, I realized that the best way to learn which mattered more—my enthusiasm or my doubts—was to join a journey that continues, albeit with pandemic delays and other detours. Participating in community building, on and off KU's campus, in solidarity with people featured in this account, taught me to rely less on the social model and to explore approaches from critical disability studies and disability justice.[6]

Improvising Across Abilities: Independence, Inc.

AUMI-KU InterArts debuted at Independence, Inc., a Lawrence non-profit agency run by people with disabilities to advocate for their rights, inclusion, and welfare. Founded in 1978, it was Kansas's first independent living center (ILC). This off-campus venue helped AUMI-KU nour-

ish relationships between KU and surrounding communities. In the early 2000s, I had visited Independence, Inc. to research efforts at making KU and Lawrence compliant with disability rights laws in the 1970s and 1980s. At the time, I was a PhD student working on my first disability studies project. Without Independence, Inc., I could not have finished and published the paper. Later, they invited me to share my findings as a guest speaker. Another chance to visit the agency came in 2010, when I helped organize a twentieth anniversary celebration of the Americans with Disabilities Act (ADA). When AUMI-KU launched on September 28, 2012, I returned to Independence, Inc. with great anticipation.

Workshop preliminaries were in full swing when I arrived. About twenty people were in attendance, a mix of KU-affiliated people and Independence, Inc. clients and staff members. Along with the AUMI-KU faculty team, graduate and undergraduate students were there to help, try AUMI, or both. Two workshop facilitators came from New York. Sherrie had worked with Leaf Miller and Jaclyn Heyen before, but they were new to us and to Lawrence.

Most action occurred on opposite ends of a large conference room. To my right, an acoustic rhythm section formed as talkative people milled about, acquainting themselves with various instruments. The base of AUMI operations was on my left. Four people, seated at two tables arranged to make an "L," were gazing at laptop computer screens, an unremarkable sight at first. Soon, though, these MacBooks became multivoiced musical instruments, each connected to its own loudspeaker. Signals from the four devices fed into Kip's sound-mixing console at the far end of the "L." As the players warmed up to AUMI, I heard the software's sounds for the first time: digital yet warm, synthetic but playful, electronic whimsy. Despite their differences in facial expression and body language, all the volunteers seemed captivated.

This suggested that AUMI's creators were adept at making the software user friendly, or, as Abbey Dvorak and Elizabeth Boresow (2019) put it, "intuitive and immediate" (2). But volunteers who needed help were in good hands. Pete Williams, a PhD student and AUMI-KU project manager, offered musical and technical expertise along with humor and flexibility. Leaf and Jaclyn exuded confidence as they conferred with organizers and participants. Each wore vibrant colors: Jaclyn was in tie-dye, Leaf's shirt patterned with blue and white flowers. Otherwise, they were a study in contrasts. Jaclyn, the taller of the two, appeared studious, even serene. Her head was shaved, her eyeglasses had small oval frames, and her voice was soft. Leaf, dark-haired, compact, and wiry, embodied

dynamism. Her facial features were intense but cheerful as she motivated everyone in her orbit, preparing to strike up the band.

On the room's perimeter, I shared a drum with another participant in the rhythm section. Along with music making, picture taking was on the agenda. A digital camera would add documentation to my participation and observation. An exuberant Sherrie welcomed everyone, thanked the cosponsors, and introduced Leaf and Jaclyn. In humble, affecting words, the facilitators shared how they had used AUMI in New York. There was no ego in their stories, no fishing for praise. Instead, Leaf and Jaclyn patiently explained their early AUMI work, recalling challenges of thin budgets and joys of partnerships with children with severe disabilities and others whose agency often goes unacknowledged. As they brought their remarks to a close, it was hard to imagine a better cue for the roomful of eager participants.

The first move was Leaf's. Stepping to the center of the room, wearing a shoulder harness with a *surdo* drum at her waist, she was a catalyst.[7] Holding a drumstick in each hand, Leaf raised them high to make an "X" and brought the sticks together: one-two-*three*, click-click-*click*, one-two-*three*, click-click-*click*! Drummers and percussionists took Leaf's cue: boom-BOOM-*BOOM*! boom-BOOM-*BOOM*! Their beat had force but didn't dominate. Everyone made space in the soundscape for their bandmates. Captivating sounds bubbled up from chemistry of body movements and technology: sitar, electric piano, funk guitar, barking dogs, and more. So much was going into and coming out of the improvisation, yet no cacophony. I could hear each performer's contributions, silences along with sounds. Collective impulse to listen coincided with individual desire to be heard. Urgency of deep listening: this was one of the first AUMI lessons, produced spontaneously in shared space, organic. (https://doi.org/10.3998/mpub.11969438.cmp.29).

Throughout, I relished being a photographer. The role sharpened my attention to faces. Some were bemused, but mostly I saw happiness. Participants relished a synergy that Juett (2010) describes: "performers are audience are composers are audience are performers, not so much in a cyclical relationship, but existing in a simultaneous and a symbiotic state" (1). I felt unbound as I sat with my camera in my right hand and a mallet in my left, tapping on the shared drum, video-capturing as much as I could. Trying to document *everything* was a self-imposed burden. When I let it go, my visual field notes improved. Just as AUMI improvisation needs silence, this story's gaps, rough edges, and traces of fleeting moments made it better.

Later, I discovered a wealth of surprises while reviewing footage. Details that had escaped my notice during the event became revelations. Witnessing interplay of human kinetics and AUMI music was a moving experience. Some AUMI workplayers were enthralled by sounds they produced; others were extroverted. Michelle Heffner Hayes showed how it was not just possible, but irresistible, to dance while playing AUMI from a seated position. Other priceless moments: Nicole Hodges Persley entered my frame as I panned from left to right. She faced Michelle and other AUMI players, swaying to the beats, accepting their energy and adding her own. There was so much more, all of it harmonizing with Sins Invalid's (2019) definition of disability justice: "movement towards a world in which every body and mind is known as beautiful" (27). Other highlights are linked here. (https://doi.org/10.3998/mpub.11969438. cmp.30).

Improvising New Communities: Spooner Hall

The following year, AUMI-KU kept moving toward a world disability justice that activists fight to create. Our main event was (Un)rolling the Boulder: Improvising New Communities (UTB), a public performance on October 30, 2013. Four rehearsals led up to the show, all of which took place on the KU campus. Its culmination was a multimedia, transdisciplinary performance of dance, music, and sound, with spoken word passages and video-projected images and text. UTB welcomed audience participation: dancing, writing on large sheets of paper posted on the walls, a banquet of expression. These elements dissolved lines separating audiences and performers. Befitting the community spirit, a townhall-style discussion followed.

UTB had much in common with the 2012 workshop. AUMI and improvisation were central to each. Both events featured people of all abilities, with or without KU ties. Diversity and inclusion were core elements, as was a structure that minimized power differences. The facilitation roles that Leaf and Jaclyn had at Independence, Inc. anticipated those of Kip, Michelle, Nicole, and Sherrie at UTB. Yet there were also important differences. UTB required greater commitments of time and energy. The wider scope and ambitions of the performance attracted a much larger audience. Setting was another contrast, a factor important to Pauline Oliveros. In the introduction, we shared the example of how performing in an underground cistern, with a forty-five-second reverberation, led Oliveros and peers "to consider the space that we played

in as another and equal partner in the sounds that we were making and to respect that 'other player'" (Oliveros and Kreuger 2016). The "other player" for UTB was Spooner Hall, an architectural jewel on KU's campus. Its columnated conference room became our rehearsal and performance site. Another key aspect of Spooner was its ties to The Commons, a project vital to intellectual and civic engagement. Via The Commons, audiences at Spooner have had dialogues about mass incarceration, racist policing, immigration policies, voter suppression, and more.

On September 18, fifteen people[8] joined the AUMI-KU team at Spooner to map the journey. Rehearsals entailed planning, scripting, choreography, and scoring (see Hodges Persley, chapter 16). Although the process was collective, some volunteers were more involved than others because of personal interests, skills, or other reasons. For optimal performance results, volunteers had to attend all four rehearsals. This raised the stakes during the first meeting and put some pressure on Sherrie, Kip, Michelle, and Nicole. They had to use their status as KU faculty members and AUMI-KU lead investigators to help everyone feel welcome and keep them coming back. Volunteers sought their expertise and guidance but needed to believe in their own creative agency.

Yet the occasion did not call on Sherrie, Kip, Michelle, and Nicole to surrender authority. Instead, they fostered horizontal rather than vertical power relationships. All that they did and didn't do had potential to make things more (or less) collaborative. Judging from what happened that day and subsequently, they succeeded. Along with everyone else, they sat in a circle to exchange ideas. When people of higher rank meet with those lacking such status, it can sometimes feel that the "real" meeting took place beforehand, leaving no room for meaningful dialogue. At Spooner, the core four carried themselves in ways that made this scenario unthinkable.[9] This doesn't mean the atmosphere was utopian. Starting with myself, I need to acknowledge the predominant whiteness of our assemblage. Another uncertainty stemmed from whether disabled people would be visible, equal participants. From start to finish, the core four did most of the talking while the sixteen volunteers mostly listened. But having the most to say is not always tantamount to dominating discussion. Choosing to listen does not always equal passivity.

Dancing played a larger part in UTB than it had in the workshop. Spooner had more room and Michelle was eager to make the most of it. Drawing on choreographic skills, she invited everyone to envision their roles and use the setting for storytelling (https://doi.org/10.3998/mpub.11969438.cmp.31). The key was awareness of "composing music

[with AUMI], but then you're going to change gears, right? You're going to go to this other section [of the room], which for me feels spatially divided right now." Warming to the topic, Michelle explored nuances: "There might be a series of movement prompts we develop, using words like *connect* and what does it mean to connect? Or, to *reach*, too, so that looks different on everybody. It's like the same verb on each individual body will have a different outcome." Perhaps most important were Michelle's ideas about creativity: "What I've noticed, working with people and groups like this, is that if I say, 'You know, here are some parameters and you could pick up movements from each other,' [then] we develop some favorite movements that everybody seems to enjoy doing and those can appear, but they'll emerge rather than being prescribed."

A composer, Kip brought passion for sounds. When offering options for what participants and audience would hear, he cast his nets widely. Kip knew that myriad sounds would emerge from and fuel collaboration. Along with AUMI, the show's score included live performance with violin and trombone, songs from exercise classes, spoken word passages (recorded and live), and sounds of dancing bodies (https://doi.org/10.3998/mpub.11969438.cmp.32). Kip relished eclecticism: "we can load in whatever sounds we want. We don't have to play musical notes . . . we can think in terms of playing musical notes and pitches and make it sound like a piano or whatever." Cinema was another reference point. "We can think about how you might use sound in the way a movie uses sound, to be more expressive. Sound in a film is very rarely what the actual sound is of the thing that you're watching. It's really something that's designed and then creatively manipulated. We can think in those terms, and because speech is sound, you can deal with speech in a lot of ways." Finally, Kip encouraged ambition: "We could record keywords and put those in . . . just as a suggestion, but I would like to think bigger than just a music concert."

A veteran stage and screen actor, writer, and director, Nicole was sensitive to those unsure of improvising. She spoke about structure and spontaneity. To illustrate a point, Nicole held up her laptop computer to show the word NORMAL on its screen. "I started to collect random stereotypes of things that I think resonate when people hear something about *disability*," she explained. Then she urged volunteers to notice "little things—how do they all come into play, to give shape to what we will consider our script?" From there, Nicole elaborated on how the plan required collective patience and trust. Over time, she said, rehearsals start "to write things for us, things we can use and adapt and revise." She

also acknowledged two audiences: one her present company, and the other that would not arrive until performance:

> I'm hoping I came up with . . . ideas of images that are important to you. Over here might be images running, really to kind of bombard our audience with things. It's going to be a very intertextual piece that I think will be birthed out of our exchange with one another today, and the next one, and the next one. Whatever we have by the third [rehearsal] is where we stick, because we'll see some repetition start to happen. That is kind of the broad snapshot of what it was in my head. (https://doi.org/10.3998/mpub.11969438.cmp.33)

Volunteers responded swiftly to Nicole's persuasion. They wanted to be part of the picture she envisioned. I found her photographic metaphor appealing as I videorecorded the conversation. Along with her idea of a script that would eventually jell, Nicole's "snapshot" reminded me of a Polaroid featuring the volunteers. Their images would give pleasure as the photo approached clarity. Her words were cues to keep taking pictures while everyone else started rehearsing. Another encouragement was the unanimous agreement that UTB needed to be documented. I hadn't expected to be project videographer, but the role felt right. Everyone consented to the use of their images and seemed comfortable with being recorded. Taking on the task felt natural even though it distanced me from performing.

Since I did so much work behind the camera, I will forgo describing UTB rehearsals and performance and instead invite readers to seek out my videography (https://doi.org/10.3998/mpub.11969438.cmp.34).[10]

Now for a jump cut into the joy of UTB's postperformance discussion. Those who left after the show had a wonderful but incomplete experience. Those who stayed witnessed affirmation by all voices. This conversation was even more absorbing than the first planning session. My account only suggests the emotional range of dialogue among UTB volunteers and audience members. Their words, voices, and facial expressions signified community formation.

JoAnne Fluke choreographed key UTB sequences. (https://doi.org/10.3998/mpub.11969438.cmp.35) An exercise and dance instructor who uses a wheelchair, JoAnne described similarities between her UTB contribution and her work at Grooveability, a nonprofit organization in Ottawa, Kansas, where one activity was accessible Zumba.[11] These sessions, JoAnne explained, "really opened up my eyes to see how an

individual who may not be physically able to move could still represent and be a part of the class." She brought her awareness to UTB rehearsals, suggesting music and movements. I marveled at JoAnne's charisma and skills before, during, and after the performance. The segment featuring her choreography fired up those who had rehearsed, along with audience members. After the performance, JoAnne told everyone that Grooveability needed AUMI: "There are going to be people that come to us who are quadriplegic and can't use the power chair . . . if we had an AUMI present, they could help create the music that the other people are dancing to." She closed optimistically: "This instrument has a lot of potential in many communities. I can see some focus on the disability community as a really big place where it could work very well." (https://doi.org/10.3998/mpub.11969438.cmp.36)   (https://doi.org/10.3998/mpub.11969438.cmp.37).

AUMI's future at KU interested audience member Thomas Dirth, a graduate student in psychology who is disabled. His questions about what AUMI could mean for other disabled people at KU appealed to several discussants. Sherrie added that the project extended beyond campus boundaries: "Pete Williams started [leading] improvisation groups at Independence, Inc., and Ranita Wilks, who is participating tonight, helped [him] organize and has been very generous. The AUMI is downloaded on all the computers in the [Independence, Inc.] lab, so we hope to get improvisation sessions set up on a regular basis."

Nicole responded to Thomas by describing how AUMI-KU helped her students expand their acting range: "You open up ways for thinking about how the disability community can intersect in some of the performing arts in a different way," Nicole stated. "Now that I have (UTB participant) Lorie Sparks coming to my acting class to do a talk, that really will say that this isn't just for the performance. This is part of us really trying to create inter-arts world views about how people think about humanity—not to get too 'We are the world' about it—I mean, this is how we feel about what we are doing. It's great."

Michelle and her students expressed similar views. First, Michelle praised them for participating in UTB as audience members, mentioning their experience with AbleHawks, KU's disabled students' organization, and with Independence, Inc. She also recalled brainstorming sessions with JoAnne that generated ideas for an AUMI orchestra. Next, Michelle's students talked about what they saw, heard, and did during UTB. A sequence featuring Michelle and Nicole, who quoted Dr. Martin Luther King Jr. while dancing, affected them deeply. A student whose

passion is dancing said, "It's really beautiful that something like this exists. I would like to see this keep happening, to spread throughout KU, and I really think it could happen."

As discussion diminished, two friends sitting together affirmed AUMI's positivity by voicing gratitude. Both were international graduate students from China. Alice Zhang was a UTB performer. Her friend, who did not give her name, was in the audience at Spooner and spoke first (https://doi.org/10.3998/mpub.11969438.cmp.38). She referred to conditions for disabled people in China and their effects on Alice, a wheelchair user. UTB made Alice "more excited, happier." Her friend said Alice was "smiling more often [because of] the great opportunity to release the inner energy outside" and to "just be friends with her body." Finally, she addressed Alice and the crowd: "I'm happy for you and I do appreciate all these performers in it. You are wonderful and caring."

In response, Alice spoke of the accident that led to her disability. Having not danced since being injured, Alice was candid about her vulnerability (https://doi.org/10.3998/mpub.11969438.cmp.39). "At first, I was so nervous, even before the performance. I forgot everything every time I looked at everyone else." With time and interaction, Alice grew "more and more relaxed." Realizing she did not have to "be a professional musician and dancer" freed Alice "to follow the music and enjoy the show." The more she worked with peers, the more confidence Alice gained. Her experience was "awesome" because she entered UTB with few expectations. Alice ended by thanking everyone in the room, extending special gratitude to "every performer" and the "very good time" they shared.

These words stood out in an emotion-laden evening. Alice and her friend struck chords with each other and with the audience. Watching and listening, I thought of Bob Marley's lyric about music's impact: "When it hits, you feel no pain." When reviewing the video clip, I respond to these two friends with renewed enthusiasm. Their mutual appreciation hits harder and feels better every time. My reaction is all about gratitude: an emotion and state of being, a concept and reality that brings out the best in people. Its presence in the UTB postperformance talk was no surprise. Nor is the increasing scholarly attention to gratitude.[12] When thinking about what gratitude means for intellectual work, I am in territory Nicole explores in chapter 16, where she recognizes love's importance. Love is active in all definitions and expressions of gratitude. Their interconnections generate change. With transformation in mind, I close by describing what has been most important to me as an AUMI-KU community member.

Conclusion: Improvisations of Gratitude
for Renewable Communities

AUMI-KU catalyzed disability studies activity at KU during the project's first decade. Much of this reflected the influence of critical disability studies and disability justice. KU has no disability studies degree program or department. I speak as someone who adopted disability studies as my approach to American studies as a KU graduate student, when few in or outside my department shared the interest. Many KU scholars specialize in disability in special education, applied behavior analysis, psychology, and gerontology. I don't criticize them for medical model ties because no one is fully outside that framework, nor is the medical model the sole influence in their fields. Many colleagues representing those areas have strengthened my disability studies commitment and supported AUMI-KU activities. Until the 2010s, however, disability studies had a low profile at KU, especially in humanities and social sciences.

After UTB's success, Sherrie and I initiated a disability studies seminar at KU's Hall Center for the Humanities in 2014. For many at KU, the seminar is a resource for staying current with critical disability studies and disability justice. Presentations by Alison Kafer, Leroy Moore Jr., Subini Annamma, Akemi Nishida, and William Cheng have advanced this mission. The same is true of DSS lectures by AUMI-KU and UTB participants, including Dot Nary, Ashley Mog, Liam Lair, Ranita Wilks, and others. This programming is where AUMI-KU and the disability studies seminar find space and time for diverse, inclusive, and pathbreaking inquiry.

I am still new to methods and legacies of Pauline Oliveros. Based on what I know of her, I believe she would be impressed—briefly—by what we have done, then would urge us to press on. Being grounded while finding common ground with others, having confidence to believe in oneself while remaining selfless: these principles shape her legacy. Witnessing their realization is a blessing. If my gratitude for this gift is meaningful, then this chapter will be useful.

Emphasizing *beginning* matters because thankfulness is a *process*. I honor this process without taking myself seriously, an attitude I associate with Oliveros. Another influence, Dan Goodley (2011), asserts that "critical disability studies might start with disability, [but] they never end with it" (157). Those wanting to "contest dis/ablism" must be "ever vigilant of political, ontological, and theoretical complexity," Goodley continues. Sami Schalk's (2017) point is also compelling: "One can study disabled

people and not be doing critical disability studies and one can be doing critical disability studies and not be directly studying disabled people" (1). What Schalk and Goodley argue resonates with reflection on my first decade of AUMI-KU experience. My gratitude for their contributions to disability-based inquiry is great. Such work fortifies the field and helps me know that AUMI-KU advances critical disability studies and disability justice.

People show gratitude to Oliveros by improvising new communities in spaces she helped them find and create. To my knowledge, no one has identified her as a pioneer of critical disability studies and disability justice. This chapter illustrates her work's relevance to these unfinished projects. In bodymind and in good company, I thank Pauline Oliveros.

Notes

1. Alison Kafer (2013) writes, "In imagining more accessible futures, I am yearning for an elsewhere—and, perhaps, an 'elsewhen'—in which disability is understood otherwise: as political, as valuable, as integral" (3). Also see Stewart et al. (2017).

2. For more on this performance, see Niccum 2019 and Haaheim, chapter 26.

3. Sins Invalid (2019) defines "bodymind" as the "relationship between the human body and mind as a single integrated entity" (146). Margaret Price (2015) conceptualizes "bodymind" as "mental and physical processes" that "affect each other but also give rise to each other"; that "act as one" yet are "conventionally understood as two" (269).

4. We look forward to Henry Lowengard's browser-based AUMI Together.

5. Pauline Oliveros influences me through her music and writing (2005) and through what others have written about her. See Alarcon and Herrema 2017; Arcangel 2009; Dublon 2017; Ramirez 2020; Robidoux 2019. For critical disability theory discussions, see Goodley 2011; Meekosha and Shuttleworth 2009; Schalk 2017; Shildrick 2020.

6. Lennard J. Davis (2017) explains the shift from disability studies to *critical* disability studies as efforts to "reevaluate" the "focus on the social model" and decide "how to conceptualize diversity among disabled people" (175). Historical materialism of the social model has given way to eclecticism, drawing from intersectionality, Michel Foucault and "self-reflexivity of feminist scholarship."

Disability justice, a social movement, has common ground with critical disability studies. It goes beyond goals of the disability rights movement of the second half of the twentieth century (e.g., creating new laws, eliminating barriers). The disability justice movement targets *ableism*, "the process of favoring, fetishizing, and building the world around a mostly imagined, idealized body while discriminating against those bodies perceived to move, see, hear, process, operate, look, or need differently from that vision" (Taussig 2021, 10). Ableism harms not

only disabled people, but also BIPOC, trans, fat, and queer people. Disability justice pursues dismantlement of capitalism, patriarchy, homophobia/transphobia, and white supremacy.

7. *Surdo* drum: a bass drum common in samba music. Thank you to Jesse Stewart for this information.

8. Volunteers included JoAnne Fluke, founder of Grooveability, a nonprofit dance agency; Lorie Sparks; Ranita Wilks, then a peer counselor at Independence, Inc.; Elizabeth Boresow and George Li, KU undergraduates and members of Ablehawks, a campus organization run by disabled students; Trevor Grizzell, Liam Lair, and Ashley Mog, graduate students in KU Women's, Gender, and Sexuality Studies; Kay K. Walker and Pete Williams, graduate students in American Studies at KU; Alice Zhang, graduate student in applied behavior analysis at KU; Dot Nary, assistant research professor, KU Bureau of Child Research; Arienne Dwyer, professor of anthropology at KU; Jamie St. Viva, KU's Americans with Disabilities Act coordinator at the time of UTB; and the author. Fluke, Sparks, Wilks, Li, Zhang, and Nary are wheelchair users.

9. https://youtu.be/sMQ-GRgXVwI, UTB planning and rehearsal footage, Wednesday September 18, 2013, https://youtu.be/RIxDYPf7jYo; https://youtu.be/Gyt8V0IW9nI.

10. The oral historical research by Liam Lair and Ashley Mog, available through print and digital platforms, is an invaluable source on the use of space in UTB (Lair and Mog 2016, 2015). This showed me how Spooner became what Jules Gimbrone (2017) calls "queer space" in his essay about musical transgressions of Pauline Oliveros and John Cage. Such space is neither fully material nor fully figurative. It partakes of both while finding a zone between or beyond them. "There is a room without walls," writes Gimbrone, one that "queers all that enters. When we are in this room we feel welcomed and visible" (1).

11. UTB rehearsal, Wednesday October 2, 2013, https://youtu.be/Q9UFgTE-064: https://youtu.be/T-0H27LPWQE.

12. For example, see Wood, Joseph, and Linley 2007.

PART 2

AUMI Performance

> In order for us to survive, there has to be creative action, creative expression at every level of society without exception. This feeling that one gets from realizing and expressing something of the spirit is missing. It's not available to everyone, and it needs to be. This is what is the passion of my life and why I keep doing what I'm doing.
>
> —Pauline Oliveros, "Cues"

Pauline was an internationally acclaimed performing artist who rejected the view that creative expression was the rarified purview of professionals. Long before AUMI, she promoted "creative expression at every level of society" as a matter of survival. AUMI joined other projects, including the Sonic Meditations, to expand who performs and is listened to. Pauline programmed the Abilities First "Play the Drum" Band alongside seasoned professionals at the Cell Theatre in New York. Later, she wrote, "Their performance in the second *Stretched Boundaries* concert succeeded in showing them, their fellow performers, and the audience that they are musicians" (Tucker et al. 2016, 185).

Relationality among people is often a key component of AUMI performance; many of the chapters in "AUMI Performance" would also be at home in "AUMI Communities." They appear here for the ways they illuminate the experience and practice of "realizing and expressing something of the spirit" (Oliveros 1993, 378). Performances include concerts for peers and public audiences (Stewart, chapter 21); and self-expression through AUMI dancing (Huggett, chapter 22), singing (Waterman et

al., chapter 23), and other forms of musicking that draw on performers' lived experience in relation to environmental input (Stewart, chapter 21; Haaheim, chapter 26; Harris, chapter 24; Robidoux, chapter 25).

Authors consider performance as a means of accessing recognition, what Ellen Waterman et al. call "I Am Here" (after Henry Lowengard's AUMI Sings composition) and Li Harris calls "Sonic Witnessing." And they take performance as a powerful act for transforming social relations, as seen in Mills AIE's practice of "holding space" (Robidoux, chapter 25), WAAM's actualizing of the declaration "We Are All Musicians" (Stewart, chapter 21), and Henry Lowengard's and Kip Haaheims's AUMI compositions designed to be performed by anyone (Waterman et al., chapter 23, Haaheim, chapter 26).

No chapter considers "creative expression" better left to professionals.

TWENTY-ONE │ WAAM + AUMI

The We Are All Musicians Project and the Adaptive Use Musical Instrument

JESSE STEWART

In 2010, I was asked by the National Capital Commission in Ottawa, Canada, to create an interactive sound installation for the official Canada Day celebrations. The result was the "Junk Funk Sound Cube," an open eight-foot cube made of aluminum scaffolding that supported a bevy of recycled items that served as percussion instruments: large plastic tubs that sounded like bass drums; inverted five-gallon pails for higher-pitched drums; suspended lengths of steel electrical conduit that sounded a bit like a glockenspiel; hanging steel containers that produced different tones when struck; and ABS pipes that sounded a chromatic scale when played with flip-flops.

For three years, I assembled this contraption in a park in the Canadian capital on Canada Day. I began by sounding a quarter-note pulse on one of the plastic bass drums. Acting like a sonic beacon of sorts, the pulse seemed to attract people from all over the park. One by one, people picked up mallets on all sides of the cube to join in improvised percussive merriment. Throughout the day, literally thousands of people—diverse in cultural, gender, linguistic, and age backgrounds—participated. No one ever told anyone else what to play or what not to play, and yet the music always felt cohesive and inclusive, until I realized it wasn't.

I set up the sound cube for the third and final time in 2012. At one point, a group of people in wheelchairs approached. It was not until that very moment that I realized I had designed the cube to be played while

standing, thereby excluding a whole segment of society. That moment was a personal tipping point for me. I resolved to do better, to be more inclusive in the community music initiatives with which I was involved. Not long after that, I started the We Are All Musicians, or WAAM, project (https://doi.org/10.3998/mpub.11969438.cmp.40).

We Are All Musicians is founded on the idea that music is a fundamental human right: everyone deserves opportunities to make music, regardless of musical training, income, age, or physical or cognitive ability. To realize this vision, the WAAM project uses a variety of adaptive and assistive technologies, in conjunction with more traditional musical instruments, to foster improvisatory musical interaction, particularly among individuals and communities that experience barriers to making music historically, notably children and adults living in low-income situations, individuals with disabilities, and the elderly.

AUMI is an important part of the WAAM toolbox. This chapter discusses four collaborative WAAM projects in which AUMI played a central role:

1. Turning the Page, a 2013/2014 collaboration with artist-musicians with disabilities from H'Art of Ottawa
2. Umbrellas, a 2014 collaborative performance with low-income adult students enrolled in Discovery University
3. Music Matters, a 2015 project involving older adults living with dementia
4. An ongoing project at Saint Vincent Hospital in Ottawa involving patients with complex care needs.

Turning the Page

In 2013, I began a year-long collaboration with H'Art of Ottawa (now known as Being Studio), an organization that facilitates art making among adults with intellectual disabilities. The collaboration culminated in a multimedia performance at the National Arts Centre in Ottawa in 2014. Turning the Page featured projected images of paintings by H'Art of Ottawa artists and a live improvised soundtrack performed by H'Art of Ottawa artists and me.

Throughout the collaborative rehearsal process, we explored the sound of a wide variety of percussion instruments (shakers, drums, waterphones, gongs, etc.) and repurposed found objects. We also used electronic instruments including AUMI. We called the project Turning

the Page because we felt as though we were metaphorically turning the page on some of the ways in which art and music by people with disabilities have been historically framed.

AUMI occupied a central place in Turning the Page. We positioned four AUMI-equipped iPads across the front of the stage. Several performers had backgrounds in dance, in addition to visual arts. AUMI enabled us to incorporate a dance component that inverted the traditional relationship between dance and music: instead of the body responding to music, the movements of the improvising body caused the sounds, orchestrating the music. It became clear early on that each person who interacted with AUMI needed their own monitor so they could discern the sounds generated by their own movements from those of their coperformers. If all sounds were channeled through a central sound system, it was difficult to tell who was making what sound. We solved this in Turning the Page by positioning four Bose L1 speakers, one behind each AUMI performer. The sound from those speakers was loud enough for each performer to clearly hear the samples that they added to the sonic mix and to fill the room and blend with the in-house sound system that amplified the other instruments.

On April 30, 2014, Turning the Page opened in Ottawa to an enthusiastic capacity audience at the National Arts Centre's 4th Stage, a 180-seat cabaret-style performance venue inside one of Canada's pre-eminent concert halls. An Ottawa-based filmmaker named Andrew Hall, who has a long-standing relationship with H'Art of Ottawa, made a documentary film about the project that is available online at https://vimeo.com/114442912.

In Turning the Page, AUMI facilitated musical participation and interaction among participants, empowering them to move outside their comfort zones. AUMI's capacity to empower was crucial to the success of another WAAM project titled *Umbrellas*.

Umbrellas

In fall 2014, I had an opportunity to teach musical improvisation through Discovery University, a program inspired by the Clemente Course in the Humanities developed by Earl Shorris in New York City in the mid-1990s. Run by the Ottawa Mission, Discovery University offers free university-level classes to adults experiencing poverty or other forms of economic distress. There are no tuition fees. Likewise, textbooks and transportation to and from class are provided free of charge.

The Ottawa Mission advertised the course, emphasizing that no prior

musical training was required. Prospective students applied by providing a rationale for why they wanted to participate. The course was limited to fifteen students. In my experience, when the number of improvising musicians in a given ensemble increases, the capacity for group cohesiveness and listening generally decreases, particularly with inexperienced improvisers. Even an enrollment of fifteen poses musical and pedagogical challenges.

Many in the class had little or no prior musical training; several had disabilities, some visible and some invisible. I encouraged students to use their voices as musical instruments if they felt so inclined and to bring found objects to explore as musical instruments. Among the items brought in by members of the class were a cheese grater, cookie tins, cat toys, tin cans, a pitch pipe, bells, recorders, and rummage sale ukuleles. I, too, brought a variety of instruments: shakers, bells, rattles, waterphone, and other odds and ends. I also provided several iPads equipped with AUMI, which helped put all the musicians on more equal footing.

Initially, some class members were reluctant to interact with AUMI. They were concerned about the tracking feature and did not like feeling as though they were being surveilled. Others did not want to see an image of themselves in the display (since that time, Henry Lowengard, developer of AUMI for iOS, added an option to turn off the display).

At one point, one class member used his umbrella to trigger an AUMI response. This act struck me as a beautiful performative gesture that had the added advantage of being easily detectable by the iPad's webcam, even in low light. It occurred to us that an umbrella was an interesting metaphor for some of the issues we were discussing in the course and that some class members dealt with in their lives: an umbrella symbolizes both protection and shelter, and inclusiveness. Our course also happened to coincide with the "Umbrella Revolution" in Hong Kong, a prodemocracy movement in which protestors used umbrellas to protect themselves from police use of pepper spray and photo surveillance. We discussed the similarities and differences between the Hong Kong protests and our own work, which led to rich discussions about politics, protest, and social justice as well as the roles of music therein. We agreed on Umbrellas as the title of our end-of-term performance.

The class was invited to perform on December 1st, 2014, at the National Arts Centre 4th Stage. The performance was loosely structured: I began by introducing it as the culmination of a semester-long course offered through the Discovery University program. Other class members were seated inconspicuously throughout the audience. While I spoke, other

performers began tapping rounded stones together, creating a sonic texture reminiscent of the sound of rainfall. To me, the fact that other members of the ensemble were hidden at the outset of the performance signified that those who are economically disadvantaged are often rendered invisible by the mainstream society and dominant discourses. The class's sonic interruption of my opening monologue posed a symbolic challenge to such discourses, creating a space for their voices to be heard in the improvisatory, community-affirming music that followed.

The sound of tapped stones gradually increased in density and volume until the sound of thunder was added. At that point, I opened a colorful umbrella on stage, and the performers seated in the audience responded by opening umbrellas of their own. I then moved to an AUMI-equipped iPad and used the movements of my umbrella to trigger woodblock samples reminiscent of the sound of the tapped stones. One by one, other members of the class opened their umbrellas and came to the stage, where they triggered additional AUMI sounds from three iPads. I then moved to the drum set, playing drums with my umbrella. The rest of the class gradually made their way to the stage, adding improvised piano, electric guitar, recorder, waterphone, and various percussion sounds to the mix.

Reflecting on the performance, one class member shared:

> I could feel something different in our playing. We started to relax and enjoy ourselves and you could feel the rhythm of the music. I looked across the stage and we were all playing in sync. I was moving to the beat and felt completely at ease. This went on for several minutes and was not rehearsed. I don't remember this happening at any of the practices or at the dress rehearsal. . . . It was a great feeling of combined success.

I, too, felt that the Umbrellas performance, and the Discovery University "Improvisation in Theory and Practice" course, represented a combined success facilitated, in part, by AUMI.

Music Matters

In 2016, WAAM partnered with Artswell (a nonprofit organization that uses the arts to improve the quality of life and well-being of individuals living with the effects of age, illness, or injury), the Alzheimer's Society of Ottawa and Renfrew County, the Bruyere Continuing Care Centre in

Ottawa, and the National Arts Centre to cofacilitate a program called "Music Matters."

Through Music Matters, singer and community arts worker Julia Churchill and I made music twice a week for eight weeks with a group of eight seniors living with Alzheimer's and other forms of dementia, as well as caregivers who, in most cases, were their spouses. Many group members shared a deep love for music. Several had extensive experience singing in choirs. Others had little or no performance experience.

Part of the intention behind this project was to provide an opportunity for all participants to have a new musical experience shared by caregivers and those receiving care. Through the process of musical exploration and dialogue, we cocreated an original piece that combined music, poetry, and dance, which we performed at Canada's National Arts Centre on May 1st, 2016.

At first, most participants showed little interest in AUMI, preferring to sing songs from their youth. AUMI played an important role, however, in enabling one member of the group to participate. After one of our singing sessions, a participant named Felix said, "I like to sing with my feet." He explained that he preferred dancing to singing. So we included a dance number in which AUMI translated Felix's dance movements into sound. For Felix, AUMI provided an enjoyable gateway into the music. His interactions with AUMI also generated more interest in the instrument among the other members of the group.

The Music Matters project highlighted the power of music to bring people together, to promote health and well-being, and to foster a sense of community across differences in age and cognitive health. Angela Paric, a graduate student in the Health Sciences Department at Carleton University, studied the health impacts of the Music Matters program, finding that care recipients' levels of enjoyment and willingness to initiate music making significantly increased throughout the program. In general, care recipients were "more relaxed, content, and cognitively engaged" during and after Music Matters sessions than at the outset. Likewise, caregivers reported fewer negative emotions following the Music Matters program (Paric 2019). The Music Matters program was a transformative experience for me too, one that highlighted music's potential to make a positive difference in people's lives, including my own. Music Matters also led to a current partnership between WAAM and Saint Vincent Hospital.

Saint Vincent Hospital

Since 2018, the WAAM project has been using AUMI at Saint Vincent Hospital, a complex care facility in Ottawa. Each visit includes a group music-making session and one-on-one sessions with patients unable to leave their rooms. In group sessions, AUMI provides a way into music for patients who find it difficult to hold or play other musical instruments. Likewise, in one-on-one sessions with patients with limited mobility, AUMI enables us to enter into musical dialogue with one another.

We have started to use AUMI in a new way at Saint Vincent. In addition to translating movements into digital sound, we are using AUMI to send MIDI (musical instrument digital interface) signals to solenoid strikers attached to acoustic percussion instruments (bells, bowls, cymbals, tambourines, woodblocks, etc.).[1] These items are propped up by mounts made of Lego building blocks. The blocks allow for rapid prototyping as we explore—with input from the participants—a wide variety of objects for their sonic potential. In a way, each session is an exercise in improvisatory codesign as we work together to reconfigure the instrument (which we have been calling "moto-mechano-music") to meet the needs of those who attend these sessions. The initial responses to the moto-mechano-music experiments have been favorable. One participant, Scott Mayhew, who has attended every group session at Saint Vincent Hospital, stated, "I love this. It gives me joy and I am doing something. There is a community. We are doing something together" (Robb 2019).

Conclusion

AUMI has played a crucial role in creating a sense of inclusion and community in each of the projects discussed above. AUMI empowers people, affording those with little or no musical training, with low confidence or self-esteem, and with diverse minds and bodies an opportunity to make music, in some cases for the first time. If making music is a fundamental human right and we are, indeed, all musicians, we need to have more instruments like AUMI that can adapt to the panoply of abilities in the world today.

Note

1. A solenoid is an electromagnetic transducer that consists of a coil of copper wire and a moveable plunger. When an electrical current is introduced, a magnetic field forms around the coil, causing the plunger to move in a linear motion.

TWENTY-TWO | "To Me, Dance Is a Home"

An Interview with Jessie Huggett

JESSIE HUGGETT INTERVIEWED
BY JACK HUI LITSTER

October 16, 2020, and November 12, 2020

Jack: Jessie, to start us off, can you tell us a bit about yourself?

Jessie: My name is Jessie Huggett. I have Down syndrome and *moyamoya*. I am thirty years old. I am a dancer and a visual artist. I have been with Propeller Dance for fourteen years, and I recently had a stroke and brain surgery, five years ago. I have chocolate brown, straight hair and blue eyes just like the ocean. I am unique, and I love having attention on me. I am joyful and I have my originality. I really like to dance, and I write scripts and fan fictions, and singing and acting. I actually am taking acting classes on Zoom with the Improv in the Arts.[1]

Jack: Could you tell us about how you started becoming a dancer?

Jessie: My dance story actually goes all the way back from the beginning. I have always loved dance. I took regular dance classes, but it didn't work out for my body or for me and my body type. So I quit, I took my own path. My mom found a dance school called Tournesol, which is a French word for sunflower, with Hannah Beach, and that worked with my own natural movements and helped me find my voice. And I created a dance, called "I Am," which is about how people with Down syndrome

get excluded and then included. And then Danceability came around, which became Propeller Dance.

Jack: For you, Jessie, what does dance mean to you?

Jessie: To me, dance is a *home*, where I can feel safe, and where my voice can be heard.

Jack: Yes! And can you share any experiences that you have had, Jessie, where either through dancing or through making music, the dance experience or the music-making experience has become more inclusive?

Jessie: I have been dancing for a long time with Propeller, for fourteen years. Since the beginning, the Ottawa and Canadian dance community has changed a lot and has gotten way more inclusive, and it has lots more opportunities. And I just got an Ontario Arts Council grant! We are part of the arts community, not just our little disability community. So the community is growing, and people are interested in our work, and we give workshops, and we actually performed at the Harbourfront Centre in Toronto as part of the 2015 ParaPan-Am games.

Jack: I'm going to ask you about the Adaptive Use Musical Instrument, or AUMI. What do you like about using that?

Jessie: I really like certain sounds, like the cartoon one. I love it. It makes me feel like I am part of the Looney Tunes. (https://doi.org/10.3998/mpub.11969438.cmp.41) (https://doi.org/10.3998/mpub.11969438.cmp.42)

Jack: I know you've been using the AUMI for a number of years now. Do you remember what the experience was like when you were first getting to know it and learning how to use it?

Jessie: Learning with the AUMI has been a bit of a challenge, but I am still learning and I am energetic.

Jack: What felt different and new for you when you used the AUMI?

Jessie: When me and Jesse Stewart performed at the Power of the Arts conference, what I got from that was that it is really cool and interesting how my movements make the sounds.

Jack: How does performing with the AUMI make you feel?

Jessie: Happy, joyful, really thrilled, and it makes me feel more alive and energetic.

Jack: In your opinion, do you think the AUMI is something that could be used by anybody?

Jessie: Yes, because making movements with the AUMI is impor-

tant for people with or without disability to help them have a voice and so that their voice can be heard.

Jack: Can you think of any ways that the AUMI could be improved or made better for you for when you are using it?

Jessie: I realized that it worked better with a blank background. The AUMI can be challenging, but fun. My mom couldn't turn it on and off, and figuring out the controls. We need someone to help with that. And if you can figure out how it responds to movement.

Jack: Let's watch a video together, of you and percussionist Jesse Stewart performing together at the Carleton University Art Gallery, in March 2015.

[We watch the video together via Zoom]

Jack: So cool Jessie! Maybe we could talk about how that performance experience felt for you?

Jessie: Watching the video now, it felt really great knowing I did all those hand movements. And I really liked the way I picked up the pace of my dancing. Working with Jesse was an honor. Working with the AUMI was a great experience; it was out of my comfort zone, which I really loved. It made my dancing way more authentic and unique.

Jack: Absolutely! And Jessie, I know you are also working on a new project, creating a dance piece based on your experience with *moyamoya*. Can you tell us a bit about that?

Jessie: I sure can Jack. The piece is called "Puff of Smoke." Do you know what puff of smoke means in Japanese?

Jack: I don't. Can you tell us?

Jessie: In Japanese the word *moyamoya* means puff of smoke and it is basically clots in the arteries that make oxygen-rich blood go into my brain. My mum and dad thought I was going to die. But I've been working on this piece for a year or so. I also have a dance mentor named Elizabeth Emond-Stevenson and she is helping me with the piece. The piece is about my two strokes and my journeys through *moyamoya*. The dance is going to be interpretive and kind of hip-hoppy. And there will be other dancers involved. It's not just a solo piece. I am hoping it will be part of Propeller Dance's future programming. I hope to see this piece going on tour. I want audiences to be educated about *moyamoya* and feel empowered by seeing my healing. *Moyamoya* is very rare for people with Down syndrome.

Jack: Jessie, what would be one thing that you would like people to know about what it is like to be a professional dancer with Down syndrome?

Jessie: Being a professional dancer with Down syndrome has changed me in many ways, as you make your voice heard. I've been with the Propeller Dance company for more than fourteen years and it is really fun to know that people with or without disabilities can come together and make art and dance.

Jack: That's great. Thank you so much for all your stories and your great insight. Thanks for sharing with me.

Note

1 Improv in the Arts is a program of Improvaneers organization in Ohio: https://www.theimprovaneermethod.com/.

TWENTY-THREE | "I Am Here"

AUMI Sings and Choral Participation

ELLEN WATERMAN, LAUREL FORSHAW,
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GALE FRANKLIN, TERESA CONNORS,
AND KAREN BERGLANDER

On a wintry Saturday afternoon, the St. John's Vocal Exploration Choir and three community members with vocal impairments are rehearsing an unusual choral composition as part of a research project on the potential for adaptive musical instruments to broaden access to choir participation.[1] Embedded in an app called AUMI Sings, "Call and Response" is a structured improvisation on a playful text:

> If you go out
> Into the living world
> You will hear
> Animals call
> What are they saying?
> They are saying
> I am here.

The choir's mandate is vocal experimentation through improvisation. In response to the conductor, the choir members use their voices to improvise in response to the text. The three men with vocal impairments (the AUMI Singers) jam on the poem in the app, triggering speech and singing by touching the screen or through movement tracking, occasionally adding their own utterances.

Introduction

AUMI Sings is a new research area, developing ways AUMI can facilitate participation across all abilities in vocal or choral settings. The original AUMI can include any sample, but to date it has emphasized nonvocal sounds, perhaps because voices seem too intimate and personal for a generic "instrument." AUMI Sings also differs from the original AUMI through its design that supports composition in the form of structures for improvisation, including use of text.[2] Our research questions centered on choral participation. What if AUMI could sing? Could such technology facilitate people with vocal impairments singing in a choir? This would be a good thing, surely, given choral music's documented role in fostering social and mental well-being.[3] Through feedback from choir members and participants with vocal impairments, we learned that while the joy of singing together is real, dynamics of introducing technology into choral singing are contested and complex (Tomaz 2011; Tucker et al. 2016).[4]

Our work with AUMI Sings raises questions about what it means to be a vocalist and choral singer in ways that encompass all abilities. As Meryl Alper (2017) notes (with regard to mobile communication apps), "Voice is a multidimensional social construct; the voices of nonspeaking [people] are not static entities to be found but rather dialogic processes. The ethics of listening to disabled publics is crucial to consider, too, in any discussion of voice" (41). For those with vocal impairments or who are nonverbal, AUMI Sings questions societal assumptions about singing as voluntary production of sustained sound through the vibrations of an individual's vocal folds. AUMI Sings presents a more expansive idea of singing that comprises recorded "real" vocal samples and technologically generated (or mediated) "voices." Further, AUMI Sings contributes to studies of vocality that place singing "in dialogue . . . with the full range of vocal practices," including not only what is commonly perceived as singing but the full spectrum of embodied sounds (Meizel and Daughtry 2019, 176–203).

Singing voice synthesis has been around for decades, but most research has focused on "composers, music creation and postprocessing, singing a live performance, to imitate a singer and even to generate voices that are difficult to produce naturally (e.g., castrati)" (Umbert et al. 2015). Examples include Vocaloid ("virtual singers in your computer" http://www.vocaloid.com/), Cantor ("turns your computer into a singer!" controlled by MIDI keyboard http://www.virsyn.de/en/E_

Products/E_CANTOR/e_cantor.html) and Symphonic Choirs (a library of choir samples that provides composers tools for building words and phrases and placing them in synthetic choral settings http://www.sound-sonline.com/symphonic-choirs). Such projects often aim to replace live singers with virtual voices.

Inspired by the original AUMI, AUMI Sings' design emphasizes participation rather than sophisticated voice synthesis. First, it aims to be simple and user-friendly for a diverse range of users. Second, it should be widely accessible and ultimately available as a free or inexpensive app. Third, AUMI Sings should adapt to users' needs and desires. With their gesture-controlled singing voice installation, Poepel et. al (2014) sought to "allow the performer to experience a credible feeling of singing with a voice different from the user herself" (359). The installation simulated an "ideal" singing experience. In contrast, we seek to create an accessible, adaptable instrument for vocal exploration to model new participation methods. We seek to expand the definition of "choir" as much as we seek possibilities for "inclusion in" choirs for people with vocal impairments. Recognition of "voice" is seldom accorded to nonverbal people and those with vocal impairments. AUMI Sings raises questions about who determines recognition, in what ways recognition occurs, and how to expand the repertoire of recognition for vocal expressions of self.

This chapter describes AUMI Sings' early development and its use in a case study comprising a day of workshops and feedback interviews in St. John's, Newfoundland, on December 10, 2018.[5] Through the speech-language pathology team at the Leonard A. Miller Centre and L'Arche Avalon, we recruited three community members with vocal impairments (the AUMI Singers) to use the beta AUMI Sings app for improvising with the St. John's Vocal Exploration Choir (colloquially known as VocalX). We are grateful to the participants, who graciously adapted to less-than-ideal workshop conditions.[6] Our original research design included a month of private use of AUMI Sings by participants with vocal impairments, to ensure familiarity and to allow for adjustments. It also included an introduction to the app for choir members before workshops. As often happens in app development, the AUMI Sings beta version was completed later than planned. For various reasons, we were unable to postpone the research.[7] This meant that all but one participant was introduced to AUMI Sings on the morning of the workshops. Our compromised methodology caused frustration and misunderstanding. What we learned, thanks to everyone's generous participation and frank feedback, was that even in a welcoming and open environment, incomplete

understanding about technology's mediating role in the lives of many people with disabilities can constitute a barrier to inclusion.

Along with the three primary researchers (Ellen Waterman (PI), Laurel Forshaw, and Gillian (Jill) Siddall), our team included visiting researcher Chris Tonelli (2019) (founder of VocalX and a musicologist who studies vocality),[8] a postdoctoral fellow, five graduate students, and one undergraduate student who assisted with activities, documentation, and interviews.[9] All participants were invited to help write this chapter; those who accepted were research assistants Karen Berglander, Teresa Connors, and Gale Franklin.

The AUMI Singers were invited to attend with assistants if desired. All three men attended with family members. Mark is mainly nonverbal with limited vocabulary and communicates with short vocal sounds. Clarie communicates verbally and expressed ideas for improving the app. Trevor can also communicate verbally. He uses his smartphone's voice-to-text program to articulate longer, more complex thoughts and ideas. Clarie and Trevor demonstrated high levels of facility and comfort with the iPad. All three AUMI Singers have a keen interest in music.

Chris Tonelli founded VocalX Choir in 2014. The choir's mission is "To encourage exploration of the voice within the context of a group using conduction for emergent composition as well as free and scored improvisation" (Facebook). When Tonelli moved away, the choir continued meeting under cofacilitation by choir members Alison Carter and Mack Furlong. VocalX's Facebook page states: "New members are welcome in each session. No previous vocal experience is necessary, just a willingness to use your voice and to abide by our one rule: to respect all vocal sound as meaningful and valuable." VocalX members create their own pieces, sometimes using graphic scores. Their approach is best defined as "soundsinging": experimental use of vocal sounds (all manner of sounds from words to vocables to what is often called extended vocal techniques) and nonvocal sounds (tongue pops, lip smacks) (Tonelli 2016). Instead of performing scored music conducted by a single leader, they take turns using "conduction," whereby a group member uses agreed-upon cues to lead the group through changes in tone, timbre, volume, rhythm, and sonic gestures.[10] We chose to work with an experimental choral ensemble because we were interested in working with a group familiar with improvisation. Improvised music has always been fundamental to using AUMI as originally conceived by Pauline Oliveros and Leaf Miller because of its flexibility and expressiveness. AUMI Sings is no exception. We commissioned Henry Lowengard, developer of the

original AUMI iOS app, to design AUMI Sings and to compose *Call and Response*, a structured improvisation embedded in the app, for use in our case study. He also provided this chapter's technical information.[11]

What follows is a brief description of the app and analysis of several themes that emerged from the research. Each AUMI Singer had an iPad running the app's beta version; it was mounted on a microphone stand and amplified through a Bluetooth speaker. A fourth setup was available for choir members who wished to play the app. AUMI Singers collaborated with eight members of VocalX. During the morning, we introduced and explored AUMI Sings, moving from free improvisation toward more directed application of the app in preparation for rehearsing the composition in the afternoon. We finished the day with feedback interviews with all participants and a focus group with the research team. Analysis is based on interviews, field notes, and video documentation of workshops.

The AUMI Sings App

As Henry Lowengard (2019) explains in a paper addressing AUMI Sings' technology and philosophy, the app "was designed to be flexible with regard to the tracking technologies and audio generating models" (3).[12] Trackers supported in the beta version are a motion tracker, a face tracker, and a touch-only finger tracker that can be changed and configured for specific users or situations. For this workshop, we used the motion and finger trackers. In motion tracking, the user is looking at a live video of themselves. A cursor in the form of a dot can be positioned on the user's nose or forehead (for example) so that sounds are triggered when the user moves. The finger tracker tracks screen touches and can be used as a performance interface. Some AUMI Singers in the workshop preferred the finger tracker, which is also available when other trackers are in use.

Henry identifies a major challenge in developing AUMI Sings: "turning a low information source of real time signals, such as video tracking, into the highly subtle articulations of [the] human voice" (Lowengard 2019, 2). In this initial iteration of AUMI Sings, using preset target states rather than providing complete access to all possible parameters controlling the vocal model addressed the complexity of this challenge. Because of the challenge of singing synthesis, Henry decided it would be prudent to begin developing the app in tandem with a composition that would focus the research on a small set of vocal possibilities. He composed *Call and Response*, designed for AUMI Singers to interact with a vocally abled

choir accustomed to improvisatory choral music making. The piece "combines long samples that are static text [for example, a short poem featuring several sampled voices] with more synthetic voices to test out more melodic real time playing" (2019, 3).

Thematic Analysis

The workshop's purpose was to pilot the beta app using *Call and Response.* Interview and focus group data indicate the workshops gave all participants rare opportunities for an all-abilities music-making session, which generated positive group feelings. AUMI Singers expressed great interest in the app and its possibilities but some frustration with its beta form. Several VocalX members preferred collaborating through the use of their "conduction" method over completely unstructured "free" improvisation (both were used during the workshop). Some VocalX members wanted to include AUMI Singers in improvisatory music making without the app's mediation. These observations raise important questions about what it means to produce vocal sounds when production of those sounds involves the body (bodily movements trigger sounds in AUMI Sings) but not by (or at least not exclusively by) the vocal folds of the AUMI Singer. These observations and analysis are delineated under key themes identified below: participation, technology and musical aesthetics, and collaboration and improvisation.

Participation

One question we asked everyone was why they decided to participate in the workshops. In all cases AUMI Singers and/or family members emphasized social engagement. Clarie said, "Because it's an experience for me, it's rare for me, it's rare for me to interact, interact with other people," and he also said that he loves "interaction. I love people." Trevor independently echoed Clarie's reasons for wanting to participate: "Because I wanted to meet new people and help the choir out." When asked whether it was valuable to have technology that allowed Mark to participate in a choir, his mother replied:

> Oh my goodness, it would be fantastic! It'd be fantastic. You know, something else to broaden his interest in life. I mean right now it's very limited what's available in the community for Mark. I mean, he can go and sit in a church [choir] rehearsal or . . . but for him to be

able to go to a choir rehearsal and then to take part that would be bonus . . . would be amazing actually . . . I don't know of any [choirs] in the city or anywhere that they would be included, or anybody [who] would know how to include them.

When asked what was most enjoyable about the workshop, Mark's mother responded: "I think just watching Mark participate, I mean obviously he doesn't belong to any musical groups or anything now that he is older, and just watching him react to the music making and to the people around him, I think was, was good for both of us." This statement points to the relative paucity of opportunities for adults with disabilities compared to children in a small city like St. John's, suggesting a real need for all-ability adult musical ensembles.[13]

Many VocalX members said they were motivated to participate by opportunities to share experimental choral practice with people with disabilities. Isabella noted, "Well, I find VocalX so interesting and pleasurable, I thought that . . . being able to incorporate it with people who are unable to speak was very attractive." (Her motivation is an interesting parallel to Trevor's desire to "help the choir out.") For Alison, VocalX is a space where singers can feel "freed" and "unhindered" by normative music-making expectations: "You could be vulnerable and not be too worried about it." While the choir and AUMI Singers were positive about collaborating, and the AUMI Sings app was intended to facilitate that collaboration, differing attitudes toward technology and musical aesthetics influenced participants' experiences.

Technology and Musical Aesthetics

The three AUMI Singers regularly use assistive technologies and were much quicker to adapt to AUMI Sings than the rest of the choir, who were invited to try it during workshops via the fourth iPad station. All three AUMI Singers have strong interests in music; two expressed interest in knowing more about the app and connecting with Henry to give more feedback. Choir members were divided. Everyone in VocalX embraced opportunities to work with adults with disabilities and warmly welcomed Trevor, Mark, and Clarie to the choir, but some found the app unnecessary, even problematic for what they already see as the choir's highly inclusive choral practice. Others saw tremendous potential. In written reflection, Karen Berglander, tasked with taking observational field notes, summarized a key tension in the workshops: insufficient time for

dialogue. "The disconnect between what the VocalX singers expected from the workshop and the reality of how the app functioned in beta led me to the realization that whilst the ideal would be for AUMI Singers to be seamlessly integrated into groups of various abilities without need for extended dialogue, in practice, that cannot happen without risking a mismatch in expectations." This section explores different attitudes about musical aesthetics and the technologically mediated voice.

During the workshop and in subsequent interviews, AUMI Singers Trevor and Clarie expressed their ideas about the app's affordances and limitations. Clarie was groove-oriented, repeatedly asking, "Where's the beat?" (Jill, focus group). In his interview, Clarie said, "If it was mine to make, I would put a beat in . . . I would love to put a beat [in] it." Jill, an assistant to Clarie during the workshops, observed that he was "moving his head quickly back and forth, particularly in the keyboard state, clearly trying to get a groove going, and it's just not designed right now to allow that to happen, as you know, so Clarie was frustrated by that." Gale assisted Trevor during the workshops and observed:

> At some points Trevor would actually stop and go like this [*gestures*]—touch his ear, referencing to listen to the sounds all around him and how he can contribute. But sometimes he really didn't like the sounds, which he would acknowledge and go onto the next thing. Trevor mentioned to us in the interview, and also to me personally, that he wanted to be more involved, I think, in the process, so with different sounds in the app and sort of, not only sounds but musical sounding sounds.

When asked whether the workshop matched his expectations, Trevor said, "Well I thought this was going to be something like producing your own songs/words." He and Clarie approached the app as a musical instrument, quickly exploring its current capabilities, then listening beyond them to imagine developments that would better accommodate their musical tastes.

Significant contributions to research on adaptive use instruments are made through observing users' experiences with the instrument (Finch, LeMessurier Quinn, and Waterman 2016). The most important design consideration is that instruments should adapt to users' individual needs. Grace, who assisted Mark during the workshops, observed a design issue exposed during the session. She noted that Mark often uses front-to-back rocking motion and rarely moves from side to side.

"AUMI Sings doesn't always recognize that Mark is in the same spot and it doesn't play repeated notes. . . . And the sound doesn't return until Mark leaves that space and then comes back to the space." Mark's experience revealed the need for a more refined interface between the graphical layout and the player. The "real" and "virtual" choral soundscape could be overwhelming for Mark. His mother managed this by positioning Mark at the group's outer edge. How to modulate choral music in response to individual participants' sensory thresholds is important to consider in further research. Clarie's and Trevor's comments also affirm the importance of involving people with disabilities in the very conception of adaptive musical instruments to think through aesthetic, physical, and cognitive issues.[14] What would AUMI Sings offer if our research had started with recruiting participants with vocal impairments and ascertaining their musical preferences *before* developing the app?[15]

Along with pointing out the beta app's technological limitations, several participants wished AUMI Sings had a wider variety of sounds, especially "musical" sounds. When asked what kinds of sounds they wanted future versions to include, Trevor said, "Like, get the sound of your own voice and modify it so you can make your own music with different sentences from different songs." VocalX member Alison (an occupational therapist) suggested that AUMI Sings build on users' distinctive vocal expressions and invite other choir members to adopt those sounds into their musical vocabularies:

> You'd probably want to try and find out . . . some sounds that [the people using AUMI Sings] would be interested in being able to make, maybe taking sounds that they *can* make and using those as the samples so that then they can be raised in volume. . . . if they could make a quiet sound, but couldn't make it loud or couldn't sustain it, then their sounds could live in a bigger or more expanded way [in AUMI Sings], and then . . . the palette of sounds that the whole choir makes would have to be the same. You could have those sounds as possibilities for the people not using the AUMI interface as well.

Trevor and Alison emphasized the app's role as an aid to individual creativity and saw potential for development focused on user agency. Alison went further, suggesting the choir adopt sounds introduced by participants with vocal impairments. Different ideas of what constitutes a "musical" sound, however, complicate technology's mediating role. For

Trevor and Clarie, enjoyable music means songs and grooves. VocalX enjoys experimental vocal sounds.

For some VocalX members, the AUMI Sings app was a barrier rather than an aid to inclusion of Trevor, Clarie, and Mark in the choir because it was a proxy for their embodied vocalization, which felt "inauthentic." The perception stems partly from choir members' openness to and enjoyment of all embodied vocal sounds. This experimental choir embraces the idea that all possible vocal sounds are aesthetically worthy, so it is unsurprising that Alison valued sounds AUMI Singers produced without technological assistance. Fellow choir member Jan mused, "I wondered actually whether it would have been just as joyous without that thing on the [mike stand] . . . I would like to have tried a little bit just playing with who we are as human beings without [the app] right away and then maybe have brought that in after we just got to know who we were . . . that human dimension I think is key." For Michael, the purpose of VocalX is to create an inclusive environment for all voices without ability-based judgments. He stated that the choir consciously avoided using instruments or electronic technologies. It is not surprising, therefore, that AUMI Sings disrupted their usual practice. He noted, "If it gives voice to people that do not have a voice, I think it is great. . . . [But] I don't see why we couldn't include people with disabilities without the necessity of a technological interface." These choir members would happily welcome participation by Mark, Clarie, and Trevor for embodied sounds they can make. Arguably, most choirs would not embrace this full range of vocal sounds, since choral music is generally predicated on normative "singing" ideals.

Nevertheless, such reactions problematically position the "human dimension" in opposition to technologies that mediate many people with disabilities' interactions with an ableist world. Except for telecommunications, people without vocal impairments are unaccustomed to relying on technology for oral communication. Thus, some VocalX members' dissatisfaction with technology in a choral setting is uncomfortably at odds with the role communication technology plays in mediating lives of many people with vocal impairments. As previously mentioned, Trevor uses his phone's text-to-voice app for complicated or lengthy conversations. Taken at face value, these VocalX members' comments reveal deep-seated preferences for "natural" versus "technological" voices, which is worth consideration. On one hand, the choir was committed to collaborating with people with vocal impairments. Several expressed delight in connections made with AUMI Singers and the app's potential.

On the other hand, several choir members considered the technology a barrier to self-expression. AUMI Singers, however, readily embraced technology and could easily envision how it might be developed to better suit their musical tastes.

Drawing on work in sound studies, Gale characterized this tension as a problem of listening positionality: "Listening is an act informed by historical and cultural perspectives that allow us to form understandings of the world (Meizel and Daughtry 2019, 176; Kapchan 2016). Different genres of listening allow listeners to assume diverse affective positionings and to 'perform different aesthetic and political work'" (Kapchan 2017, 5). Although some VocalX members questioned the authenticity of using technology and its relation to "natural" sounds of bodies, AUMI Sings pushed them (and us) to consider what it means to *sound* inclusive and how perceptions of disability are *heard* in music environments and daily life. AUMI Sings not only enables opportunities for participation and collaboration among people with or without disabilities, but also challenges us as musicians and scholars to reflect on how we hear exceptional bodies, how such bodies generate sound, and how diverse sound making and listening can apply to choral spaces more broadly. In other words, Gale sees AUMI Sings' potential to encourage "critical listening positionality" as a means of reflecting on how and why our ableism conditions listening and to help us learn to "listen otherwise" (Robinson 2020, 9–11).

For Teresa Connors, a creative coder and intermedia artist, the dissonance in participants' feedback was about more than education or managing expectations:

> Beta testing new technologies is an essential step to robust UX/UI [user experience/user interface] systems. It involves unforeseen challenges in many iterations to find the best solutions. The goals of the AUMI Sings project are ambitious in that vocal synthesis is complicated. Moreover, developing an app that enables physically/vocally impaired bodies to participate in choral ensembles compounds the UX/UI challenges.
>
> The beta version of AUMI Sings is situated to develop new methods of engagement for diverse bodies, from which new styles of composition and choral inclusivity could emerge.
>
> . . .
>
> The MUN workshop enabled questions to emerge that will help focus this research group's intention. Two ideas that emerged for me

were: (1) involving a physically/vocally impaired person in the UX/ UI development, and (2) enlisting a physically/vocally impaired person to compose a work using the AUMI Sings app.

Gale's and Teresa's reflections offer productive strategies for continued research on using adaptive technologies for choral participation: iterative consultation and reflection at every stage, and fuller integration of people with vocal impairments in app development.

Next we discuss approaches to collaboration and improvisation, our core research methodologies (along with participant observation and feedback interviews). In previous studies of the original AUMI, improvisation was found to be a flexible, adaptive mode of musicking that promoted inclusion.[16] This remains true for AUMI Sings, but the choral context revealed the crucial role of structure in facilitating collaboration in a choir.

Collaboration and Improvisation

Several VocalX members discussed how improvisatory collaboration unfolded in the workshop. Some expressed frustration with the initial free improvised piece, during which most participants heard AUMI Sings for the first time. Inclusion of AUMI Sings disrupted what singers came to expect of music making within VocalX, forcing them to decide what to listen to, whose sounds to value, and to entertain broader concepts of inclusion and exclusion. The new information was distracting; many participants experienced that initial jam as a chaotic assemblage of individual sounds instead of an ensemble.

After the initial improvisation, choir members formed small "pods" centered on individual AUMI Singers. For those working closely with Clarie, person-to-person engagement through improvisation drew the singers' focus to interacting directly with him. Mark's mother noted the impact of person-to-person engagement on her son: "[T]he three ladies [VocalX singers] kind of were, almost like they were, singing to Mark. . . . And Mark really responded when they're making their sounds and they're making eye contact with [him], and [he] kind of reacted to them, didn't he?" VocalX members' choice to interact directly with each AUMI Singer drew them into the choir. After the free improvised session, we took a break with refreshments, allowing further opportunities to interact socially.

Several VocalX members preferred the more cohesive whole-group

music-making experience that occurred when Alison took on the role of conduction, using visual codes familiar to the ensemble to guide the improvisation. These included hand signs for changes in volume, to indicate rhythmic patterns or textures, and to cue short solos and duets. Terri explained:

> I don't know if it was just that I had become so much more aware of what it [the research] was about then I did when I first went in, and I just thought that the second workshop was more structured and gave me more insight. And it was more fun! . . . and it might just be a self-ish statement because I thought "okay this is what I'm used to. Alison is up there directing and so I know more of what's expected of me because I'm being directed." So that part of it worked for me better.

Other choir members concur with Terri. Isabella preferred more structure: "although VocalX is improv, it is totally improv, I quickly came to understand the power of conduction to structure that." Mack also valued the conductor's role: "We learned some lessons today: always have a director to tell you to shut up and keep quiet and let other people in, because some people don't fight for space, can't fight for space." His observation draws attention to the concept of space—aural, physical, sonic—and whose role is to ensure *space* is available to all. These insights suggest that within the community constituted by a choir, even one devoted to improvisation and individual expression, conductors can ensure that the soundscape is equitable and inclusive, if only because the conductor can listen more effectively to the overall sound than any individual singer can. For VocalX, their use of conduction offers suggestions rather than strict instructions; any singer may conduct. Within this workshop's context, Alison offered to lead using gestures familiar to the choir. AUMI Singers expressed no preference for introducing conduction to the workshop; their experience of participating in music making seemed unaffected by it. Within the workshop's time constraints, we did not reach the ideal approach to facilitating collective music making.

After lunch we rehearsed *Call and Response*. The composition includes text and a plan for moving through its nine sections, but singers improvise musical details for each section. Henry explains (email to authors August 3, 2020):

> AUMI Sings is a musical app which, in addition to playing sounds, guides the player through the sections of an improvised composition.

In any one section, the AUMI Sings player controls the sounds it produces as well as the transition to another section of the composition it is currently playing. The sounds and controls to change to new sections are represented onscreen by quadrangles. When an AUMI Sings player moves a cursor into a "sound playing box," a sound begins and while the cursor is still within the box, certain aspects of that sound can be manipulated. When the cursor enters a "control box," the composition section associated with that box loads. The cursor is moved by tracking the motion in a video image, as with AUMI, or via finger touches. Compositions are loaded into AUMI Sings which specify sets of sounds, how they can be manipulated, and which ones are associated with each section of the composition.

Call and Response has nine sections in total; the first seven are for each of the seven lines of a poem:

If you go out
Into the living world
You will hear
Animals call
What are they saying?
They are saying
I am here.

These lines are structured so users can choose among three different voices saying each line. The section after the poem is a thirteen-key virtual chromatic keyboard with sampled "ah" vocalizations. The last section is a circular interface with eighty-seven sampled voices saying or singing "I am here." Using the app, AUMI Singers interact with the choir musically. By the end, they say/sing "I am here," which Henry intends as an affirmation of presence and inclusion.

The choir workshopped *Call and Response* through three iterations interspersed with group discussion where VocalX and AUMI Singers participated. With text projected on a screen, Laurel began by talking through the score and demonstrating various spoken and sung words on AUMI Sings. Drawing on the pedagogical practice of "whole-part-whole" common in music education and choral practice, VocalX singers were invited to improvise freely on the text while AUMI Singers played the text on the app, using choices such as repetition, ordering, dwelling on a quadrangle, or changing to a new one. The primary goal was to create

space where all participants could experience "the whole" of the sound, encouraging them to construct their own understandings of the sounds, their relationships to those sounds, and their growing relationships with other participants. This first attempt ended in general laughter as various people called out "I am here" with comic inflections. Discussion of how best to organize the piece ensued. Feeling tired, Mark opted to leave the session.[17] For the second attempt, Laurel (a choral conductor) cued the change from section to section and spontaneously invited Isabella to contribute conduction hand signs. The strategy resulted in a more cohesive path through the piece and a more varied soundscape triggered by AUMI Singers. The performance ended with just the AUMI Singers playing the wheel of eighty-seven sampled voices singing and saying, "I am here." Jan enjoyed this ending because "the most important people in the room got to say, 'I am here.'" Discussion centered on how to reorder the sections so the piece would begin and end with "I am here." Everyone would participate in the first iteration, but the piece would end once again with a duet by Trevor and Clarie. Other parameters were discussed, such as balancing the choir's volume so AUMI Singers would always be clearly heard. According to Isabella, during the first two attempts it seemed "we were all responding to the words and not listening," reminding everyone about a core principle of good improvisation. The group decided to have Alison use conduction throughout the performance to prompt timbre, texture, and volume changes, while Laurel continued cueing section changes. Unsurprisingly, this third attempt was still more coordinated, with more varied, interesting sonic material and variation in phrasing and dynamics.

Alison cues the choir to fade out, and Clarie and Trevor play an extended duet in which they mix AUMI Sings' voices with their own iterations of the words "I am here," creating vocal counterpoint. Alison brings VocalX back into the mix, building a gradually denser and louder pointillistic texture before once again fading out to end the piece.

Many are moved by this finale combining sampled and synthetic voices of AUMI Sings with Clarie's and Trevor's own voices, creating a strong feeling of presence. In the hush that follows, however, Clarie shares, "I don't like being the center of attention." Jill asks "Why?" He replies with a smile "I'm too shy!" and while he then joins in the ensuing laughter and applause and congratulates Alison on her conduction, it is a reminder that participants experience music making in diverse ways. What felt aesthetically and emotionally pleasing to many in the room was not necessarily experienced that way by all.

Throughout the day of workshops, VocalX and AUMI Singers modeled the complexity of working together as a choir, including making group decisions about how to shape the music, and improvising space for every group member to be heard. They did this despite the frustrations of working with a beta app, and across differing aesthetics and attitudes toward technology.

Conclusion

Working with an experimental, improvisatory vocal ensemble was a good opportunity to test the AUMI Sings beta app with improvised musicking. Perhaps the two greatest challenges were AUMI Singers' experiences of the app's limitations, and some choir members' sense that technology alienated the AUMI Singers from the ensemble experience rather than enhancing their experience. These tensions could have been ameliorated with more orientation and dialogue. Karen Berglander reflected:

> This workshop, which was still very successful in providing opportunities for sound making (and opportunities for fun), shows that given the current culture of Western choirs and sound-making groups, it is important to have an active dialogue in mixed-ability groups about the functional limitations of technological aids being employed by group members. This will help assure that group cohesion is not impacted by different technological expectations, especially when issues of ability and age may already serve as barriers for personal connection, and help to smooth the way for further technological forays into vocal music spaces.

Most participants expressed and demonstrated positive feelings about making music together and the importance of community in ensemble music making. The enthusiasm with which the AUMI Singers engaged the app, and the potential they and other VocalX members see in future development is encouraging. Henry's development of the AUMI Sings concept into an app has extraordinary potential as researchers and practitioners seek ways to create more diverse choral practices and spaces.

Notes

1. This research was conducted in St. John's, Newfoundland and Labrador, Canada, under research ethics approval from Memorial University,

Interdisciplinary Committee on Ethics in Human Research (20182217-MU), with generous funding from the Bruneau Centre for Excellence in Choral Music and the International Institute for Critical Studies in Improvisation (funded by the Social Sciences and Humanities Research Council of Canada).

2. AUMI Sings plays "process instruments," combining controlled sound making with composition that controls what sounds are possible. Similar systems include bitKlavier (https://bitklavier.com), Nodal (https://nodalmusic.com), and many compositions/instruments written in Hierarchical Music Specification Language (HMSL) and its successor JMSL (Java Music Specification Language) (http://www.algomusic.com/jmsl/).

3. See for example, Livesey et al. 2012 and Clift et al. 2010.

4. We are not suggesting technology is always or the only way people with vocal impairments choose to communicate. Clara Tomaz, a multimedia artist who lost her tongue to throat cancer, uses her voice and speech as an "adaptive instrument." See Tomaz, chapter 3, and her vocal performance and film *Deviations and Straight Line* (2010). https://vimeo.com/16685998. For more on how her surgery and voice and speech rehabilitation shifted her perception of language, see Tomaz 2011.

5. Interviews were conducted by the research team in St. John's on December 10, 2018. That same day, we recorded a focus group with researchers and research assistants. All participants in the AUMI Sings project, including research assistants, choir members, and the AUMI Singers and their assistants, had the opportunity to read and respond to this writing. Research participants were compensated for their time with an honorarium. All participants gave permission for their names to be cited.

6. Participating VocalX members were David Buley, Jan Buley, Alison Carter, Mack Furlong, Isabella St. John, Kati Szego, Terri Thomson, and Michael Waterman. The AUMI Singers are Mark Andrews, Clarie Mitchell, and Trevor Wakely, accompanied by Marilyn Andrews, Marie Mitchell, and Neil and Constance Wakely.

7. Our grant from the Bruneau Centre for Excellence in Choral Music was for Newfoundland-based research. Subsequent to the initial research design, the three core researchers moved to distant parts of Canada. After mid-December 2018, it would not have been possible to complete the research in St. John's.

8. See especially Tonelli 2020. Tonelli has founded several vocal exploration choirs in Canada and the Netherlands.

9. The research team included Karen Berglander, Mariana Castro Carvajal, Dr. Teresa Connors, Christian Dauble, Gale Franklin, Ellen McCutcheon, and Grace Rose.

10. Conduction is a technique for facilitating large group improvisation and can be systematic, as in Butch Morris's pioneering work and Walter Thompson's Soundpainting technique (http://www.soundpainting.com/workbooks), or idiosyncratic. VocalX uses conduction symbols from several sources, but especially from founding director Chris Tonelli, who draws on gestures learned from Christine Duncan, director of Element Choir in Toronto.

11. In music, "structured improvisation" refers to a composed score designed to present a selection of prompts for improvisation. This may include form

and style elements or musical materials such as pitch, time, and timbre. Such scores may be graphic, include traditional notation, or (as in the case of *Call and Response*) rely on text instructions.

12. Lowengard is the creator of, and holds the copyrights for, AUMI Sings.

13. At the time of writing, St. John's had a neuro-diverse children's choir, Lauda, as part of the Shallaway Youth Choir. The Better Breathing Choir, a research project run by Dr. Jane Gosine, provided opportunities for adults with compromised respiratory systems to sing together with university music students. AUMI Singer Mark participates in an occasional music circle run by L'Arche Avalon.

14. Alper (2014, 3) cites research by Guha et al. in the participatory design movement that explores "how young people with disabilities can benefit from being directly involved in the development of technology intended for their use, and in turn, how technology is improved by their participation." See Guha, Druin, and Fails 2008.

15. The original AUMI was designed especially for three students with severe impairments with the principle that the app would be designed to adapt to them rather than their having to adapt to the app. www.aumiapp.com.

16. See, for example, Stewart et al. 2017.

17. Mark's mother said it was unusual for him to participate in an event for so long, and that music making had effectively held his attention, but that he was less interested in the discussions.

TWENTY-FOUR | AUMI, Theremin,
and Sonic Witnessing

LI HARRIS

What is it to be a witness?

*To have knowledge of an event or change by means of
personal perception.*

What is it to sound?

*To convey a specified impression when heard; to give an
indication of being.*

My first encounter with AUMI was in 2017 at the International Symposium
on Adaptive Technology in Music and Art (ISATMA). I attended as a
newcomer in this community of artists and scientists. I was, as I recall,
a bit apprehensive. I, too, am an artist, performer, and composer, and
although I had dreamed of an opportunity like this to convene with like-
minded people working toward closing gaps between the arts and sci-
ences, I was nervous that I may not be well enough qualified to engage
in technical conversations, or that my practice as a performer and
composer would be limiting in some way within this new environment.
At ISATMA, I presented a short video called "Body Language," which
shares how I am using the theremin as a creative tool with special needs
and nonverbal children. I then demonstrated how the theremin works
by responding to the variances in the electromagnetic fields near its two
antennae. The presentation was well-received by fellow symposium par-
ticipants. Once I realized there was little to be nervous about, I really

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began to see the intersections between what Pauline Oliveros and her collaborators set out to achieve with AUMI and the needs I was being intuitively guided to address in my own community and practice.

I always wanted a theremin. Since the first time I heard one in college, I dreamed of owning one for myself one day and using it to play duets with my voice. I studied classical music and opera on a highly competitive, strenuous level for many years. Most of those years, I focused on vocal production and vocal identity: how to make the best, most beautiful sound possible and have that sound recognized as my own unique value in the world. At times, I was debilitated with performance anxiety because not only was I uncomfortable in my body as a young singer in her teens and early twenties, I was often uncomfortable being one of a small constituency of Black Americans in my educational environment. I got used to it—being, looking, and sounding different—but in retrospect, I realize that my voice did not belong to just me.

My voice represented a responsibility to achieve merit and qualify my existence in the room, not just for me personally, but symbolically for my race and community of origin, which were disproportionately absent from my surroundings. This isn't the performance of my aria: "Woe Is Me . . . It's Hard to Be a Black Opera Singer in a Predominantly Eurocentric Culture," although that, too, is a major feat with significant soundness on its own. The fact is, it is problematic to bring forth a voice from inside an oppressed body, one often overlooked by society and not yet understood or valued by the Self. When I first heard a theremin, the sound reminded me so much of my voice, but with more freedom, broader expanse, and less self-monitoring. My observations proved logical once I learned more about the instrument's origin. The theremin was invented in 1920 by young Russian physicist Lev Teremen, whose research into proximity detection had Soviet government support during the Russian civil war. One initial intention of the instrument was to serve in a surveillance capacity by indicating electromagnetic changes of events occurring in spatial relation to the instrument's two antennae. Simply, the theremin can only monitor its surroundings in relation to itself because it is a surveillance machine. It was created to be a sonic witness, responding to life happening in its vicinity. Most often, the instrument is activated by an engaged body in space. It was made to do that. Thus, the theremin, much like AUMI, unapologetically sounds its purpose. There is no need for the theremin to exact its own location. It IS the control and was consciously created to be just that in its environment. These were some of the multiplex notions that made me feel that

if I could practice singing duets with a theremin, I could free my voice from beyond my body, and the social and historical implications placed upon it, while also practicing my body's ability to sound into space that connects every living being. Being free.

Fourteen years later when I finally purchased a Moog Etherwave theremin, I left it in the box for a couple months and grappled with how I would approach mastering the instrument. One day my mother, who was undergoing serious medical treatment at the time, constantly surrounded by machines designed to give information about her body to someone other than herself, bless her heart, came by my studio and demanded, "Turn it on! I want to hear what my body sounds like!" My first instinct was to correct her and let her know that "mastering" an instrument as complex as this takes serious evaluation and technique. Rome wasn't built in a day. But as I began to listen and really understand what she was teaching me, I was stunned. This is exactly how I will engage with this instrument, I thought. As a mirror to myself, as something that will tell me something about my body. As something that will see me first as a living being. A tool that when powered on will reflect through its own sound, the sound of my Beingness. My Permission, My Proof of Life. My Mattering. The truth that I am mattering in space, in sound, beyond human perception, with or without movement, with or without engaging my vocal mechanism.

What Pauline Oliveros and her team were working toward with AUMI and improvising across abilities encompasses much more than what we generally understand as ableism or improvisation and is rooted in Deep Listening®. The AUMI interface is a motion-tracking program that can be set up on a tablet, a desktop, or iOS device. All come equipped with video and audio surveillance as well as recording capabilities. In this way, the AUMI is comparable to the theremin, also created for surveillance. But where AUMI works in parity with devices with built-in video surveillance features, the theremin engages in sonic witnessing that abstracts the subject from traditional visual perception. AUMI's interface detects the smallest movements, from a nose twitch to a chest breathing to a slight head tilt, equipping people that have mental and physical disabilities with more options for recognition as communicative, present, creative beings. Pauline has said, "We want to increase their possibilities for choice with improvisation as an empowerment for them." This echoes my sentiments when I educate underserved communities of "high-risk" children and young adults, often on the unfavorable ends of socioeconomic oppressions, or who lack access to health care and

basic social, reproductive, and environmental justice, and who may have difficult-to-identify behavioral differences. People with disabilities (physical and mental) have historically faced wrongful institutionalization and ostracization. Therefore, engaging with AUMI is even more gratifying because the software works by looking at the player with great care and attention to detail. Even if the world can't see me, this instrument can. Yet when I work in communities where perceptions of race, skin color, gender, and orientation are treated as occupational and civil disabilities, it is useful that the theremin is void of visual perception and is only witnessing through sound and electromagnetic waves. Both instruments offer chances to be seen and heard in a more inclusive manner; both also demonstrate and reflect what it means to deeply listen. Perhaps we are all playing duets with our instruments when we think we are playing solo. Perhaps we are never playing solo if we consider that space is playing and holding our bodies as instruments too, revealing the unequivocal truth that in Being we are all the same, witnessing space and being witnessed by space. In Being, we are already improvising and with more conscientious innovations, we can all choose how we want to sound our unique purpose.

| AUMI in Practice

The Mills AIE

MATT ROBIDOUX

DEDICATED TO BELOVED AIE MEMBER
ANNIE PANKOW (1987–2021)

When recalling how I began working with community-centered music improvisation in ability-inclusive contexts, I think of the late Danny "Monster" Cruz. Between 2014 and 2017, I belonged to his band Flaming Dragons of Middle Earth (FDOME)[1] while working as his care assistant. The band's credo was expansive and open, with Danny's propulsive improvised lyrics at the fore. This project brought together many otherwise distant contingents of the western Massachusetts music scene in rock-and-roll unity on the fringe of obscurity. I left my job with Danny in 2015 for a full-time position at Viability, a community-based day program for adults twenty-five to seventy-plus with developmental cognitive disabilities, many of whom lived independently. Here I programmed arts activities for our thirty participants and took them on outings. Danny's group hosted weekly "open practice" (anyone could attend) at the Brick House Community Center in Turners Falls, Massachusetts. With this connection, I began facilitating weekly musical improvisation sessions with my new clients.

The Brick House had an accumulation of donated instruments: guitars, keyboards, drums in various states of disrepair. It was many of my clients' first experiences playing them, which they did fearlessly and imaginatively. The Beeping Red Car Band, as participants named it,

proved more exciting than many of my previous improvising situations. We started Viability Presents, a local monthly concert series in a small natural history museum that led to Free As I Want To Be, a music, art, and craft festival celebrating people with disabilities in the arts. Free As I Want To Be reached out to include other community-based day programs in the Pioneer Valley, programming a diverse array of local artists including Flaming Dragons of Middle Earth.

My move to Oakland, California, to attend Mills College was largely due to the legacy of late composer, electronic music pioneer, and humanitarian Pauline Oliveros. Through her work I became familiar with Mills. As a prospective student I was particularly drawn to AUMI.

Throughout my years in the human services profession, I saw great need in the underfunded and disenfranchised populations I served, recognizing the potential of the arts to contribute to this cause. Artistic practices my adult clients were familiar with—coloring, playing games—tended to be infantilizing and designed to pass time. Filling positions in this field is difficult. They are often underpaid and the work can involve intense work environments.

When arriving in California and securing a job at East Bay Innovation (EBI)'s community day program for people with profound developmental disabilities, I sought music therapeutic practice that felt connected to my artistic practice. This resulted in my founding the Adaptive Instrument Ensemble (AIE), a free public improvising group using AUMI to help ensemble members with limited ranges of motion improvise with high degrees of agency.

AIE started at Mills College Center for Contemporary Music shortly after its fiftieth anniversary. In 1966, the San Francisco Tape Music Center moved to Mills. Oliveros, one of three founding members (with Morton Subotnick and Ramon Sender), was the Mills Tape Music Center's (MTMC) first director. Later renamed the Center for Contemporary Music (CCM), the facility upheld its role as community center by providing access to electronic instruments and studio time for individuals in and outside the institution.

The utopian spirit underlying Bay Area counterculture resonates in the history of the disability rights movement (DRM), which took the phrase "nothing about us without us." The 1960s DRM, "a belated mission parallel to other liberation movements," sought to dismantle material and social conditions of disability (Charlton 2000, 3). Ed Roberts, a leading DRM figure, was also "founder of UC Berkeley's Physically Disabled Students Program, which became the model for Berkeley's

Center for Independent Living (CIL) and over 400 independent living centers across the country."[2] CIL laid the groundwork for organizations like East Bay Innovations, emphasizing person-centered, community-based approaches to assisting people with disabilities. Roberts dedicated himself to refuting "old attitudes that actually allow [the disabled] off the hook . . . that have no expectations and believe that we will not . . . participate in our own communities. In fact, we've discovered that the reality is just the opposite" ("Disability Activist Ed Roberts on *60 Minutes* with Harry Reasoner" https://youtu.be/ZxidR5SZXxA, accessed September 27, 2022). By way of universal design, adaptive instruments like AUMI encourage communal usability, inclusivity toward individual needs and access to community music-making activities previously barred by exclusionary instrument design.

AUMI: No Special Skills Necessary

Oliveros was MTMC director for only one academic year before she accepted a position at the University of California at San Diego (UCSD). There she developed text scores focused on enhancing listening skills and exploring new forms of collaborative social structures. Her *Sonic Meditations* were intended for group work over long periods and for individuals for whom "no special skills are necessary" (Oliveros 1974, 1). Prolonged effects of these pieces were intended to produce "heightened states of awareness or expanded consciousness, changes in physiology and "psychology from known and unknown tensions to relaxations which gradually become permanent" (Oliveros 1974, 1). Oliveros, the social practitioner, handled community as material for composition in ways others might use pitch, rhythm, and timbre.

Shared time, space, and sound, and meeting inclusively in and through music are among AIE's founding principles. Our cooperative approach encourages members who do not communicate using embodied oral speech to be leaders. In AIE, musicality is recognized as innate human capacity and basic response to the human world (Pavlicevic and Ansdell 2010, 362).

AIE requires broad participation and works in teams of three: AUMI user, care attendant (employed by EBI's community-based day program), and a changing roster of guest instrumentalists. An assortment of egg shakers, noise makers, Boomwhackers, plastic recorders, tambourines, and assorted percussion instruments are provided at our sessions along with iPads. To facilitate inclusive, valuable musical experiences

for participants with multiple/varied abilities, it is essential for all who are present to participate. EBI staff, who encourage sound interaction with their respective 1:1 clients and with the larger group, usually choose small percussion instrument roles.

In *Deep Listening: A Workshop Manual*, Oliveros writes, "As you hold the space being who you are makes it safe for others to be who they are. This creates an invisible structure that can support the basis for creative thought and action" (1998, 7).

"Holding space" requires an unconstrained, accessible environment. The facilitator's role in AIE is also that of an interpreter whose skills, like those of any social or artistic practitioner, are refined over time within the same focus group. There is particular attention to sound produced with AUMI, which has been customized into person-specific software instruments.

Agency in Gesture

AUMI accommodates various body types and ranges of movement, and thus may realize a broad range of musical and expressive goals. Foundations of our social/musical environment—acquired in communication and collaboration with others—include a wide range of activity: eating, sleeping, and simply listening (Pavlicevic and Ansdell 2010, 357). In his musicological study of people, performances, improvisation, culture, and contexts, Christopher Small examines how "musicking"[3] involves multiple relationships established and elaborated through sound. In this case we incorporate scheduling workshop meetings, signing out iPads, and arranging transportation under an umbrella of collaborative "musicking." Throughout our regular two-hour group sessions, varying levels of musical engagement are in flux. Seizures and other medical issues have arisen during sessions. These are expected aspects of AIE's social domain as we engage "musicking" in ways that are actual expressions of lives with disabilities.

AIE is always a work in progress. In early meetings we used AUMI-equipped iPads for built-in features and internal speakers. Our scope expanded in an effort to support the highest degree of agency possible for each individual. We accomplished this through software programming and custom instruments.

> The AIE session that I attended was full of interesting musical textures as well as a sense of inclusivity and equality amongst the group

Figure 25.1. Preparing the workshop space, Mills College, April 19, 2019.

members. I loved the adapted instruments and how they allow for accessible methods of making sounds. There was a sense of community in the group created by having a shared space and shared goal of music making. Having studied music therapy, I can see how providing this opportunity to improvise freely with adapted instruments can bring social, physical, cognitive, and emotional benefits to all group members.

    —Sarah Morgan, music therapist

Meet the Band

Between December 2017 and May 2019, the EBI CDS Program visited Mills College every two weeks for the AIE music group. The following describes each individual's role in the ensemble's customized AUMI setup.

Ben plays a lap steel guitar that sits on a piano bench facing him. He strums for the duration of most sessions. AUMI is aimed at Ben's hands, the most active part of his body. Values generated in AUMI from his

strumming motions influence instances of sampling and playback speed on his instrument.

Arion's setup uses group AUMI values to process her voice with a vocoder plugin, which usually sounds like a high-pitched robot voice. She likes to yell "Hello!" into the microphone and imitate animal noises, which give ensemble energy a charge when needed! Arion also uses a LeapMotion controller taped to a music stand to modulate FM synthesis, used in a style similar to that of a theremin.

Jackie often rests or sleeps. When she engages with the interface, Jackie's movements occur on a very small scale. It is important to change AUMI's parameters to the highest zoom and sensitivity levels and to be set in exactly the right place to pick up Jackie's movements. She plays a resonant filter with FM synthesis and white noise with velocity values influenced by the collective group. If someone in the group moves suddenly, Jackie's patch responds with a loud sound. If she moves slightly, Jackie triggers active electronic pulses.

Enoch, with whom I have spent the most time one-on-one, loaned the group his percussion instruments. To reflect Enoch's interest in percussion, I recorded each instrument and created a sample bank triggered through his movements. The copper straw circuit was also developed with Enoch in mind, although it has also become a favorite of Annie's. Straws are among Enoch's favorite objects to manipulate. He does so with high dexterity. This pair of copper straws modulates a dual oscillator circuit, creating an arpeggiating rhythmic pulse when joined.

Annie has a direct action-sound relationship with her instrument, an additive synthesis plugin that creates shimmering long tones with modulating frequency levels determined directly from her AUMI values.

Ed Roberts Campus Performance

On February 5, 2019, AIE performed at Ed Roberts Campus in Berkeley, a center dedicated to disability rights and universal access built by organizations with a common history in the independent living movement. We intended to debut new systems in Max/MSP but faced a major hurdle in a broken audio interface! After an hour of troubleshooting there was no choice but to abandon the system and use AUMI's built-in sounds through small built-in iPad speakers. Setting up at the base of a multilevel wheelchair ramp in the main entrance felt a bit like playing in the Solomon Guggenheim museum in New York. Our sounds carried throughout the reverberant space. We quickly attracted a crowd
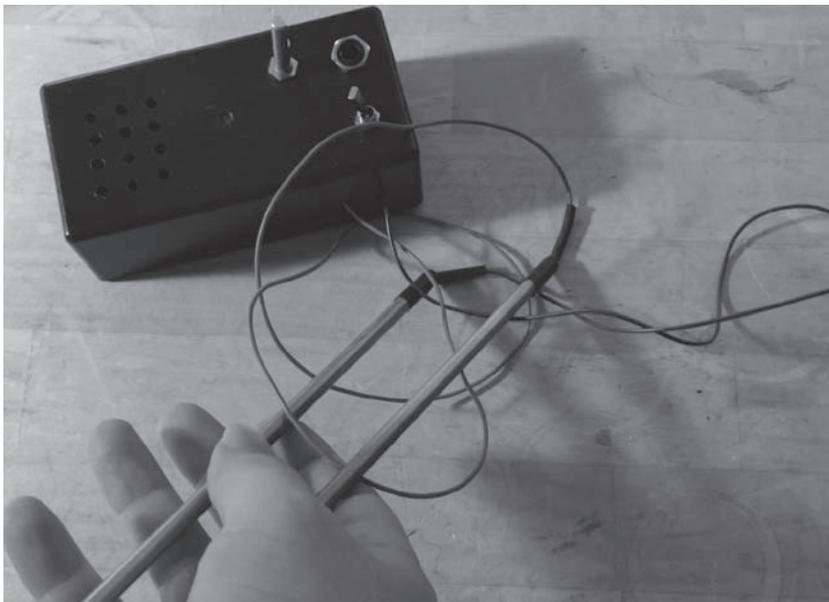
Figure 25.2. Copper straws.

Figure 25.3. AIE at Ed Roberts Campus, February 5, 2019.

of lunchtime onlookers and participants, some of whom happened to be carrying their own instruments. Percussion instruments, especially Boomwhackers, featured prominently in the expanded group improvisation, adding colorful buoyancy to the beat. Our open workshop/performance was short but successful, despite not being able to use any of our more technical systems.

Movement Studies

A second performance, Movement Studies, took place at Mills College's 2019 Signal Flow Festival. When selecting guest musicians for this performance, I chose individuals who had worked personally with Pauline Oliveros: Jennifer Wilsey, Phillip Greenlief, gabby fluke-mogul, and Amy Reed. While working with Wilsey at Mills in spring 2018, I developed AIE's session-based research in conversation with the Deep Listening® community.

In Movement Studies, audio is routed to five speakers, each assigned to an iPad running AUMI, localizing each sound source to its origin. This programming allows varying degrees of direct gesture-sound relationships (sound evidenced of the motor action that produced it) (Cox 2016, 27). In this piece, many sounds are movement-themed and include samples of windswept bushes, moving trains, dogs barking, bird wings, and ocean waves. (https://doi.org/10.3998/mpub.11969438.cmp.46)

Performing Disability

Presenting disability in performance as "a way of being in the world" challenges exclusionary practices and asserts the disabled body's right to exist (Cheu 2005, 139). The intersection of music and disability demonstrates that disability and embodied impairment are both socially constructed. Music and disability scholar Alex Lubet (2011) suggests that performance by people with disabilities "enables music that would be impossible for a more typically abled artist" (41). AIE attempts to address accommodations toward physical/neuro-diversity and a range of musical abilities. "Ability-inclusive" is used in this application to describe broad inclusivity toward all approaches of music making, however new or experienced one may be.

Similarly, AIE's social functions are characteristic of more well-known free improvisation structures. As a musical form, improvisation has the

Figure 25.4. AIE at Mills College Signal Flow Festival, March 10, 2019.

capacity to accommodate all abilities. In this music, as described by gui-
tarist Derek Bailey, "diversity is its most consistent characteristic. It has
no stylistic or idiomatic commitment. It has no prescribed idiomatic
sound. The characteristics of freely improvised music are established
only by the sonic musical identity of the person or persons playing it"
(1993, 83). Historically, free improvisation has created nonhierarchical
space centered on individual embodied stylistic idiosyncrasies.

AUMI is among the final legacies of Pauline Oliveros's lifetime dedi-
cation to addressing issues idiosyncratic to her compositions: nonhier-
archical inclusivity, expansion of improvising communities (across abili-
ties, demographics, and geographies), and sonic embodiment as thera-
peutic practice. In the AIE, we seek to continue the work set by these
principles, through shared sound and space, available and open to a
public of all abilities.

Notes

1. "Flaming Dragons [of Middle Earth] play a form of super crude/sophisti-
cated free rock ala The Godz or even a punk-primitive Arkestra but with Cruz's
stunning, oracular vocals giving them a mainline to the freak flag style of prime
Captain Beefheart, Roky Erickson and Wasa Wasa-era Broughton. Cruz's instant
lyric inventions are as mind-boggling as your favourite medium . . . indeed Cruz
makes most 'sound poets' sound like children's entertainers." David Keenan,
Volcanic Tongue, http://www.onekindfavor.net/2014/06/flaming-dragons-of-
middle-earth.html, April 9, 2021.

2. "About." 2020. Ed Roberts Campus, accessed March 14. https://www.edrobertscampus.org/about/.

3. "To Music is to take part, in any capacity, in a musical performance, whether by performing, by listening, by rehearsing, or practicing, by providing material for performance (what is called composing), or by dancing" (Small 1998, 9).

TWENTY-SIX | Knowing as Feeling

Five Meditations on the Planets

KIP HAAHEIM

As a composer and performer, I am well acquainted with the joys of playing and listening to music. I have written music for and performed with musicians who spent many years becoming prodigiously skilled at the highest levels of accomplishment. There is something rewarding about this sort of musical experience: doing something only the very best can do, communicating with others in language few can speak fluently. But it strikes me that some (many) deeper aspects of musical performance should be accessible to anyone who tries. Profound features of the musical performance experience are not necessarily tied to thousands of hours of practice time. It is my belief that everyone has the capacity to communicate feeling using some musical process and can play a role that is itself small but that combines with others to form a greater "whole." Most importantly, everyone can "listen." (In this context I use the term "listen" the way Pauline Oliveros might have used it: to "attend to" or "pay attention to" something. In this sense a Deaf person can "listen" just as well as anyone.) Aren't these things potentially available to every human?

AUMI "evens the playing field" for performers; people with vast musical experience are no "better" at playing the AUMI than people with no experience. Adults are no more "skilled" than children. The degree of a person's "abled-ness" has virtually no effect on the musical outcome. Skill, as a factor influencing quality of performance, is essentially mitigated. Qualities embodied in an effective AUMI performance have more

to do with communicating feeling musically, contributing to a great whole, and listening with others.

The musicality varies across the *many* AUMI improvisations I've been involved with. Without some sort of structure, "beginning" AUMI improvisations (with more than one person) tend to be wildly chaotic, like going to the public pool on a hot summer day, crowded but still fun. Some AUMI improvisations have a more organized sound and express a clear mood. To my ear, some are quite listenable, even beautiful.

In my years of observation, participants in improvised performances seem to get more of a payoff when their music is roughly organized, their roles are clear, and they spend significant time listening (rather than constantly making sound). When these three elements are present the joys of improvisation emerge naturally, regardless of musical experience. The degree of "organization" can be small and still effective. For example, all AUMIs can be tuned to the same musical key and set to complementary timbres. Or the group can decide before starting that one person will begin the jam, then another will join, and so forth.

One of the most critical concepts in improvisation is "negative space." Sometimes the performance is more interesting if not everyone is playing at once. Sometimes the best contribution to the jam is to do nothing. Less is more. This is especially challenging for nonmusician performers. Again, a small bit of organization can open things up a lot. Consider the verbal prompt, "Make eye contact with another performer. Play something for them. Then wait for their response." Here "waiting" implies not playing but actively listening.

With the composition *Knowing as Feeling: Five Meditations on the Planets,* I had several goals. Ultimately, I wanted to facilitate a high-level musical performance by members of our AUMI community. I wanted something that did not compromise quality in order to showcase AUMI or depend on the "novelty" of variously abled-ness. I wanted a performance that the audience didn't need to adjust expectations to enjoy. I also wanted to compose a piece that would open doors to deeply felt musical experience for people who didn't necessarily think of themselves as musicians.

The work is in five parts (Venus, Jupiter, Saturn, Neptune, and Pluto), each comprising three elements: (1) a video made from various images of five of our planets taken by NASA, (2) a droning backing track of audio created by manipulating audio files created by NASA (also from the planets), and (3) six AUMI performers, one of whom also had a microphone to speak into.

All audio in the piece, including the backing drones and AUMI instruments, is derived from NASA's planetary sounds.[1] The planet sounds are not part of the AUMI preset sound libraries, so we had to upload them to each AUMI for the performance. Two of the planets feature Julie Unruh reading poems she wrote specifically for this project at my request. Oliver Hall, one of our AUMI community collaborators, created two audio CDs in which he took NASA audio of the various planets to create evolving soundscapes. I found his work to be quite beautiful. We used several tracks from his CDs in another AUMI performance (see video: "AUMI Dream Ensemble Concert for IONE's 24th Annual Dream Festival 2018," https://doi.org/10.3998/mpub.11969438.cmp.52). Although I didn't use Oliver's recordings in this composition, I would not have been able to compose the piece without his precedent work.

For each planet, the video and audio backing track create an environment that gives context to sounds played by the AUMI performers. Each AUMI is loaded with a specific "instrument" containing a few notes that "sound good" with the backing track. The meditation provides a way for each performer to focus their attention. The meditation also builds in two important musical features, repetition and space, which won't necessarily emerge during free improvisation. For example, for the planet Neptune, each player is instructed to make a simple gesture followed by two breaths. Then they do the gesture two times, followed by another two breaths. Then they do the gesture three times and so forth. If (when) they lose count, they take two breaths and restart with one gesture. Most people—trained musicians or not—lose count after just two or three iterations (see score for "Neptune" below).

The work premiered at the Alliance for the Arts in Research Universities (a2ru) 7th Annual Conference: "knowledges: artistic practice as method," Woodruff Auditorium, Lawrence, Kansas, on November 7, 2019 (see Mizumura-Pence, Chapter 20). (https://doi.org/10.3998/mpub.11969438.cmp.48).

The following is the "score" for the composition, which also served as a program.

Knowing as Feeling: Five Meditations on the Planets

A collaboration directed by Kip Haaheim

The Collaborators and AUMI Players:
    Abbey Dvorak

Oliver Hall
Ray Pence
Julie Unruh
Drew White
Ranita Wilks

(1) Neptune

Counting

The AUMI will have two boxes.

Play one of the boxes. Then play the other box.
Wait for two breaths.

Play the first box then the second—two times.
Wait for two breaths.

Play the first box then the second—three times.
Wait for two breaths.

Continue like this until you lose count.
Wait two breaths. Start over.

(2) Jupiter

Keep a Steady Beat

Play any of the boxes but try to keep a steady beat.
Boxes can be played in any order or any combination. Playing
    only one box is OK too.

Foreign Words © 2019 Julie Unruh
The planet utters words that
turn into music

a dance emerges from the language quickly turning into a warn-
    ing
then it declares foreign words
as it speaks in tones of static

the warm feeling leaves our
hearts, as the melody from the planet leaves us stunned.

(3) Venus

Playing with Thoughts
Whenever you have a "thought" play a sound on the AUMI. Let
the sound of the AUMI interrupt the thought and allow your
mind to go blank.

Wait for the next thought. When it comes up—play a sound on
the AUMI. Let the sound of the AUMI "interrupt" the thought
and allow your mind to go blank.

Keep doing this.

(4) Saturn

Breathing

Move the circle over one of the boxes and try to hold it long
enough for the sound of the in-breath and out-breath.
Repeat this over and over . . . It's OK to pause for as long as you
like between "breaths."

Untamed © 2019 Julie Unruh
In the darkness a silhouette
Of Saturn forms
As the night hides its rings
the air gets quicker never
slowing down.
a warning sound of the
untamed static disappeared
as quickly as it appeared
the air instantly returns to its speed.
quietly a didgeridoo fills the space,
giving a nice warm feeling of comfort
but immediately the untamed static returns as a warning.

(5) Pluto

Circles

Play the boxes of the AUMI in a circle.
The circle can go either direction.

If you make a "mistake" stop and take a long breath or two.

Start again by playing the boxes of the AUMI in a circle.
The circle can go either direction.
If you make a "mistake"—stop and take a long breath or two.

Continue . . .

Note

1. These are not recordings of the sounds planets make. NASA scientists took raw data from various spacecraft sensors and mapped it into the audio domain. https://www.nasa.gov/vision/universe/features/halloween_sounds.html, accessed July 20, 2022.

PART 1

AUMI Classrooms

JENNIFER HURST AND GRACE SHIH-EN LEU

> In our educational system, we're taught to appreciate and criticize
> and to perform, but we're not taught to create, listen to what's going
> on inside, and make new instruments for this expression.
>
> —Pauline Oliveros, "Cues"

Situating AUMI in the context that inspired its creation, the next three chapters recognize its continual classroom impact. Resonant themes are creativity, flexibility, and teachers' expertise as they align AUMI to pedagogical goals, troubleshoot AUMI setup and use, discover other technology to enhance AUMI use, and draw on students' interests and responses to revise AUMI-based learning. Not only do these chapters reveal AUMI's pedagogical usefulness, but they are pedagogical in nature, teaching readers fundamentals of making AUMI work in classrooms. Authors illustrate steps taken and challenges faced, and they offer resources found along the way.

First, Deborah Nelson and Nancy Patterson (chapter 27) share insights on using AUMI with students with significant support needs. Pedagogical highlights include a list of music and YouTube videos that work alongside AUMI instruction, a section called "Musical Things to Try" that provides lesson ideas, suggestions on how to use AUMI with students with visual and hearing impairments, and numerous linked resources. Their

experience reveals AUMI as useful in teaching academic content such as literacy and math, socialization, and physical skills.

In "AUMI and 'Improvise Approach' Backing Tracks," Carrie Lennard (chapter 28) shares a video demonstration of AUMI, set to play notes of the C major pentatonic scale, used with backing tracks for jazz improvisation. Supplementing the video, she narrates the impact this had on a student named Claudine, who enjoyed music but had limited access to playing instruments. In sum, Lennard finds a creative way for students with physical disabilities to move in whatever way they choose in jazz improvisation while still creating harmonies that both students and teachers, versed in Western musical traditions, recognize as melodic and pleasant.

In "AUMI and the Ethics of Technology: A Personal Encounter," Eric Lewis (chapter 29), a philosopher of improvisation and member of the AUMI Research Consortium, centers Pauline Oliveros's mission of inclusiveness in AUMI's use at Mackay Centre School. Although Lewis imagined using the AUMI to meet specific curriculum standards, the principal quickly realized the greater value of AUMI when she witnessed two usually disengaged general education students playing the AUMI with a student with disabilities. Observing this, the principal decided that instead of emphasizing its therapeutic uses, AUMI would be a way for students across abilities to socialize and engage in a collaborative community. In this move, we are reminded of educational philosopher John Dewey's (1897) idea, "I believe that the only true education comes through the stimulation of the child's powers by the demands of the social situations in which he finds himself" (3). As Dewey explained, it is within an active community of learners that students reach their learning potential. Connecting this idea back to the principal's desire to use AUMI to create an inclusive space, educators have pointed out that in order to succeed educationally, it is a "moral imperative" that students with disabilities obtain "full class membership" among their general education peers (Sailor and Burrello 2012, 24).

Evident in these chapters is the dedication and passion these educators have in meeting their students' needs, and it is within this search for how best to serve their students that AUMI found a place in their schools. While each chapter gives unique, situational uses of AUMI, read together they situate AUMI in building academic skills, increasing engagement, and creating inclusive spaces. In doing so, they have responded to Oliveros's critique of educational systems quoted above by creating new ways of music making, listening to students, and welcoming

AUMI into their classrooms; with this, we challenge readers to use these chapters as springboards to even more creating, listening, and classroom AUMI-ing!

TWENTY-SEVEN | Working with AUMI in
Classroom Settings in a Center
School for Students with
Severe Cognitive and Physical
Challenges

DEBORAH A. NELSON
AND NANCY PATTERSON

We are a classroom teacher and a music teacher at a school for students with disabilities. Because classroom teachers attend music classes with students in our school setting, we have worked together on many projects, some involving AUMI. Some projects even migrated into regular (nonmusic) classrooms and were adapted to other uses.

In this chapter, we share our experiences with others who want to try AUMI in classroom settings. Topics include

- Hardware, setting up the environment including classroom management, and involving students' families
- Getting to know AUMI's place in the classroom for students with severe cognitive and physical disabilities
- How to introduce AUMI and why AUMI shouldn't be for exclusive use of specific students
- How to use AUMI for more than free improvisation for students in need of meeting other goals in the music classroom
- How to transfer the demonstration of learning declarative knowledge from concrete objects to real pictures or icons with words for use with AUMI

- Content and impressions of success of lessons with AUMI
- Ideas for incorporating AUMI for service providers who work with students who are deaf, blind, or deaf/blind.

We are pleased to share our ideas and techniques, and we hope to learn from others, as well, about how to meet students' needs.

As different kinds of teachers with different student needs and different goals, we found in our discussions that we used AUMI in various ways. Easily customized, AUMI is a flexible, valuable tool for everyone. Therefore, we have each provided what we think is useful to others who may want to use AUMI with students with various disabilities. Deborah begins with a report on her work using AUMI with students in music classes and adds suggestions for others. Nancy's report follows, in which she shares ideas and techniques she found useful in using AUMI with students in her classroom outside of music.

Deborah A. Nelson: AUMI in Special Education Music Classes

Our First Exposure to AUMI/Computer

I'm a special education music teacher for students with significant cognitive and physical disabilities, from kindergarten through transition, age twenty-two. I started with AUMI's desktop version. Students were allowed to discover their ability to make music or, for students with low to no hearing, to control the screen with movements. Eventually I added subwoofers so that students with low to no hearing could enjoy feeling musical vibrations their movements created. The fun part is that classroom teachers at my school must attend music classes with their students, where they can see AUMI's impact on students' motivation, enjoyment, and access to the music curriculum, and to Individual Education Plan (IEP) skills like communication, functional movement, range, and intent. Some staff members decided to use AUMI in classes for recreation and sensory time. Students' parents, support staff, and substitute teachers also learned about AUMI and spread the word.

When AUMI was developed as a low-cost and then free iPad app, it was easier to encourage even more people to use it. It was simple to use, flexible on the input end, and, best of all, customizable on the output end. This all happened when demands on students and teachers were moving from functional curriculum to an academic focus with strong demands on teachers to facilitate documentation of academic learning

gains and higher-level thinking. When technology is open-ended, teachers often need examples and prompting to help them adapt what they have always done in new ways that ignite students' abilities and motivations to demonstrate learning. People become blocked by either having too many choices or by not being able to see connections.

Too often, people stick with what they know. Many use concrete objects, real pictures, proprietary pictures, or icons used by augmentative and alternative communication (AAC) device companies, such as the ubiquitous squawk box sounding switches or specific AAC devices for teaching in similar settings. My students have been conditioned by others to "hit the switch" whenever it was presented, without engaging much thought. I can only imagine that after years of doing the same thing, most students, including those with intellectual disabilities or the most restricted movement capability, would enjoy interacting with AUMI's "magic." With practice, most would understand cause-and-effect well enough to take the next step in its use. That "next step" depends on how the hardware meets goals of parents, teachers, or therapists. In my opinion, it should be based on the end user's needs.

I'm a strong advocate of allowing students to play with AUMI before trying to use it for any specific purpose. I believe that play helps them first develop an understanding of how it works, thus easing the cognitive load when adding more structure as to how the sound will be used. Remember when you first started driving and had to really concentrate on everything? After practicing, you could drive while also listening to the radio and while carrying on a conversation. I would like to advocate for children with intellectual disabilities and restricted movement to be given time for facilitated play to explore their environment with the cause-and-effect that AUMI provides. Putting AUMI on a stand and aiming it downward at a child on a carpet so it can pick up the child's movement and then amplifying the resulting sounds through a super sound system can be stimulating, especially if the music's vibration is pumped through a subwoofer and felt through the floor. If the floor is wood, try inverting the subwoofer near the child or hooking the sound system up to the Guitammer Company's ButtKicker brand low-frequency transducer or another means of sound vibration. The company's president and CEO, Mark Luden, says that he would be glad to help other teachers with floors for this use. If you are interested in doing so contact: www.thebuttkicker.com or mark@guitammer.com. Mark said that he will offer a discount because he is so intrigued with this novel application of technology.

Most of my students react to vibration. Some may prefer gentler vibration while others require heavy-duty vibration delivered by music like reggae. I believe this has to do with sensory diversity. Until they use intentional motion to trigger AUMI sounds, as in playful turn taking, I would suggest not changing orientation of AUMI sounds or changing other parameters such as positioning of the child or of AUMI to help build understanding more quickly unless one observes a need to do so.

After a student is aware of cause-and-effect from interaction with AUMI and can trigger sounds in a meaningful way, the teacher could make changes in the sound AUMI produces. They could also attach a meaning to it for specific social play or music making, or even use it as an AAC device for performing in ensemble projects or similar activities.

Before moving to the next step and attaching curriculum to AUMI's use, I recommend allowing students to explore AUMI's sound. Teachers can support students by changing timbres and the mechanism or type of trigger from more basic to more complex, for example moving from one sound to two contrasting sounds, words, or songs. Discover which sound a child prefers or triggers more often and try to understand why they favor that sound. Can you attach a word, object, gesture, or some other meaning to get the child to trigger a specific sound that is programmed? Will the child play with you and take turns making that sound or even play it on cue? Will the child play it as part of a recurring word or phrase in a song? Will the child trigger the song on cue for others to sing along? Will the child trigger sound effects for a piece of music or story that has been set up for automatic success, as in errorless learning?

Although I have a curriculum to follow, students must develop specific preskills such as following directions, working with others, expressing needs and preferences, requesting, and refusing. All are important and essential to success in, as well as out of, music class. Then there are those things such as muscle control that occupational therapists (OTs) and physical therapists (PTs) normally address. Music is a perfect place to incorporate students' goals in a fun atmosphere where repetition is part of the experience. As a standard part of each lesson, students are invited to request taking turns and request doing more of something. This is a great opportunity because the one thing students with profound cognitive disabilities need is repetition. Music makes this less tedious and more fun because of simple changes that tempo, pitch, timbre, style, or creative movement can provide. This repetition will help with fine-tuning the AUMI triggering technique for each individual. Each individual may interact with AUMI in their own way, such as by rocking their

body, moving their head, waving an arm, or some other motion. All this repetition will also help students build knowledge about constructs and concepts necessary for building understanding, which in turn helps students to generalize everything to other songs, musical instruments, content, or experiences.

I teach through multimedia presentations that combine as many senses as possible. To start, I use concrete animal representations to which students have previously been exposed. I don't just stand there holding the animal for them to see, but instead I place it in their locus of control. For many of the youngest students and those working on improving or developing verbal skills, concrete objects come first. I can help them build vocabulary with children's songs and have them trigger the correct animal sound or the animal's name via AUMI. For optimal visual and physical success, place the stuffed animal next to the iPad with AUMI with the sound the animal makes in one big target square on the screen in a contrasting color from the dot that controls triggering of the sound. Possibilities I have observed are to trigger when prompted, not trigger when prompted, or just play with triggering the sound and not show any intent to respond to communication partners. Once the student can understand how to move and to select the desired sound for the prompt, this can be transferred to any social occasion, academic area, or song with choices, refrains, or other simple (age-appropriate, functionally appropriate, and meaningful-appropriate to the child) tasks. As a child shows understanding and control, AUMI could then have two sounds to trigger and on the appropriate sides different animal representations depending on the child's level moving from the concrete to picture to icons and possible words. One can see how this activity can include following direction, socialization, teamwork, and more. Some students will be independent and some will need only a slight prompt, while others will need total physical assistance. Some students needing total physical assistance usually show delight and eventually "get it." Others may never develop a way that a teacher could observe that they "got it." Since there is no way of measuring this, teachers will continue exposing students to different experiences with the hope that someday the teacher will find an activity that allows them to discern student reaction more accurately.

After playing and understanding how to respond to a question, I use an LCD screen or another iPad with an AAC program. My favorite for this level is the MyTalkTools app, with pretaught pictures and sounds that prompt students to trigger a matching sound with AUMI instead of having someone verbally prompt them directly with pictures. It also

works the opposite way: a student triggers a sound example on AUMI and uses an AAC device to identify it by matching the pictures. Either way, for the more advanced students, I usually have two sound choices, one being the distractor and the other the correct choice, one on each side of AUMI's screen with a representational picture mounted near the iPad (perhaps behind it on a Plexiglas frame to avoid hindering the students' field of vision). When using this setup, I make sure there are silent areas between the two choices set up on the AUMI interface. This helps students demonstrate learning and could be interpreted as a reading exercise.

Once students have practiced this and built understanding and physical skills, I often tell stories and use visual and auditory prompts to cue students when to make music or sound effects. This application takes their understanding and skills to a higher participation level than simple switch-hitting or hand-over-hand work. In the future, I hope to facilitate original, creative sound carpets or mood music by giving students menus of choices. Then I would design a way to capture their ideas by inscribing meaningful pictures and names, using them to perform these representations in sequence like a traditional musical score.

These are *future* plans because I had to stop using AUMI in my school. When the instructional technology department in my district determined that AUMI posed risks to student privacy, I was forbidden to use it until I obtained permission. I urge those who develop AUMI and other technologies involving student access to be aware of and up to date with privacy and security issues facing educational institutions so their products can be used.[1] I retired before using AUMI again, which saddens me. I had several AUMI ideas I wanted to try with students.

Some curious students would excel at using AUMI to make music. Too often, special education students are expected only to be compliant and follow directions in classrooms. Encouraging students to experiment with sound took modeling on my part. I usually start with wild, unique sounds and by being totally silly and exaggerated to get students' attention. This seems to break barriers and provide motivation. To encourage independence and self-advocacy I expect most students to request taking turns, using their own communication styles. In every class there usually are one or two students who can do this and others who are able to follow independently, need prompts, or will allow someone to physically help them use AUMI. I would love to have longer classes and more than one class per week to see if all students could demonstrate understanding cause-and-effect from their body motion while using AUMI.

Next, there is AUMI's spontaneous, creative aspect, where players can improvise. Being part of an activity and participating like the other students is empowering. One doesn't need an advanced music degree to make things sound good, but there are a few tricks requiring little effort and time that make for instant success. First, set up a C pentatonic scale (C, D, E, G, A) on AUMI and let students freely improvise, but starting and stopping when cued. After they are successful, set up bass-like ostinato (short repetitive pattern) in C major pentatonic by using C and G together at the same time in Garageband on an iPad (other options include a music looping app, having peers play Orff instruments[2] or resonator bells, or nontraditional instruments like Beamz, Boomwhackers, Deskbells, Doreme Cats, Skoog, or Soundbeam to facilitate independent harmonic participation). Start the session with the bass line, then cue in improvisation on AUMI with both parts stopping when prompted.

My job required that I teach units with particular music education objectives and to demonstrate that these built specific kinds of knowledge and skills. Additionally, I worked within themes that academic teachers use for instruction, to incorporate key words each month to build students' vocabularies, and to help them generalize their use. There is also a comprehensive evaluation tool that dictates much of what my administrators expect to see any time they step into my classroom. I try to design lessons that will make it easy for them to recognize what students are accomplishing. I don't want them thinking we are not on task. Administrators must document many indicators during their brief observation periods, so observing students and staff having fun can be distracting. I began using AUMI in unique ways to help demonstrate and document students' learning gains and abilities.

For students with previous experience with touching iPads or seeing others use the touchpad, controlling AUMI with body motion must be taught through modeling and practice. Some students, particularly those on the autism spectrum, are visual learners. They seem more attentive to video examples than to my talking and demonstrating. I usually use both in lessons.

AUMI can be a gateway or facilitator for access to curriculum for students who need something other than responding by touch or using eye-gaze. It's almost like magic since no touch is required to trigger programmed sounds. In fact, I consider it the perfect tool that meets Universal Design ideas and appreciate it as a universal tool because I've found that everyone, even staff members, want to try AUMI. With many students being touch-defensive or having tactile barriers, AUMI is per-

fect for providing active, independent curriculum access. I observed that when students in my class see peers and staff members using AUMI first, they will often imitate them, so my teaching pedagogy is to embrace Universal Design and try to give everyone the same opportunities in ways appropriate to their needs. Everyone doesn't have to have the same task or expected outcome when they use AUMI. With this in mind, I don't believe AUMI should be used by just one student. Even if it's as simple as following directions, working on increasing range of motion, or generalizing declarative knowledge or skills to another music-making instrument, every student can participate and can benefit.

At a workshop for teachers, speech and language pathologists, PTs, and OTs , I set up AUMI as part of a round robin of four music technologies. I programmed it with alluring sounds and let it "speak for itself." As people passed in front of AUMI on their way to try other technologies, they soon realized they were triggering it. It was an instant success and fun to watch their "ah-ha" moments. Naturally, AUMI's other attributes— being free and simple—got them hooked; several downloaded AUMI immediately. The software "sold itself."

Musical Things to Try

Try introducing new musical experiences in incremental steps while supplying pictures, videos, and examples for students to use before trying new things on their own.

- Show students videos of ensembles with a conductor; focus on how the group stops and starts before asking them to start or stop creating music on AUMI when prompted.
- Create a slow rhythmic pattern on AUMI of just one note, C, to go with improvisation or an Orff arrangement in C pentatonic. If the song has a nice beat it's easier for students to pick up moving to the steady beat, moving half as fast, or half as slow. If one uses Orff instrumentation, then students with Orff instruments could learn to sway to the left and to the right with the beat as they play and sing, to visually prompt students using AUMI to synchronize with them. AUMI players could sound a low C on the first beat of each measure, while the Orff players sway left and right, timed so the left sway coincides with when the AUMI players need to move to their left to sound the note at the right time. When students are playing borduns, they usually move their bodies with the mallet changes

anyway, so movement becomes a universal tool. The group visually entrains the AUMI player into a successful pattern.

- Try an Orff Bordun so the left side of AUMI would play C and G at the same time, a middle section would be silent, and the right side would play the same C and G sound so a child could rock back and forth to a steady beat and provide harmonic accompaniment for a C pentatonic song (C, D, E, G, A).

- Try an Orff Broken Bordun so the left side of AUMI would play C and the right side would play G. A child with the same rocking motion could play harmonic accompaniment for a C pentatonic song. Depending on the timing ability of the child's playing, you may or may not want a silent box in the middle.

- Try an Orff Crossover Bordun so AUMI is set up with three notes from left to right as lower C, G, and higher C. Again, a child with the same rocking motion could play harmonic accompaniment for a C pentatonic song. Depending on the timing ability of the child's playing, you may or may not want a silent box between sounded notes.

- Finally, students can take turns such as in call and response. I'd start with awareness of the timing a phrase would take (eight beats) so the performer could start and stop on cue. I'm happy if a student can play a phrase and stop on C when playing in C pentatonic. Advanced students may start a call on C and end on G with the second student responding by starting on G and ending on C.

- A student could create an original sound carpet or background music for a story or poem by playing music to evoke feelings, moods, action, and location, and customizing it by making changes in tempo, pitch, volume, and timbre. If students are nonverbal, provide choices with an AAC device by using real pictures of classroom instruments and the same icons used for teaching music concepts for them to choose from. Then, not to lose an opportunity to link music making to academics, after going over the story or poem without any sounds, offer students choices. Pictures of instruments and elements would be lined up on a flannel board so the individual or group could read their composition while performing it. AUMI is perfect for this because it has many sounds available and users can import other sound files. One could use AUMI along with traditional instruments or have iPads with AUMI set to different mood themes.

- Try different styles, moods, and feelings with major and minor pen-

tatonic scales and different timbres. For those curious about the pentatonic scale, this link is interesting: https://www.musical-u.com/learn/five-notes-will-change-your-life-pentatonic-scales/.

The AUMI app is wonderful just the way it is, but if you have specific timbres or sound files you want to use, customizing it is easy. Instructions are well done and software support is available: http://aumiapp.com.

Some Things You Might Find Useful

Proper placement of AUMI, lighting conditions, correct positioning of the person using it in relationship to placement of others, visual contrast provided by neutral background, and correct positioning and support for participating students: all these are interconnected factors one must test before working with a class or individual. Making sure the iPad is charged and that amplification is via Bluetooth so that wires don't interfere or create hazards are important. So is good sound quality, which piques players' interest.

Using a camera to capture each student's performance so they can see themselves and change their techniques is helpful. I also verbalize what I see them doing to help students process the experience. I name the body part they are moving and comment on the motion and sound.

Here are songs, stories, and videos that lend themselves to AUMI activities:

> **Lori Hendriques "I Say Woo."** I copied the song and omitted each "woo" in each verse. Then I cut each verse into sound files and put the music sound files in order (one per PowerPoint cell) with pictures to support lyrics. I created silent PowerPoint cells for each "woo" with a picture prompt so students would trigger AUMI to sound the "woos." Having pictures for each section of the lyrics as the song plays and then a silent cell is the prompt for the "woo" singer. If you're familiar with Wii Music, it's just like when the orchestra or chorus looks at the conductor with the "What?" look. Students usually "get it" and trigger "woo" with no further prompting. There is laughter as everyone waits. I contacted Lori for permission and had a delightful conversation with her. The song always brings out big smiles and its lyrics seem to fit my curriculum as well as engage the staff. This activity helps students to attend, read, and virtually sing as an ensemble.

Cat "singing"

https://www.youtube.com/watch?v=qTjXQoj-HeA.

I did something similar and put each section of the harmonica playing sound in a PowerPoint cell along with a gif of an animal playing the harmonica. At the end of each phrase I change the cell and show the word "meow" to prompt the child to trigger the meow sound via AUMI. So the form is easy to follow: listen, play, listen, play, for a fun, social musical activity. This gets students to attend, read, and virtually sing on cue.

I wrote an original song about underwater life for a topic I had to integrate into a music lesson. All students and staff members took turns participating with others dancing, playing instruments, or singing as they waited to use AUMI. I do this with all the technology, even eye-gaze music, making it available for anyone who wants a turn. I encourage students and staff to try everything. As one of my elementary teachers once said, "If you never tasted pistachio ice cream, how would you know if you like it or not?" Other staff members started asking students more about their preferences after seeing them make choices in music class.

"The Green Grass Grows All Around" American Folk Song. The end of each verse has a repeating refrain that students triggered on AUMI.

"This Land is Your Land" by Woody Guthrie. The last line in each verse "This land is made for you and me" that students triggered on AUMI.

"Anvil Chorus" from *Il Trovatore* by Giuseppe Verdi.
I had my students watch an excerpt of the opera version first:

https://www.youtube.com/watch?v=QZN01_pAxro.

Then I played a version without video so they would pay attention to what they were supposed to do:

https://www.youtube.com/watch?v=WEMMVHAINFM starting at 1:05

A piano roll version worked well for students with autism because they love visual patterns:

https://www.youtube.com/watch?v=ubDa-fk_w5I.

Students played along with the music using AUMI to make the anvil sound.

Students played jingle bell sounds on AUMI to the refrain of **"Over the River and Through the Woods"** Song. Book by Linda Ashman, illustrated by Kim Smith. It's a modern day take on the old classic. https://www.youtube.com/watch?v=SSGlDNnSD70.

Check Pinterest for lists of stories, songs, poems, or activities to use with AUMI.

For students who are deaf or partially deaf. Try using a frequency transducer, subwoofer, vibroacoustic floor, or speakers with dancing waters and lights. Be mindful of placement of the sound source in relationship to the iPad with AUMI.

For blind students, or for those with low vision. Try raised tactile symbols like puff paint to craft things like low to high being a line moving left to right on a raising angle. Provide high visual contrast between the iPad and what is behind it (from the student's perspective), and set contrasting colors for the screen and cursor. For students with cortical blindness, we have had success using high contrast background or even holographic paper like: https://legionpaper.com/mirri-holographic. Slight movement of the paper creates the illusion of movement that may help students with cortical blindness see better. Placing AUMI against an area with one color like black and then making the cursor and target triggering area a light color may help.

For students who are both deaf and blind. An object's special sound or vibration source (frequency transducer, subwoofer, or a vibroacoustic floor) help students focus on the cause-and-effect of their movement when using AUMI. Be mindful of placement of the sound source in relation to the iPad with AUMI.

Classroom set up for power, speakers, lighting. When working one at a time with a student in a class, the motion of other students can be problematic unless you plan where to place AUMI and how to program its settings. Look for the safest place to

put your AUMI setup with easy access for all students. Test the location for all requirements for successful AUMI playing before working with students.

Stand types. In special education, equipment is often expensive. The first tablet floor stand I tried had a goose neck, so it was easy to adjust its position when changing between students in classrooms. For most students and situations, it was okay. Amazon sells many varieties of these. It wasn't very good at fine-tuning and keeping special positions for students who required the iPad to maintain a "just so" position.

I have another tablet floor stand for eye-gaze music because it must be steady in specific positions. The tablet floor stand is easy to use, has convenient features, and maintains "just so" settings perfectly. Talk with this company to help you get the right stand for your needs at a good price.
REHAdapt North, Contact Rob McPherson at rmp@rehadapt. com
Tablet Floor Stand—FS-L3D HD
GA Universal Tablet Mount 7″–13″

Positioning. I work closely with the classroom teacher and the OTs and PTs so students can be positioned correctly with proper support for optimal ability to move for classroom work with AUMI. Using AUMI may motivate students to keep themselves in good working positions.

Triggering. AUMI has front and back camera access. Give both a try, depending on student needs. Ambient lighting is important to having AUMI successfully interpret the users' motion. Having color contrast between the user and background is helpful. So is avoiding a busy background or motion in the background (from other students or a fan). As the instructions say, use a neutral background. Some students also love to mug for the camera when AUMI shows their faces, making it difficult to have them attend to anything else. AUMI has a setting that will not show users' faces. My students use this setting best.

Price point. For some families, purchasing an iPhone or iPad is prohibitive. Apple and other companies sell refurbished iPads

and iPhones on which AUMI functions without activated phone service. Many charities grant funds or wishes for students with disabilities and financial limitations.

Ease of use. AUMI usually works without special setup as soon as you open the app. All instructions are included with the app and are accessible at the bottom of the screen. AUMI is fully customizable and has much to offer even in its simplest settings. Try all the bells and whistles as you go through the instructions if you have specific needs.

I wish you good luck with your AUMI adventures. If you have questions please email me:
Deborah A. Nelson: learningwithmusictechnology@gmail.com.

Nancy Patterson: AUMI in the Special Education (Nonmusic) Class

I've been a special education teacher for many years. The term used to refer to education that reaches diverse learners, at the time this chapter was written, is "differentiated instruction." I have practiced this for many years, mostly with visuals and text paired with objects. Once technology entered the curriculum, we could incorporate tools such as AUMI. Though it is a musical instrument, AUMI helped students outside music class to access the curriculum where many other communication modes have fallen short.

It is necessary to initially assess how students can best participate in lessons. There are definitely "layers of understanding." For instance, a student with multiple physical and cognitive disabilities may be able to use eye-gaze to look toward a picture or object. Maybe they can help read a story by touching a voice output device to read a recurring line in a story. They may be able to touch a voice output device using their hand, chin, or head. What if they can't activate a device with correct pressure or stability? This is where the AUMI app comes in. I have students with very limited use of their hands and arms. They need appropriate "wait time" to process how they will help read a story, answer a question, or access the curriculum. These students found success with AUMI when "reading" the recurring line "It's all good" in "Pete the Cat: I Love My White Shoes." They were thrilled to participate independently just by moving their bodies back and forth! Another student enjoyed the AUMI app by

using it to activate music with only the movement of his head. This student is tactilely defensive, so he enjoyed doing something independently by not having to touch anything!

All these activities help students access the curriculum and correlate with IEP goals and objectives or learning goals. For example:

> **Academic goal:** The student will be able to help read a recurring line of a story using a universal communication device or an app from a device or computer switch activity.
>
> **Social/emotional goal**: The student will be able to activate music using a universal communication device or an iPad app.
>
> **Math goal**: The student will be able to count out objects one to ten using a universal communication device or an app on an iPad.
>
> **Gross motor positioning/independent functioning goal**: Students will be able to tolerate adaptive equipment to access universal communication devices or iPad apps.

As mentioned above, gross motor positioning/independent functioning goals are on most of our students' IEPs. This is an important component for students to access all areas of the curriculum. It has also become important to helping them develop skills to access various technologies such as AUMI. Teachers of students with disabilities need to collaborate with PTs and OTs about each student's various unique physical needs to help them have successful school days. Special positioning in adaptive equipment needs daily implementation in classrooms. This will help students enjoy applications like AUMI.

Conclusion

We encourage teachers and therapists in and out of music to try AUMI in their settings and share with others how they used it. AUMI is especially helpful when students have few opportunities for independent play, independent social back and forth, and independent musical expression that is developmentally and functionally appropriate. Please consider fostering these experiences for such students through use of AUMI. The joy of participating in their pleasure and learning growth is worthwhile, sometimes even magical.

Notes

1. Thanks to Deborah's efforts, AUMI for iOS now has a privacy policy that teachers can share with administrators (Lowengard, chapter 11).

2. Orff Schulwerk is an approach to teaching music and movement that focuses on improvisation and imagination. Orff uses traditional poems, rhymes, songs, games, and dances from children's culture, accompanied by body percussion and instruments. It was first developed by Carl Orff for music education, and Gertrude Orff adapted the Orff approach to music therapy. For more information, see the American Orff Schulwerk Association website: https://aosa.org.

TWENTY-EIGHT | AUMI and "Improvise Approach"
Backing Tracks

CARRIE LENNARD

I'm Carrie Lennard, a special needs music teacher based in the UK. For nearly all my working life, I've endeavored to unearth exciting, accessible ways for children and young people to make music. Music that comes from them, their true selves. For me, the possibility we might empower anyone to play a musical instrument regardless of abilities was an inspirational dream. As far as teaching children with special needs, the iPad has opened up so many possibilities. For me, discovering AUMI's iPad app was a game changer! (https://doi.org/10.3998/mpub.11969438. cmp.49).

To be honest, my pupils use two music-making iPad apps, ThumbJam and AUMI. Both are brilliant, reliable, and ultra-easy to set up and use. ThumbJam requires touch to activate the screen "instrument"; AUMI requires movement.

For many years I'd worked with Claudine, a young girl with profound, multiple learning difficulties.[1] She enjoyed listening to music but was tactile-defensive. Anything touching her hands caused her to recoil and totally withdraw. I'd worked often with her using vocal games and intensive interaction, copying Claudine's sounds, embracing her responses to establish shared space for us to build communication, trust, and musical knowledge. Some years ago, before iPads, I started investigating touch screens but found the software limited. When the first iPad came out, I rushed out to buy one. I tried out apps like GarageBand and Air Vox, which I thought might be promising. In school, we still had and occa-

sionally used a Soundbeam. For those not acquainted with Soundbeam, it uses sensors, MIDI, instrument sounds, and various scales. The player "plays the sound" by moving a body part in front of a sensor (positioned on a microphone stand). It's been popular for many years in special schools because it offered something musically no other resource could. It also was and still is too costly for many establishments. Again, opportunity for someone with profound learning difficulties to make music comes down to availability of a large budget!

That has now changed thanks to the AUMI app, which works similarly to Soundbeam but has three advantages. (1) The player can see themselves moving in the iPad screen while making music with, for example, their moving head, so it's a more concrete experience as opposed to waving one's hand in front of the sensor and hoping the pupil can make a cause-and-effect connection. (2) It's incredibly easy to set up, and (3) It's FREE! That means everyone with access to an iPad can download the app and start making music!

The big question is, how can those playing AUMI make their music sound harmonious? If other people are also playing (e.g., an accompanist, people in the music group) how is it possible to bring everyone together, to create a beautiful piece of music, when the group lacks musical knowledge? Part of the answer comes in the form of an ancient pentatonic scale, five notes. Which five notes? I use C, D, E, G, A (C major pentatonic) on every instrument. Play these notes however you want with any specially composed, Improvise Approach backing tracks and you have a successful performance. Add other musicians playing the same selection of notes on (for example) chime bars, Boomwhackers, or bells, and you have a band! In short, once you've set up AUMI in C major pentatonic scale and have selected one of the Improvise Approach tunes, you can move in front of iPad's camera (to activate AUMI) however you like. Everything you play is in tune with the backing music.

So, returning to the story about Claudine, I placed an iPad on her tray with AUMI ready to play. It required Claudine to move and thus activate sounds. She quickly sensed connections between her movement and changing musical notes. Just then, Claudine "stilled" in front of the screen. The sounds stopped, her eyes fixed on her image in the screen. A few seconds passed, then suddenly she moved her head this way and that, and the look on her face said it all. "I'm doing this, I'm controlling these sounds" "This is ME!"

She continued making music for the rest of the lesson. I'd never seen

Claudine smile and laugh so much and it continues to this day. Claudine and I, together with other students from our school, worked alongside postgraduate students from the Royal Academy of Music in London on live improvisation using the Improvise Approach model. We performed in Duke's Hall in the academy. We loved it and discovered we could make different kinds of music together in the moment. Such was our trust and confidence in ourselves and each other. Claudine on AUMI was a star, as were other students who played a diverse range of instrument sounds. It was a great experience for us all and one I continue exploring.

About the Improvise Approach™

As a special needs music teacher my greatest joy is creating opportunities for students with profound and multiple learning difficulties by exploring their playing and vocalizing capabilities through music. For many of these students, traditional music activities require dexterity and verbal capabilities unavailable to them. Often their musical experiences are passive: listening to music played to them, or perhaps having someone move their body for them, either to play a drum or percussive instrument or to be moved around while music plays.

This passive engagement model does little in the way of adding quality to students' lives and is more a token way of passing time. I felt there must be a way to focus on students' capabilities rather than their disabilities, so I explored available technologies and created a program (The Improvise Approach,™ www.improviseapproach.com) to allow students to play in their own band, expressing themselves individually.

Grooving with AUMI

For most of my students, the ability to play or learn a traditional instrument is well out of reach, usually due to severe physical limitations. For most students, however, moving their bodies in whatever way they can is crucial to developing self-awareness and independence of being. Most of them can manage broad movements that can translate on an iPad, whether with their hands, feet, chin, nose, elbow, or other body parts! The trick was to find an interface that would register this activity and connect it to music making. The two crucial technology elements are iPad and AUMI.

Ensuring Independence

Students must have opportunities to recognize they are the ones making sounds. Therefore, it is important they have their own speaker and that sounds are not all piped in together to one main monitor. I connect each iPad to a small vibratory "WOWee" speaker (this is a wired connection, not via Bluetooth, as this creates delay between what students play and what they hear). Students can then hear and feel sounds, giving them immediate feedback to which they can respond. In all my classes students love this. In some cases, it is the only activity that gives them a sense of their physical presence in the world.

Playing in Harmony

At this point you may be imagining a horrifying cacophony of sound that hardly classifies as musical activity. Certainly there is potential for that. There is a better way, though, and that's by using the pentatonic scale. Notes of the pentatonic scale have no clashing tones, so it is perfect for this kind of setting. AUMI has many settings for choice of scale, so I make sure pentatonic is selected, which genuinely allows students to make music that sounds good together. I either play backing chords for students, which provides structure for their improvisations, or I can select an Improvise Approach backing track. There is a wide selection of styles to choose from.

This general approach to music making and improvisation can also work for students with moderate disabilities. Because there are no "wrong" notes and the technology is easy to use, it is an excellent way to encourage students to explore and be curious about music.

I have seen firsthand how profoundly life-changing it can be for people to make music in all contexts. This is especially true when students with limited physical abilities, and for whom little is expected in life, experience active independence and real joy while making music with others.

Note

1. Claudine is a pseudonym.

TWENTY-NINE | AUMI and the Ethics
of Technology

A Personal Encounter

ERIC LEWIS

> It isn't the AUMI software that is important, it's what
> people do with it.
>
> —Pauline Oliveros

I try to remember when I first encountered AUMI. Although it was not
that long ago, I draw a blank. At least I draw a blank concerning the
instrument itself. What I do recall vividly are people who played key roles
in my introduction to AUMI. As I hope to make clear, there may be in my
selective memory a moral appropriate to AUMI and its use, potentials,
and possibilities, namely that AUMI is ultimately about people, individu-
als, bodies, subjectivities, all meeting, musicking, and forming commu-
nity. If the technology itself fades into the fog of memory, why might
that not be a good thing as long as the community configured around it
remains in the mind's eye (ear?)? This brief piece is a story of my coming
to see just how true Oliveros's statement is, and the many different mor-
als to draw from it within the context of a complex research project such
as AUMI. What does it mean to keep people in the foreground when
working with a highly technological, multiply mediated tool?

At a presentation at an ICASP (later to evolve into IICSI) confer-
ence, several researchers and activists introduced AUMI. I remember
Pauline Oliveros, IONE, Jackie Heyen, Leaf Miller, Ellen Waterman,
Gillian Siddall, and Sherrie Tucker, many associated with the ICASP

"Improvisation, Gender and the Body" (IGB) research axis. I was struck by many things about their presentation. First, the audacity of their goal, to allow individuals unable to make music in traditional ways, with traditional instruments, to do so, yet the relative simplicity with which they conceived the goal. Second, the *way* they conceived this goal, not simply as a technical engineering task nor a musical pedagogy problem, but a social imperative, a project whose primary momentum was ethical, ultimately philosophical. Third, I was struck by the manner in which their collective theorizing about AUMI, the hows and whys (actualities) and the wishes and dreams (possibilities), moved elegantly and unencumbered across traditional disciplinary boundaries, across expertises and theoretical paradigms, across problematics and positionalities, in a manner neither self-conscious nor attention-grabbing, yet forceful and sophisticated. This appeared to be a model of cross/multidisciplinarity and of how such work is community forming. It was and remains difficult to tell if the interdisciplinarity (too narrow a description of AUMI's research group, involving voices and bodies whose heterogeneity goes beyond and cuts across traditional disciplines) of the group embodied yielded community building or if community building led to interdisciplinarity. I think both bootstrap each other, but the result was clear in a related sense: this was a research group that, for all its theorizing, expertise, and accomplishments, was *having fun*! Their presentation was animated, full of smiles and laughter (even when describing lived conditions of those forced to navigate a world that constructs disabilities more than engaging positively with them). They butted in to one another's comments without butting in, they passed around themes, altering them. They often came to collective agreements; when they did not, they outlined the range of opinions and kept options open. In effect, they modeled improvisation at its best, bringing the audience into the discussion. This roundtable conversation was intimate and sophisticated, personal yet theoretical, practical yet engaging in blue-sky thinking. Afterward, I felt several things—elated, impressed, moved, challenged—and had one primary thought: I want to join this group!

Upon joining the IGB, my pleasure from being associated with such a group of creative minds starting me thinking of ways I could contribute. This desire is a product of the open, inclusive AUMI research community, with implications for scholarship more generally. When you create a vibrant, inclusive academic ecosystem, people will *want* to join, whatever their previous training and expertise. There is an argument here for inclusion more generally: increasing inclusivity of communities enriches

them, draws in new individuals, and creates conditions where they want to contribute to community growth rather than seeing it as a chore or obligation. As a philosopher, my work had been highly abstract, first surrounding the history of theories of space, time, and matter, then on the philosophy of improvised arts. I had neither the experience, nor time and energy, to move into a totally new field of scholarship, practice, and theory. Yet the opportunity seemed so inviting!

As a member of CIRMMT (Centre for Interdisciplinary Research on Music, Media and Technology) at McGill University where I teach, I had access to world-class expertise in digital instrument design and testing. I thought McGill might be a good site for refining AUMI's interface, having technical expertise right at hand. Yet such testing and refinements had to be made against a backdrop of practical AUMI use. A foundational principle of the AUMI research team is that AUMI is designed bottom-up. Users determine what they want it to do. Not only is AUMI primarily for them, but only they can communicate how their subjectivity interacts with the device and how they would like it to do so. This is not just a practical point but is also an example of inclusive design and inclusive community building. By involving individuals with disabilities (in Montreal, mainly children and young adults) in designing AUMI, along with their caregivers, family, teachers, and therapists, one is already making progress toward achieving a goal of building inclusive community: spinning out new webs of interpersonal relations.

This entailed having a site in Montreal for using AUMI. Mackay Centre School (MCS) is the primary school for all children with physical disabilities in the Montreal English School Board. I arranged to present there on AUMI, for staff and teachers. This was the first yet not the last time I witnessed the precariousness of conditions under which the MCS staff works. Setting up an AUMI presentation required much planning: When would it be, how would classes be covered, would teachers be compensated, how would lunch be served? At first I thought these issues and others were trivial and easily surmounted. What I now recognize and am constantly reminded of is that the converse of Pauline's statement is also true. Who the people who use AUMI are, and what they want and can do with it, need to determine what AUMI software is. It must be easy to use, intuitive, quick to set up, nonintimidating, and remain free to all.

Through that initial presentation, I witnessed, and in a fleeting, highly ephemeral way, entered into the MCS community. My sense of the community—general and fuzzy at first—would develop into something more like understanding. Heck, I recall the first time the receptionist at

the school's entrance smiled and waved me in rather than checking my credentials and asking whether I had an appointment. This was crucial to working with AUMI effectively and a direct reflection of my coming to play a role, however small, in the MCS community. Without my playing this role, I could not oversee AUMI's development in a way that would make sense for this community.

After this meeting with MCS staff, Leaf Miller was invited to work with some students at the school, culminating in a full-school musicking event. Leaf has the most experience of anyone working with AUMI with people with disabilities. It was her suggestion that AUMI be created. She is not only a skilled occupational therapist but an expert drummer and tireless advocate for those with disabilities. Leaf worked for several days with children in a particular class, most in wheelchairs with limited motor control, leading to a grand event with the whole school in the gym, a couple hundred folks that Leaf led in collective musicking. The children played hand drums and assorted other small instruments, clapped their hands, stomped their feet, and danced, along with about eight children using AUMI. This may have appeared chaotic to an outsider, but Leaf had all students participating, having fun. I focused on little things: the relative volume of the outputs of the children using AUMI, how motion tracking was working, and the like. I was fixated on AUMI users, a mistake of sorts. Right after the event ended, the school's principal Patricia Ciccarelli (who deserves a whole chapter in this book!) and I had a quick discussion. I was going to list all the ways I would use AUMI slightly differently next time and speak to how children using AUMI did or did not seem to participate in the festivities, when she immediately drew my attention to something else. Two boys with full motor control who usually participate in almost no activities, who, to put it crudely, "do nothing," had actively joined the collective festivities. One of them stationed himself next to the AUMI users and interacted with them. This was due largely to Leaf's skill and enthusiasm, but the cross-ability encounter, coupled with the event's impact on two children not using AUMI at all, sold Patricia on the project. Immediately, she saw something I was slowly coming to realize:

"It isn't the AUMI software that is important, it's what people do with it."

The event's success led us to establish an ongoing partnership with the MCS to think about ways to use AUMI there in a more substantive, permanent way.

I had assumed we would use AUMI as a creative tool directed toward precise therapeutic goals, facilitated by the fact that AUMI is fun to use. So I thought we would work on things like increasing range of motion in individual children and related goals. Patricia had different goals in mind. She recommended integrating AUMI into classroom curricula in various ways: having children take turns using AUMI to direct collective music making, having them make sounds appropriate to a story being told (e.g., wind sounds, dog sounds), and using AUMI to teach children particular social skills like sharing, asking, and thanking. In other words, she wanted us to downplay precise therapeutic capabilities, and in effect downplay all AUMI functionalities per se, and concentrate on how AUMI could help socialization in the classroom. We are presently working on analyzing the year-long data we collected related to this AUMI-in-the-curricula project and the data from the next year of research, where one classroom formed a class-band using AUMI and hand drums. Again, what is clear, what Patricia saw along with many of the MCS teachers, is:

"It isn't the AUMI software that is important, it's what people do with it."

In year one we focused on making classrooms more civil spaces, while the band formed in year two was really about students forming solidarity, creating a band name, feeling accomplishment and membership in something other than just "class 203." AUMI was crucial to both projects, yet it was a means to an end of community formation and inclusion. Although barriers (often socially constructed if not actually planned) between the able-bodied and people with disabilities exist, we sometimes forget such barriers exist *among* people with disabilities. We used AUMI to bring these barriers down and help the communities that inhabited MCS become *a* community.

I realized the role I was best suited to play in the AUMI research team was to mediate among subgroups of researchers and participants. Issues of adaptive design, creation of inclusive spaces, and more effective means of creating community across exclusionary barriers are often stymied by parallel disciplinary barriers. Recalling the first ICASP AUMI roundtable, I was able to bring control surface designers, medical engineers, OTs, PTs (physical therapists), and disability scholars together with teachers, caregivers, and individuals using AUMI. It became clear that many technical refinements of AUMI would be easy from an engineering standpoint, the designers had simply never been aware that such refinements would be useful for the therapists, teachers and users of AUMI.

On the other hand, those who use AUMI were often unaware of what was possible from an engineering perspective, and so had never thought to ask the designers to make certain refinements. For example, after the first AUMI demonstration at MCS, a talented, concerned teacher who worked with a class of children with visual disabilities took me aside and said, "Eric, this is wonderful, my kids would love to use this, but they cannot see the dot [which tracks motion on the AUMI screen], and many are color blind, so the lack of appropriate contrast means they cannot make out any of the controls really." I thought about this and asked the design team at CIRMMT if they could adapt the software to allow users to alter the size of all visual elements (dots, boxes, and the like) and to have similar control over colors. They said yes, that would be fairly easy, but they did not understand why one would want to do this until I explained. Two weeks later we had a new AUMI prototype with these functionalities. AUMI was henceforth used in the class with children with visual disabilities. We need broad interdisciplinarity, a wide range of expertise, and an open, inclusive research team so that AUMI will develop in ways responsive to users' needs and desires. Breaking down barriers between different kinds of expertise, getting engineers to talk to therapists, were ways of building inclusion parallel to the goal of AUMI. The far richer academic community built around AUMI was a model and product of the richer inclusive community writ large that AUMI helped create.

My ability to bring together many different folks to the same table was greatly facilitated by meeting and forming a research partnership with Keiko Shikako-Thomas, an OT professor at McGill. She worked in the same building where MCS was housed, focusing on issues surrounding disability, inclusion, and access. Our backgrounds differed, but AUMI brought us together and allowed us to merge our circles of academic contacts to form a research network dedicated to creating inclusive cross-ability communities. This led to numerous grant applications and AUMI-related projects (e.g., designing inclusive playgrounds incorporating digital technologies adapted from AUMI, reviewing literature on adaptive musical instruments). This is an important partnership for me, one grounded in a shared ethical sense of the importance of inclusion and the roles AUMI and related technologies can play in bringing it about.

I am not used to writing such as this, both personal and testimonial. At the risk of self-indulgence, let me say more about how AUMI has affected me. I have often wondered about why, whenever I enter MCS, I feel uplifted and happy. This is so even despite features of the school's day-to-day operation that are disturbing: the sudden appearance of an

ambulance, seeing the symptoms of a child with a progressive condition worsen, and the like. Much of this has to do with the overwhelmingly positive attitude of all those working at MCS. Yet I think there is more to this. The ancient Stoics developed a theory of ethics based on the principle that you should "bring the circles in." As they put it, strive to treat your aunt and uncle like you treat your children, treat your neighbors as you treat your family, treat strangers like you treat fellow citizens. Their ethics was based on bridging degrees of difference between us, to building inclusive communities, recognizing that we are all part of *one* community (for the Stoics, literally all proper parts of one cosmic individual). They also thought accomplishing this would bring happiness in having one function properly as part of an integrated, inclusive community. MCS and similar places strive for and model this. Perhaps the Stoics were right. I felt, and continue to feel, better when in such a community and am happier for it, feeling I am functioning as I should. Inclusion is not to be pursued because it is good for those normally excluded (this is more than enough reason on its own), but because it is *good for all of us.* AUMI can help bring this about and model what a globally inclusive community and society might look like. There are many positive points to make about AUMI as a therapeutic tool, as teaching cause-and-effect, increasing range of motion, improving posture, increasing motor control, and the like, but ultimately:

> *"It isn't the AUMI software that is important, it's what people do with it."*

AUMI and Music Therapy

Supporting Independent Musicking

ABBEY DVORAK AND NICOLA ODDY

> Ted Krueger: Do you see the use of AUMI as therapeutic?
> Pauline Oliveros: It's musical (laughs). I think that being able to participate in a community through making music improves the quality of one's life. The kids at Abilities First were excluded because of their disability, but now they are included. And inclusion in community is part of healing, as far as I'm concerned. . . . Improvisation is another practice that is healing. To make music, to make sound and to engage others in the making of sounds can be very healing, too. Because you're having a conversation of some kind, you're exchanging energies. You're listening and responding, but equally others are listening and responding to you!
>
> Pauline Oliveros and Ted Krueger, "A Composer's Practice," 286

Oliveros describes several therapeutic aspects of music improvisation: engaging others in music making, listening, and responding. Music therapy intentionally uses these therapeutic aspects of music in clinical treatment to support individuals, groups, and communities maintain or improve health, well-being, and quality of life. Although Oliveros was not speaking about music therapists, but the therapeutic effects of music making, music therapists have found AUMI useful for clinical practice.

Authors in this section are music therapists who have used AUMI in clinical practice. Music therapy is the "clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program" (American Music Therapy Association, https://www.musictherapy.org/about/musictherapy/, accessed September 21, 2022). Music therapists graduate from accredited degree programs; in some countries they complete board certification exams and receive specific professional designation. For example, music therapists in Canada require the designation of Music Therapist Accredited (MTA), while those in the United States require Music Therapist-Board Certified (MT-BC). Music therapists work with individuals, groups, families, or communities in various settings to improve quality of life and physical, social, communicative, emotional, intellectual, and spiritual health (World Federation of Music Therapy 2011). Music therapy is a "reflexive process wherein the therapist helps the client to optimize the client's health, using various facets of music experience and the relationships formed through them as the impetus for change" (Bruscia 2014, 36).

Music therapists use four general methods in clinical practice: improvising, composing, listening, or re-creating music (Bruscia 2014). *Improvising* allows participants to extemporaneously create new music in the moment, while *re-creating* involves participants in reproducing already composed music. *Composing* engages participants in writing musical products, such as songs, lyrics, or instrumental pieces. *Listening*—also called receptive music experiences—involves listening and responding (e.g., relaxing, moving, talking, drawing, etc.) to live or recorded music. Methods of music therapists are based on their education and training, as well as on the goals, needs, strengths, and characteristics of participants. Chapters in this section focus on the use of AUMI for improvisation, although it has the potential to support music therapists across all four methods.

Music therapy is a profession, and as a profession, we all use music and music experiences. But not all music therapists practice music therapy the same way. Depending on training, experience, population, and sociocultural context, music therapists may have different theoretical orientations and approaches that guide their work. Music therapists may follow humanistic, psychodynamic, cognitive, behavioral, neurological, and other approaches. Some music therapists also practice within a specific model of music therapy that follows a systematic, comprehen-

sive approach requiring specialized training with various protocols and techniques. One such model is Nordoff-Robbins (also known as Creative Music Therapy; see Mulcahy, chapter 32). Another is Neurologic Music Therapy, discussed in Hazard, chapter 31. Although each chapter describes aspects of clinical practice, each author describes and practices music therapy differently. AUMI is a flexible musical instrument with potential for the practice of any music therapist regardless of approach. In the following chapters, readers will identify various therapeutic outcomes based on individuals' needs, goals, clinical settings, and socio-cultural contexts. AUMI is a useful option or tool music therapists may select—from many possible resources—to best serve clients and improve accessibility of independent music making.

THIRTY | Clinical Applications Using AUMI in
Music Therapy Practice

ABBEY L. DVORAK, JAMES MAXSON, AND DAVID KNOTT

Pauline Oliveros's (2005) description of Deep Listening®, her central approach to music and community making, includes a belief that dynamic forces of change are possible through music. The practice intends to expand consciousness, compassion, communication, and understanding by creating, imagining, listening, and remembering sounds. In her *Sonic Meditations*, Oliveros (1974) invites participation and sharing in music experiences from all present in the moment, including musicians and nonmusicians. Oliveros's development of AUMI as a tool for increasing access to expression for those with limited mobility extends tenets found in her earlier work. These creative works share theoretical underpinnings to music therapy practice (e.g., music as a dynamic force for change, participation in music for all). Many music therapists traditionally use acoustic instruments in clinical practice, but electronic music technology (EMT) opened new possibilities for clients (Krout 2014, 62). One such EMT, AUMI, elegantly provided a platform for music therapists to enable clients to realize their movements and pay attention to how those movements translate into music. As with any instrument or technology used in practice, music therapists familiarize themselves with how AUMI is played so they can efficiently anticipate and correct interface challenges when they arise, maximizing the flow of music and session. This chapter provides examples of music therapists using AUMI in clinical practice.

Music Therapy Clinical Applications with AUMI

AUMI is a flexible, accessible, and adaptive musical instrument that clinicians can use effectively in therapeutic settings (Dvorak and Tucker 2017). Clinicians reported the successful use of AUMI in individual therapy settings with children, adolescents, and adults, along with group and community music-making experiences for people who may otherwise be excluded from music making due to disabilities (Finch, LeMessurier Quinn, and Waterman 2016; Krout 2014). Oliveros, Miller, Heyen, Siddall, and Hazard (2011) described the creation of AUMI as a way for students with limited voluntary mobility and motor control to participate independently and inclusively in group drumming. Dvorak and Tucker (2017) described improvisation with AUMI for intergenerational community formation to increase inclusion and accessibility of musical expression for all. Dvorak and Boresow (2019) provided case examples describing the use of AUMI with four individuals with various physical, intellectual, and developmental disabilities. As with the choice of any musical instrument or electronic music resource, using AUMI for therapy must stem from client need (Magee 2014a). Clinicians must consider clients' physical, sensory, cognitive, emotional, social, and behavioral needs before deciding to use EMTs.

Magee and Burland (2008) identified a five-step clinical process model when using EMT with people with complex needs. First, clinicians must identify the best EMT to meet client needs and have access to that resource (Magee and Burland 2008). AUMI software is free but requires the purchase or use of a computer, iPad, or iPhone. Second, clinicians must assess clients' movement patterns (e.g., range of motion, trajectory, volition, etc.); EMT characteristics should match the movement's characteristics (Magee and Burland 2008). AUMI is flexible and modifiable during setup to adapt to various movement patterns (see Dvorak and Boresow 2019). Third, the clinician enables the client as musician, carefully positioning the EMT where it may be operated easily (Magee and Burland 2008). When using an AUMI-equipped iPad, clinicians may purchase a protective iPad case that attaches to a flexible mounting system, which in turn may be connected to a stationary object (Dvorak and Tucker 2017). The mounting system allows AUMI to be easily positioned to best capture and translate movements into sound. Fourth, the clinician must assess client understanding of cause-and-effect when using the EMT (Magee and Burland 2008). When EMTs are triggered without physical contact, as with AUMI, a client may have difficulty connecting

their movement with the corresponding sound, particularly someone who struggles with abstract concepts (Bache, Derwent, and Magee 2014). Using appropriate visual cues as adjusted on the software's "Looks" screen (Dvorak and Boresow 2019) may help in this area. So does placing the speaker in the same direction as the iPad (as opposed to coming at the client from another direction) (Bache, Derwent, and Magee 2014). Fifth, after clinicians carefully assess client comprehension of cause-and-effect relationships between movement and sound production, the client may move into musical play (Magee and Burland 2008). AUMI allows various musical improvisation choices selected on the "Instruments" and "Sounds" screens appropriate to client sensory needs, personal preferences, and individual characteristics (Dvorak and Boresow 2019).

Music Therapy Clinical Descriptions with AUMI

In this section, three music therapists discuss using AUMI in (a) a pediatric children's hospital, (b) a children's long-term residential care facility, and (c) an adult community mental health center. Authors describe settings, populations, and common needs; their history using AUMI in practice; therapeutic applications using AUMI; and potential indications and contraindications of using AUMI within their population and setting.

Pediatric Children's Hospital, David Knott

Setting, Population, and Clinical Needs

Seattle Children's is a 407-bed hospital and regional medical center. Music therapy at Seattle Children's is part of Creative Arts Therapies, housed within the Child Life Department. Music therapists serve infants, children, and adolescents across all in-patient hospital units (i.e., Pediatric Intensive Care, Cardiac Intensive Care, Neonatal Intensive Care, Cancer Care, Rehabilitation, Medical, and Surgical), providing limited coverage to special outpatient programs. Young patients present with life-threatening illnesses and injuries along with complex medical conditions, genetic, developmental, and neurological disorders. Some treatments include short- or long-term application of life-sustaining medical equipment. Each unit provides specialized care according to patient needs. For example, the Intensive Care Units provide the highest acuity treatment, while stays on the Rehabilitation Unit stress intensive

physical (PT), occupational (OT), and speech/language therapy, often to improve skills before discharge. Hospitalizations may be as short as a single day or more than a year, depending on the young person's needs. A vast range of clinical needs arise during hospitalization including physical, cognitive, emotional, social, and communicative. Music therapy services address clinical needs related to poor coping, pain that is difficult to treat, end of life, and adjunct support to rehabilitative efforts when a young person can engage more efficiently or effectively through music-facilitated treatment. Music therapy approaches include receptive approaches to redirect attention and develop new coping skills, using adapted instrument-playing techniques to gain strength and improve movement skills, along with songwriting and creative music recording to facilitate expression and create legacy materials for family members.

History of AUMI Usage

I discovered AUMI through the work of Pauline Oliveros and her Deep Listening Institute in Kingston, New York. In 2000 I attended a Deep Listening® Retreat at Rose Mountain, New Mexico, and studied Oliveros's *Sonic Meditations* (Oliveros 1974), a set of scores describing ways of focusing attention with oneself and others through listening and sounding.[1] When I learned her team had developed a tool to allow people with very limited movement to play music, I knew it would have applications in our setting.

In 2010 I downloaded the Beta 2 version of AUMI on a Macintosh PowerBook laptop computer (1.5GHZ PowerPC G4), running MAC OS X version 10.4.11. The PowerBook did not come with a camera, so an external camera was required. Using a Macally camera (Model no. ICECAM2) clipped to the computer's open cover, easy adjustments of the angle could be made by simply further opening or closing the computer's cover or changing the position of the camera left to right. With the computer resting on a patient's tray table, a standard item for all hospital rooms in our facility, it could then be easily adjusted to create the best angle for a young person to control AUMI with the head of their bed elevated. In 2013, when I began using iPad with music apps during music therapy sessions, I downloaded the AUMI app for iOS[2] and began using it. AUMI iOS has remained a resource instrument, used when its unique method of playing is best suited to clinical needs.

Music Therapy Clinical Applications with AUMI

In a pediatric hospital, children of all ages often face diminished or lost motor skills. These losses can challenge their senses of identity and present challenges for families adapting to new realities. AUMI can demonstrate new possibilities as the child creates music within their new movement abilities. As an instrument that enables even limited movement patterns to translate into music, setup can be individualized to each person's movement needs, allowing for target movements to become part of the sound palette. An individual's playing can then be supported by the music therapist's accompanying instrument, or other participants' sounds in a group setting, enabling them to create music within individual movement possibilities. Music therapy in a pediatric hospital is most often targeted to addressing specific clinical needs. Three areas addressed successfully through AUMI are motivating engagement, facilitating increased movement, and enabling creative expression and socialization.

Motivating Engagement

Motivating recovering children to participate in therapy can be challenging. Along with developmental considerations and day-to-day fatigue for anyone who is hospitalized, the inability to do things they used to do easily can bring frustration and disengagement. AUMI can motivate children with new movement limitations as it demonstrates how technology can meet them where they are and support their continued needs and efforts in therapy.

I was asked to see a young man with autism spectrum disorder who had experienced a stroke in his brainstem, leaving him paralyzed with minimal functional movement. He could move his mouth, so the team tried to encourage him to use a mouthstick for communication. This was a light, pencil-shaped stick mounted at the end of an oval placed between this young man's teeth. In a single session, he was shown how the mouthstick could be used with AUMI to make sounds; he easily recognized how he could control the instrument. As he explored possibilities, I followed and supported his continued engagement using quiet attention and periodically imitating sounds he made (i.e., mirroring) or playing sustained sounds that provided a foundation for notes he played

(i.e., grounding). Even after forty-five minutes, he did not want to stop playing AUMI. This is but one example. Others who struggled with new movement limitations but were motivated to participate through AUMI have included young people with spinal cord injuries and brain tumors, and those recovering from protracted viral illness.

Sensorimotor Training

For hospitalized children who are already participative, music therapists may use musical exercises to support sensorimotor goals. One program offered through occupational therapy is constraint-induced therapy (CIT). CIT is used with children with hemiplegia—either limited or no movement on one side of the body. Hemiplegia may result from congenital or neurological injuries or other complex medical conditions. CIT participants have casts placed on the arm they typically use and attend daily three-hour OT sessions. They also continue using their affected arm at school and home. Casts are removed periodically to ensure their skin remains intact. CIT participants in music therapy groups use AUMI to facilitate increased use of their affected arms and have challenged themselves to increase range of movement to play the highest notes when using the keyboard mode.

This specific aspect of AUMI—providing feedback about an individual's range—was useful in supporting rehabilitation of a sixteen-year-old young man who experienced traumatic brain injury from a gunshot wound that left bullet fragments in his left occipital lobe, resulting in right-side hemiplegia (i.e., paralysis on one side of the body). I had been supporting his OT using targeted placement of electric and acoustic drums and a client-preferred beat that provided clear reinforcement of his movement rhythm patterns. During these exercises he stood and had his balance guarded by the OT standing behind him. This allowed them to target his balance and foot placement while I facilitated his upper-body workout with the drum patterns. Throughout his sessions, he continued having difficulty with shoulder extensions. But when AUMI was introduced, he intrinsically moved his arm higher, reaching for higher notes. The OT noted this increase in range, and AUMI provided a separate instrument-playing strategy for him to engage in during seated breaks to continue his progress.

This intrinsic motivation was observed in another session with a fourteen-year-old young man experiencing left hemiplegia following a cerebral stroke. In collaboration with another OT we observed that

he struggled to maintain his posture throughout the session. With the introduction of AUMI he immediately sat up, hearing how his tall sitting enabled playing higher notes. This stimulated him to begin repeatedly trying to independently stand up and trigger the highest possible notes. This was surprising because he had been considered a maximum assist transfer in and out of his wheelchair.[3] These examples demonstrate AUMI's capacity to stimulate movement patterns and help rehabilitation with some young people.

Creative Expression and Socialization

In music therapy, perhaps one of the most well-known applications of music is for creative expression and socialization (i.e., interacting with others). Introducing AUMI to families of children with total care needs and severe developmental delay creates opportunities for music play with parents and siblings. One young man with profound developmental delay and medically complex care was frequently readmitted to the hospital. On one visit, as his health improved, I introduced him to the AUMI iOS app. He recognized how his movements were translated into sound, which he then translated into laughter. On hearing his son's laughter and observing his interactions with others, his father recognized AUMI's potential and downloaded it to use at home. During a later admission, he shared that his son's other siblings would set him up with AUMI while they played other instruments with him. He described these at-home music sessions as festive and laughter-filled.

Indications and Contraindications of AUMI

AUMI can reduce barriers for participation of young people with functional movement limitations, providing them a free musical instrument that can adapt to their range of movement. AUMI should be integrated by music therapists working in pediatric medical settings because it may enable increased access to active music-making strategies for those with difficulties playing traditional instruments. Through thoughtful application of AUMI, music therapists in pediatric settings can address clinical needs to increase motivation, movement, and expression while reinforcing an emerging sense of success and ability, an important experience in the context of what these young people have lost to illness and injury.

While iPads are prevalent in many medical settings, music therapists should ensure that an iPad does not interfere with specialty medi-

cal equipment used in a patient room or with medical devices within a patient's body. One example of a medical device that can be affected by electromagnetic fields from iPads is the programmable cerebral spinal fluid (CSF) shunt. This is a tube placed in the brain to drain excess fluid to another part of the body where it can be absorbed (Drake, Kestle, and Tuli 2000). CSF shunts that are designed to be programmed externally are susceptible to magnetic interference. The FDA recommends tablet devices are safe if used more than two inches from the site of the implanted device.[4] Music therapists should assess these risks when introducing iPad apps like AUMI in music therapy sessions and collaborate with staff members responsible for patient safety related to medical equipment.

Residential Health Care Facility for Children, James Maxson

Setting, Population, and Clinical Needs

Elizabeth Seton Children's Center (ESCC, the children's center) is a residential health center for 169 children with severe medical complexities in Yonkers, New York. We provide services to children requiring specialized medical, nursing, rehabilitative, and educational services. Children from birth to twenty-one reside and attend school in the same building. Some children require ventilators, supplemental oxygen, rehabilitation services, developmental support (e.g., newborns who need additional care before going home from the neonatal intensive care unit), feeding therapy, housing support, family training (e.g., for family caregivers to learn to care for their child to eventually take them home), or nursing support throughout their childhoods. An important distinction is that ESCC is not a hospital; it is a residential medical center. Children requiring acute care or surgery are transferred to hospitals.

Many children at ESCC are nonambulatory and nonverbal. All have palliative care services, which does not mean that they are at end of life, but rather that we provide consistent comfort-care services to increase their quality of life for the duration of their stays. We do, however, provide end-of-life care for some residents who are admitted with a poor prognosis. On average, four children pass away each year due to complications or symptoms of their diagnosis, illness, or genetic condition. Emblazoned in the entrance of the children's center lobby are the words of founder St. Elizabeth Ann Seton: "All are Welcome." This is a promise to help all who ask for it, regardless of ethnicity, creed or belief, or

background. Our diversity reflects this commitment and the fact that everyone who enters this "home" belongs.

ESCC employs seven music therapists, including one as clinical director of creative arts therapists. There are two art therapists and a dance/movement therapist within our creative arts therapy team. Almost all residents receive music therapy either individually or within group settings. Helping residents participate to express themselves creatively—through music, art, or movement—is a common goal. Many residents require full assistance to participate, so methods to increase independent self-expression are often welcomed and explored.

History of AUMI Usage

The AUMI program was first introduced to the residents around 2010 after I attended a presentation at the Royal Hospital for Neuro-Disability (RHN) by AUMI's creators. The program was downloaded for the facility's 2009 MacBook Pro, which had a built-in camera. Use of AUMI significantly increased after the iPad app's release, allowing for easier setup with an iPad and mount. As most residents use wheelchairs and have significant motor disabilities, the computer was often cumbersome to position effectively for residents to use and see the screens at the same time. Often the computer had to be on a table to pick up a resident's movement, but the resident could not see it. The benefit of the iPad app was that with an iPad mount, the screen could be positioned where a resident could see it and we could use tracking shadows or other pixel changes from the image of the resident's face. This ability for visual feedback and closer proximity greatly increased usage of AUMI so that a resident could see the targets or areas required for activating sound.

Music Therapy Clinical Applications with AUMI

Several children at ESCC are in a minimally conscious state (MCS), a disorder of consciousness (DOC). When certain diagnostic criteria indicate minimal but clear evidence of self or awareness of the environment, that person is in a minimally conscious state (Giacino and Kalmer 2005). Signs of awareness can include simple following of commands or understanding language, verbalizing or gesturing of yes or no, and movements or behaviors that occur in response to external stimulus but are not reflexive. Reasons for MCS could include many factors such as a genetic condition, TBI, acquired brain injury, or a neurologic condi-

tion. MCS is a higher level of functioning than a vegetative state (VS), that is, not quite at a level of full consciousness or awareness. VS, sometimes referred to as unresponsive wakefulness syndrome, does not have a fully agreed upon definition, but rather is characterized by a "complete absence of behavioural evidence for awareness of self and environment" while still retaining some level of arousal (Giacino and Kalmar 2005). The care provided would not change for a person between persistent vegetative state (PVS) and MCS. In other words, the person would still receive the same therapeutic and rehabilitation services. Knowing that this individual has a higher level of consciousness, however, may change the way a caregiver interacts with the resident. Thus, the family may have a different experience knowing their child has more awareness than previously observed.

These diagnostic criteria are primarily contingent on an understanding of language. A person must understand questions being asked of them to answer correctly. What if that individual suffered an accident at a young age or was born with a neurological condition that placed them in a minimally conscious state *before* language development? Is the individual unable to correctly demonstrate behaviors because their level of awareness is lower than the diagnostic criteria for MCS? Or perhaps it is because they do not understand what is being asked of them and do not know they are being asked a yes-or-no question. In other words, the individual has not yet developed language skills sufficient to meet diagnostic criteria. This differs from working with adults who had functioning vocabulary and communicative abilities before the MCS. So how can AUMI be integrated with people in MCS regardless of language development? AUMI can transcribe movement into music, provide opportunities for nonverbal communication, and allow music therapists to focus on clients' therapeutic needs such as increasing awareness, motivation, and purposeful movement.

Increasing Awareness and Validating Purposeful Movements
in Minimally Conscious States

Within creation of music there is an innate ability to participate without words. We can integrate a nonverbal assessment strategy and offer musical-dialogue-based interactions (Gilbertson and Aldridge 2008). Regardless of an individual's level of language development, music has a role in processing and is tangible in a way language alone is not. Active music making, or musicking, refers to participation in music and how

music is enacted and experienced as the interaction of various relationships (Pavlicevic and Ansdell, 2004; Small 1998).

At ESCC, children diagnosed with a DOC—requiring medical, nursing, rehabilitative, and educational services—also require technology that allows them to participate fully in as many childlike experiences as possible. This type of setting encourages a certain number of creative adaptations. Grasping musical instruments can be difficult without hand-over-hand (HOH) assistance. There is also the question of *who* is actually playing the instrument: the child or the caregiver/therapist? If a strap attaches a mallet or drumstick to the child's hand for stability, how does the child put the mallet *down* to indicate they no longer wish to play? Any opportunity to increase independence is valuable. This is one reason we avoid the phrase "will tolerate ____" in our goal writing. Music is not something to measure in tolerance.

Thus, the appeal of AUMI. We often place it near a resident's field of vision so they can see the screen, see their image, and visually track the spot where they want to interact for sound. There is no need to grasp anything. A small movement can be recalibrated to be bigger, which can be important for a resident's self-expression goal. If a resident cannot strike a drum hard because of poor motor control or low muscle tone, how can they express musical emotion (i.e., playing loudly can perhaps indicate frustration, excitement, pain, joy, etc.)? Calibrating a small movement to louder sounds or more sounds can make music and the related emotional expression more accessible. In one example of using AUMI this way, the care team altered a resident's diagnosis from persistent VS to MCS. When participating with AUMI, the child clearly demonstrated some awareness of their environment and self and showed increased purposeful movements once musicking had begun. As diagnosis between MCS and VS can be challenging and unclear, AUMI was a valuable tool to help assess this resident's awareness of self and environment.

AUMI and Musicking When it Is Unclear if the Movement Is Purposeful

ESCC believes in the importance of helping our children "see themselves in a new light, work through emotions, tap into their creativity and be loud and messy."[5] In the therapeutic process musicking is about creation and exchange of music between therapist and resident. If it is unknown or unclear if movement is purposeful (e.g., due to spasticity, tremors, myoclonus, etc.), having unconditional acceptance of the child and giving them opportunities become primary objectives, in other

words, accessibility to musicking. AUMI provides a method for making music from any movement, thus bringing the relationship into existence and giving meaning to the "performance" that can be difficult or chaotic with traditional or acoustic instruments (Pavlicevic and Ansdell 2004). Spastic movements when playing wind chimes can create loud or disorienting sounds. A mallet strapped to the resident and played with hand-over-hand assistance can be superficial, inorganic, and disingenuous. Having a resident with spastic movements play the piano can be overstimulating or challenging with so many notes to worry about. Control over the tonal environment that AUMI provides can help create a more appropriate environment for musicking based on residents' sensory needs. Adapting scale, tonal frame, mode, timbre, and even original sounds are ways music therapists can establish a more therapeutic environment, whether movements are volitional or not. It appears there is an increase in movement upon initiation of sound. This evidence is anecdotal; further study and assessment is needed to "prove" it. The transfer of movement to sound, however, and thus the *musicking*, still occurs.

Motivating and Visualizing a Movement Goal as Adjunct Support in Rehabilitation

Cotreating with OTs or PTs is common in music therapy. Many residents receive therapeutic interventions such as passive or active range-of-motion exercises to help with decreasing joint limitations, improving flexibility, and contributing to overall functional ability. Passive range of motion (PROM) refers to when the therapist (PT/OT) or equipment moves a joint through the range of motion with no effort from the resident. Conversely, active range of motion (AROM) occurs when the resident can do it on their own (Dutton 2014). Range of motion is important because it can measure progress or long-term ability (Leonard 2019). There is a therapeutic need for the resident to be relaxed or have their attention focused on something other than potential discomfort. Music can help facilitate this. The AUMI program on a computer and smart device app provides a unique way for an individual with limited cognitive ability or conscious awareness to be included and participate musically while meeting rehabilitative goals. Active engagement in music can then help the resident be more comfortable during active or passive range of motion, increasing effectiveness of their physical or occupational therapy goals.

Visual feedback provided by the AUMI screen can help a resident

visually track where their arm or leg is in space. The various boxes and range of the musical scale can help provide visual and auditory feedback for motivation, targets, and motor control. Setting up specific parameters for what tones and how many are played, as well as sensitivity to the movement can reflect various emotions or preferences for the resident. We, as music therapists, can use our skill sets of how to use music that is patient-preferred, live, and also motivational to achieve client goals and provide an inclusive and equitable experience.

Music is inclusive and equitable—from loud to soft, fast to slow, high-pitched to low-pitched—an individual can be heard and validated. If the child wishes to play the drum loudly to express themselves in such a way, it can be challenging for someone with limited strength, grasp, and movement to play music in a way they are feeling. A digital interface that does not require strength to play can be a valuable tool for that child to express a more accurate representation of their emotions. If we assume music therapy theory is based in "metatheoretical assumptions about humankind and music" (Stige 2004), then ability to transcend boundaries to musical access is extremely important. If a child desires to express themself, but lacks physical control or communicative capacity to play music traditionally, extremely important intervention is in a music therapist's instrument bag. By translating movements into sound, AUMI allows the child with or without disability to participate. It is important to identify, though, that assent has been given and the child has something musical they want to say or give. If they indicate verbally or nonverbally that they do not want to participate, then AUMI should be muted so movements do not inadvertently make sound.

Suggestions for Clinical Practice

Environmental impacts for using AUMI with medically complex children are also evident. Community music therapy explores social and ecological perspectives on music and health, promoting healthy connections not only in client and therapist relationships, but also between individuals and communities (Stige and Aarø 2012). Participation in music can build a strong sense of belonging. In a facility that is also home and school to the children, belonging to the facility is also belonging within your home and community. Witnessing a child create music simply by moving has elicited responses from caregivers such as, "I hear you playing music, Donny!" or "I've never seen you move so much!" and "I didn't know they could do that." Statements like these help caregivers (i.e.,

nurses, nursing assistants, doctors, therapists) validate a child's feelings, build positive memories in the workplace, and increase their awareness of who the child is as a person.

AUMI can also be presented as a community instrument; think of it as digital wind chimes. Imagine how wind chimes produce sound by the wind passing over a weight within the chimes or even the chimes themselves, which creates repeated patterns from a series of notes. The passing of an individual through the camera field that activates AUMI can also produce wind chime effects, but inside the building. This can have the effect of letting people know that their presence is seen and heard. It affects the environment and can bring caregivers, families, and residents into the moment to remind them their presence is known. Setting up multiple iPads with AUMI focused on a single point can create a forest of sound as one passes through, crafting an aural soundscape validating the community's movements and drawing attention to how movement can influence the whole group. This kind of musicking is thus a type of ritual situation, enacting ideal relationships that become the foundation of the community in the Children's Center (Pavlicevic and Ansdell 2004).

Adult Community Mental Health, Abbey Dvorak

Setting, Population, and Clinical Needs

The Bert Nash Community Mental Health Center is a nonprofit mental health organization offering outpatient services for adults and children. Its mission is to advance community health through comprehensive behavioral health services responsive to evolving needs and changing environments (Nash 2019). Community Support Services (CSS)—one service area within Bert Nash—helps individuals diagnosed with severe and persistent mental illness (SPMI) to live independently and productively within their community. Through CSS, a weekly sixty-minute music therapy group began in January 2014.

Mental illness, a health condition affecting thoughts, feelings, and behavior, causes distress and difficulty in functioning (National Institute of Health [NIH] 2007). In the United States, 41.4 million adults (17.8 percent) are diagnosed with a mental illness; approximately 17.4 million receive treatment each year (Substance Abuse and Mental Health Services Administration [SAMHSA], 2013). The National Institute for Mental Health estimates the total yearly cost of serious mental illness at $317.6 billion (2012). SPMI affects 3.9 percent of U.S. adults, approxi-

mately nine million people, and includes diagnoses of schizophrenia, bipolar disorder, severe depression, and other psychotic conditions (SAMHSA 2013). Although definitions vary, SPMI describes adults with a current psychiatric diagnosis that results in debilitating extended impairment in functioning in self-care, daily living activities, social functioning, concentration, and/or task completion (Office of Mental Health [OMH], 2013).

The music therapy psychosocial rehabilitation (MTPR) group was open to participants eighteen years of age or older who were diagnosed with an SPMI. In addition to SPMI, many participants had comorbid medical conditions or physical disabilities. MTPR worked to enhance relationships, improve social skills, develop a social network, and focus on hope, wellness, recovery, and empowerment. All music therapy experiences were designed to help participants achieve their psychosocial goals in a supportive group environment. The music therapist designed music experiences to also have secondary gains in self-esteem, self-expression, positive mood, and healthy feelings and thoughts. Within each session the music therapist used introductory group cohesion active music making and ended with music relaxation interventions. The core content of each session differed depending on client needs, preferences, and interests. This content included various music experiences throughout the year so participants could explore and discover what worked best for them. No formal music training was required; all experiences were designed to engage and be successful for nonmusicians.

History of AUMI Usage

I was introduced to AUMI in 2014 when Sherrie Tucker approached me about potential interest in working with a student on an AUMI project. In 2015 I joined the AUMI-KU InterArts team and began cofacilitating community jams with Sherrie Tucker and Kip Haaheim using AUMI at Lawrence Public Library's SOUND+VISION Studio in Lawrence, Kansas (see Barnes et al., chapter 15). Once I began working with AUMI community jams and had facilitated the CSS group for a year, I realized that I could use AUMI to meet some identified needs of group members.

Music Therapy Clinical Applications with AUMI

Participants in the MTPR group preferred active music engagement interventions, particularly those playing instruments such as guitar,

piano, tone chimes, and drums. Some, however, had difficulty holding or playing instruments due to disability or fatigue. AUMI seemed a potential solution, so I introduced the AUMI iOS version on iPads to group participants. For setup I attached four iPads to a long table in the middle of the room, two iPads to a side. Due to sensory issues, additional speakers were not used; volume was limited to and controlled by individual participant iPads. During this session two participants shared each iPad, taking turns playing AUMI. Sharing allowed participants to interact with and practice social skills with peers, and providing or receiving feedback appropriately.

The session began with a brief introduction to AUMI. Participants could explore different sounds and functions. They were asked to find an AUMI sound they wanted to use for improvisation. This gave participants choice and control, empowering them to make decisions and identify preferences. After everyone picked an instrument sound, I helped adjust the pitch and scale wheels on each AUMI so everyone could play in the same key for a more pleasing, familiar ensemble sound.

We started improvisation with one person moving, then each added in their sound through movement. At first, participants seemed self-conscious but grew less tentative and more purposeful in their movements. They listened and responded to one another during improvisation, adding sounds and silences to create musical experience. After the first improvisation, participants reflected on and processed the experiences, drawing attention to sounds the group created and their own experience within it. The second person on each iPad could choose an instrument and movement. Again, I adjusted the volume, pitch, and scale wheels for the next improvisation. A different person started the improvisation, then group members joined. Afterwards, group members compared and contrasted the two improvisations. Participants reflected on their thoughts and feelings about the session experience with AUMI. They appreciated trying something new and the ease of learning an instrument without having to hold or play it a certain way. Several downloaded AUMI on their phones for home or community use. The transfer of AUMI to outside the group indicates participants could use AUMI as leisure activity. Finding and building leisure skills and activities is especially important to help participants live independently and productively in communities.

Conclusion and Future Recommendations

Within these three distinct settings, music therapists successfully integrated AUMI into clinical practice. This captivating electronic music instrument has many clinical applications for music therapists. Like any instrument or EMT, AUMI should be used with therapeutic intent, focused on client needs and goals in music therapy practice. Music therapists could increase access to adaptive improvisation with AUMI in their setting by downloading and learning to use the free app, including AUMI on resource lists for therapists, and introducing AUMI as standard practice for families of children with limited movement who have access to a computer, tablet, or phone.

Tactile feedback, typically occurring while playing traditional instruments, is missing from playing AUMI. Participants cannot physically "feel" sounds they play. Clinicians and software developers could integrate AUMI with haptic vests that translate sound into vibration. People with specific sensory needs could fully participate by receiving tactile vibratory feedback indicating creation of sound in their environment. With its availability as an iOS application, AUMI can turn any iPad or iPhone into a musical instrument that nearly anyone can play regardless of ability or disability. AUMI's ubiquity and adaptability offers possibilities for music therapists in varied settings across multiple need areas.

Notes

1. An example of one of Oliveros's Sonic Meditations is number X: "Sit in a circle with your eyes closed. Begin by observing your own breathing. Gradually form a mental image of one person who is sitting in the circle. Sing a long tone to that person. Then sing the pitch that person is singing. Change your mental image to another person and repeat until you have contacted every person in the circle one or more times."

2. AUMI for iOS is substantially different from AUMI desktop. See Lowengard, chapter 11.

3. A maximum assist transfer requires a caregiver to provide three or more points of contact and greater than 75 percent of the work.

4. https://www.fda.gov/medical-devices/cerebral-spinal-fluid-csf-shunt-systems/magnetic-field-interference-programmable-csf-shunts.

5. https://setonchildrens.org/creative-arts-therapies.

Use of AUMI in Clinical Music Therapy for Hospitalized Patients with Complex Neurological Disabilities

SERGIO HAZARD

WITH TRANSLATION ASSISTANCE BY CALEB LÁZARO-MORENO

This chapter shares experiences from our use of AUMI during the Music Therapy and Musical Technology project (2009–2011) in Santiago, Chile. Our multidisciplinary team in the Children's Rehabilitation Institute–Teleton (CRI-T) implemented the project to complement rehabilitation programs designed for patients with complex neurological disabilities. For two years, we worked specifically with patients diagnosed with acquired spinal cord injury (SCI).

We introduced patients from the CRI-T to AUMI to encourage neurorehabilitation across both functional and psychosocial aspects. Our primary objectives were to improve capacity in range of movement, muscular strength, Activities of Daily Living (ADLs), cognitive skills, and symptoms of mood disorders. We observed that using AUMI provided positive outcomes for patients in our project.

Neurologic Music Therapy in Chile and AUMI

We recognize music therapy or *therapy through music and/or its elements* (including vibration, sound, rhythm, melody, harmony, and silence) as

a discipline belonging to the health sciences, with its actions focused on sound/musical experiences people have and relations that develop through these experiences (Bruscia 1989). Fundamental objectives of music therapy are prevention, promotion, assistance, and rehabilitation of health (Bruscia 1989).

In Chile, many professionals studying music therapy come from education, psychology, and health fields. Integrating their knowledge base in these fields, music therapists in Chile are generally separated into these respective disciplines. Clinical music therapy has been used as treatment for more than fifty years in Latin American contexts, with nations like Argentina and Brazil in the vanguard (Barcellos 2001). Clinical music therapy is one form of treatment for patients with diverse pathologies. A common objective in music therapy treatment in Chile is to contribute to the psychosocial and physical well-being of the patient beyond their disability so that they may achieve optimal functioning and self-acceptance.

Within clinical music therapy, neurologic music therapy (NMT), developed over the past two decades, exemplifies the neuroscience of music perception and production and is dedicated to studying effects of music on human physiology and the central nervous system (Thaut and Clair 2000). NMT is the therapeutic application of music with people who live with neurological illnesses.[1] Music and other related activities are tools for producing nonmusical results, such as stimulation or cognitive, speech, sensory and motor rehabilitation. This also includes pain management and re-education of skills lost due to neurological conditions. Patients who can benefit from NMT include children, young people, and adults who have any sequelae/symptoms due to SCI, traumatic brain injury, stroke, general development disorders, autism spectrum disorders, chronic pain, dementia, Parkinson's disease, disorders of consciousness, and other nervous system illnesses.

Integrating the use of musical technology, both of software and devices and of instrumental adaptation interfaces in NMT, is an innovative proposal. Thus, AUMI constitutes a breakthrough technology in Chile. I initially heard of AUMI in 2010 at the Royal Hospital for Neurodisability in London, where Pauline Oliveros authorized my use of AUMI as a project of the Deep Listening Institute. Our objective was to create new interfaces that were flexible, included digital controls and applications, and allowed for instrument modifications to be used by children and young people with limited mobility or functional movement. The purpose of using AUMI was to contribute to and motivate neurologic rehabilitation of CRI-T patients by providing space for creativity, free expression,

and free playing of electronic sounds in individual or group settings. During NMT sessions patients could also improvise and compose their own music.

Institutional Context

The Music Therapy and Musical Technology project integrating AUMI within clinical music therapy settings was conducted at the Children's Rehabilitation Institute–Teleton (CRI-T) of Santiago. The Teleton Foundation (TF) was established in 1986 with its mission being the development of integral rehabilitation programs for children and young people with motor skill disabilities of neuromusculoskeletal origin, emphasizing self-care (https://www.teleton.cl). A pioneering leader in Chile for pediatric rehabilitation, TF supports children and young people integrating various aspects and activities of life via medical, pedagogical, social, and occupational actions. TF secures necessary resources mainly through a massive fundraising campaign, in which national and international artists perform on a television show for twenty-seven hours of continuous broadcasting on all Chilean channels (https://www.teleton.cl).

Currently, there are fourteen Teleton Institutes across Chile, which have allowed for 97 percent of Chile's children and young people with motor disabilities to receive clinical attention. Teleton receives more than three thousand new patients yearly. There are more than one hundred thousand disabled children and young people who have received integral rehabilitation services, bettering their lives and opportunities thanks to the constant dedication of Teleton's professional staff (https://www.teleton.cl). For this project, participants were people with acquired SCI between seventeen and twenty-four years of age, ranging from lower-middle-class to extreme poverty, basic to medium-level education, and supported by Chile's National Health Fund.

Setting and Equipment

At CRI-T, patients received NMT in their hospital rooms and in a designated occupational therapy room. Instruments and materials used included AUMI, acoustic percussion and stringed instruments (i.e., cajon, kick drum, tambourine, finger cymbals, kalimba, singing bowls, and guitar), tech devices (i.e., laptop, video camera, photo camera, speaker system), tripod, stopwatch, metronome, goniometer (an instrument for the precise measurement of angles related to the joints' range

of movement), library and musical material designed specifically for a patient's personal history, therapeutic implements (e.g., sling, wedge, skate, ergonomic table), and a field notebook.

Clinicians

Interventions were facilitated by a music therapist or in groups in which the music therapist was accompanied by a cotherapist. The therapeutic team consisted of myself, a neurologic music therapist (NMT) specializing in sound and music technology, and Rodrigo Cubillos, occupational therapist (OT), assistive technology unit coordinator.

Other collaborators were Patricia Vergara, MD, medical director of the Children's Rehabilitation Institute of Santiago (CRIS); Roxana Böke, bachelor of science in nursing (BSN), Hospitalized Patients Unit coordinator; Marcos Chiang, OT, Occupational Therapy Unit coordinator; Macarena Rivas, art therapist (AT), High Motivation Program coordinator; Cristina Rigo-Righi, MD, physiatrist; Macarena Varolli, kinesiologist; Claudia Pezoa, OT; María José González, psychologist, Hospitalized Patients Unit; and fourth-year interns of occupational therapy from the University of Chile.

Fundamentally, the project was oriented to the medical model, where one integrates clinical music therapy and a therapeutic approach with a multidisciplinary team's support. On all levels of intervention, we proposed experience-driven, active participation from patients, which resulted in their cocreating their own rehabilitation process.

Patients

The six male patients and one female patient in our program ranged from seventeen to twenty-four years old. Six were diagnosed with traumatic paraplegia, paralysis of both legs and the lower body typically caused by SCI because of a traumatic event (e.g., a traffic accident). One patient was diagnosed with incomplete quadriplegia, which occurs when there is incomplete severance of the spine and some movement of limbs is conserved. This intervention program consisted of a minimum of twelve sessions, each forty minutes, twice weekly. Four patients had twelve sessions while three had, respectively, fifteen, twenty-four, and forty sessions.

Therapeutic Framework

Our therapeutic framework consisted of (a) functional, (b) psychosocial, and (c) technological components. Functional and psychosocial components were based on our clinical objectives and used in measuring effectiveness of our interventions. Broadly, these objectives comprised contributing to and encouraging neurorehabilitation for treatment of patients with acquired SCI and to improve their capacity to perform fundamental activities of daily living (ADLs).

Functional component objectives focused on increasing range of a patient's joint movement, muscle strength, and voluntary motor control in areas of the body both unscathed and partially affected by SCI. Thus the functional components consisted of retraining of gross and fine motor skills and re-education of the body scheme. Psychological component objectives were to improve capacity for attention and concentration, communication and interaction skills, and intra- and interpersonal relationships. The psychosocial component centered on improving cognitive-behavioral processes; reduction of symptoms associated with mood disorders, anxiety, and post-traumatic stress; and improving adherence to treatment.

The technological component was integral to the entire music therapy process and consisted of using sound and music technology in the therapeutic context. This meant incorporating musical sound technologies such as AUMI and other specialized software alongside acoustic instruments in therapeutic work. It also included design and production of musical material based specifically on patients' musical sound identities.

In summary, all three components of our framework were present throughout the therapeutic process. This allowed for a more integral view of patients and the understanding that all patients can improve through rehabilitation.

Music Therapy Interventions

Four music therapeutic interventions were used: (a) musical sound feedback, (b) rhythmic auditory stimulation (RAS), (c) patient's musical sound identity, and (d) skill training that prepared patients for ADLs.

First, we used musical sound feedback, a concept that emerged from our clinical practice in which we realized that physical movements trigger musical sound, resulting in a cyclic cause-and-effect phenomenon.

We realized AUMI was a music-sound input stimulus (cause) resulting in interactions and reactions produced in a patient's movements (effect). Alternatively, a patient's movement (cause), however tiny—from movement of a finger to the turn of a head and blink of the eyes—could produce in the AUMI (effect) a big, amazing sound. Working with patient's limited motor movements, AUMI's ability to translate the smallest movements into loud, clear sounds became an important element of patients' rehabilitation.

Second, we used RAS, the flagship technique of NMT's motor rehabilitation. RAS draws from the work of the Center for Biomedical Research in Music (Colorado State University), led by Dr. Gerald McIntosh, and the Robert F. Unkefer Academy for Neurologic Music Therapy (University of Toronto), led by Dr. Michael Thaut and Dr. Corene Hurt-Thaut. RAS research focuses on neuroscience of rhythm and musical cognition, formation within neurologic music therapy, and communitarian neurologic rehabilitation clinics. RAS is a method that uses the physiological effects of rhythm upon the motor system with the goal of increasing efficiency of movement pattern control during neurologic rehabilitation. In other words, RAS takes the steady rhythm or beat of music, like a metronome—tick, tock, tick, tock—to help patients regain motor control through a process called "entrainment." Entrainment is synchronization of a patient's auditory and motor cortex so a person starts to move to the rhythm of what they hear. A common use of entrainment is synchronizing music's rhythm to a person's steps to encourage an even gait.

Third, we used the patient's musical sound identity, a critical element of music therapy in Latin America. A patient's musical sound identity draws on the Benenzon theory of music therapy, which posits that each individual and group has a musical sound identity. The moment a person or group freely improvises within a space, a body-sound-musical association occurs that is nonverbal and relational (Benenzon, Wagner, and Hemsy de Gainza 1998). This intervention uses the iso principle to elevate patients' moods. The iso principle is a technique where music is matched to a person's current mood, then gradually altered to the desired mood state. In our practice we draw on musical sound identity in using receptive and active methods. The main activity of the receptive method is for patients to listen and interact with sounds and music that belong to their personal history. For instance, we may choose for AUMI to play sounds and music that a patient enjoyed hearing as a child. The active method includes musical improvisation with acoustic instruments

or AUMI to allow for patients' spontaneous, free, creative expression.

Fourth, we taught skills that prepared patients for daily living activities. To do this we drew on three theories within OT: the theory of flow (Mihaly Csikszentmihalyi), the theory of intrinsic motivation (Kenneth Thomas), and the model of human occupation (Gary Kielhofner). These theories helped shape our understanding of rehabilitation and guided our practice. Skills we taught included basic motor skills, such as range of movement, muscular strength, and hand-eye coordination. Patients also learned to improve their cognitive capacities to direct intention. Finally, patients increased their motivations to engage the task at hand.

Results

To explain the results of our therapeutic interventions we have provided two testimonial videos with several different clips of NMT sessions that highlight how AUMI was integral to our music therapy interventions. The first video, "Gross and Fine Motor Skills Retraining Using AUMI Interface" (https://doi.org/10.3998/mpub.11969438.cmp.50), focuses on the functional component by examining use of AUMI in helping patients develop fine and gross motor skills.

In the first part of this video, a patient practiced fine motor skills by rhythmically moving his head from side to side as a camera-based tracker triggered the playing of a musical scale from AUMI. In the second clip, a patient whose arm was strapped to a wheeled board was able to move the board to trigger AUMI as he rolled his hand back and forth. In these clips we see the use of musical sound feedback wherein the patient's small head and arm movements produce a big musical effect as it triggers AUMI.

The second half of the video shows patients practicing gross motor skills using AUMI. In one clip a patient swings his entire body from side to side in rhythm to trigger a jazz scale when AUMI tracks a point on the patient's forehead. In another, a patient moves his entire body up and down to create the sound of cymbals and drums, and in a third, a patient swings his arms or head to trigger musical phrases. In these examples, rhythmic auditory stimulation teaches patients to move in a steady pattern (left-right, left-right or up-down, up-down) as they trigger familiar rhythms such as evenly playing a jazz scale or the boom-tack, boom-tack of a drum set. The patients learn coordination as they synchronize motor movements with the music.

In fine and gross motor skill training, patients are trained in skills

necessary for activities of daily living (ADL). In improving fine motor skills, patients prepare for activities such as holding a spoon to eat, washing their hands, combing their hair, and tying their shoes. By developing gross motor skills, patients learn ambulatory skills. For instance, in the video of a patient learning to control his lower body and move his trunk up and down and swing left and right, the patient is acquiring skills that will eventually allow him to use a wheelchair independently.

The second video, "Musical Sound Identity, Musical Improvisations" (https://doi.org/10.3998/mpub.11969438.cmp.51) focuses on the psychosocial component by showing how AUMI is used to improve attention, develop positive relationships, and elevate moods using patients' past musical sound identity and improvisation. Clips show patients triggering music on AUMI that is familiar to them and engaging in music improvisation by playing AUMI while being accompanied by a music therapist playing percussion instruments or guitar. The clips show how patients are motivated to make progress and display elevated moods when using AUMI to make music. For instance, in the final clip, a patient smiles as he high fives the therapist at the end of a song.

Conclusion

Implementation of AUMI within the framework of clinical music therapy had a positive effect on patients' integral rehabilitation. Upon finalizing the project, our team observed positive results related to our functional component objectives. Regarding a male patient who had been diagnosed with incomplete quadriplegia and who attended twenty-four sessions, we observed a clear increase in control and range of voluntary movements in the left upper limb, improvement in execution of fine head and neck movements, as well as increased respiratory capacity. In six patients (five men, one woman) diagnosed with traumatic paraplegia, improvements were observed in dynamic control of the trunk, in increased sitting position tolerance, and in the strength of upper limbs.

We also saw improvements related to psychosocial component objectives. The therapeutic music process allowed patients to satisfy the need to remain integrated into the world, to maintain individuality, and to create a bridge of communication between themselves and their respective environments. The team also concluded there was an improvement in capacity for attention and concentration as well as in motivation and willingness to engage in new tasks and learning experiences. It also had a positive impact on relationships between patients and family mem-

bers, health team, and fellow patients, and on the strengthening of self-esteem, trust, and the capacity to create, express, and communicate. The health team concluded that implementation of AUMI into the clinical music therapy framework in this context has a positive effect on patients' integral rehabilitation process.

Acknowledgments

Notes

1. For more information about music therapy in neurologic rehabilitation, visit the Robert F. Unkefer Academy for Neurologic Music Therapy website: https://nmtacademy.co.

THIRTY-TWO | AUMI and Musical Empowerment
in a Pediatric Environment

JOHN MULCAHY

I am a board-certified music therapist (MT-BC) currently working at a pediatric hospital. Music therapists in medical settings help patients pursue individualized health goals such as building coping skills, decreasing pain symptoms, and promoting rehabilitation of cognitive/motor and communication skills (Standley and Whipple 2003). Across the range of patients with whom I work, AUMI has served as a versatile tool. AUMI's accessibility allows music therapists to offer individuals they work with opportunities to experience successful therapeutic outcomes (Dvorak and Boresow 2019).

Clinical Improvisation and AUMI

While I draw from various therapeutic approaches to meet individual patient needs, my training in Nordoff-Robbins music therapy (NRMT) remains an important influence. Also known as Creative Music Therapy, NRMT is a music-centered improvisational approach where active music making is the primary means of promoting the client's therapeutic growth[1] (Aigen 2005; Bruscia 1987). A fundamental aspect of NRMT is that the client's presenting symptoms or challenges are mirrored in their music making. The client's difficulty sustaining play at different dynamic levels or difficulty using their singing voice for self-expression do not necessarily indicate lack of musical talent but are often reflections of behavioral or personal challenges in their lives beyond therapy (Turry and Marcus 2003).

In NRMT, the music therapist seeks to create a unique therapeutic relationship with a client exclusively within music through the *clinical improvisation* process (Aigen 1996; Nordoff, Robbins, and Marcus 2007). Therapist and client are equal partners within this relationship and collaborate toward developing musical themes built over the course of therapy. The therapist improvises music (often on a harmonic instrument such as a piano or guitar) with and for the client to accompany, reflect, stimulate, or enhance the client's musical or nonmusical responses (Turry and Marcus 2003). The client plays a major role in determining the collaboration's direction. Musical material initiated by the client (who may participate through play on various instruments, singing/voice, or movement) can form the basis for musical themes for which the therapist provides musical structure and reflection (Turry and Marcus 2003). The client's progress is assessed by the quality of their music making and musical interaction with the therapist (Aigen 1996). The therapist promotes the client's expanded range of expression and independence (Turry and Marcus 2003).

While improvising with patients, my goal is to encourage and build upon their responses, no matter how small. To give a hypothetical example, while working with an adolescent patient admitted for rehabilitation for traumatic brain injury, a potential therapy goal would be to promote the patient's strength and range of motion of his upper extremities. Early in rehabilitation the patient may only be able to lift their arm a fraction of an inch to activate an instrument. This can be challenging for the patient, who may express frustration and discouragement. In this case, I may improvise music emphasizing the importance of patient-initiated music, creating a complementary musical phrase or series of phrases that would be incomplete without the patient's further participation. The patient may observe how their response is significant and meaningful within the musical conversation and feel encouraged toward further engagement through my playful introduction of tempo and timbre changes. I would then work toward gradually increasing the frequency of the patient's initiation of musical play and functional movement.

AUMI easily integrates into this context by producing sounds using the smallest possible movement. In many scenarios, I have observed patients with significant cognitive or physical impairment use AUMI to initiate music in a meaningful manner. AUMI provides immediate auditory feedback, which allows patients to experience success and creative expression to which they previously had little access. They can also receive visual feedback via watching the optional cursor highlighting

areas on the screen coordinated with triggered pitches or sounds. This can promote greater body awareness by having a reliable visual target to coordinate movement.

AUMI and Patients with Developmental Disabilities

I have found AUMI particularly useful while working with patients diagnosed with developmental disabilities. These patients face unique challenges in medical settings, such as difficulty communicating needs, fear of interacting with unfamiliar staff, increased levels of anxiety, and hypersensitivity to sensory stimuli (Johnson and Rodriguez 2013; Nunez 2018). They experience more frequent hospital admissions and higher injury risk than typically developing children (Muskat et al. 2015). I have also observed how some patients' existing challenges may further amplify issues such as limitations on caregiver availability and extended hospital admissions. The following clinical vignettes illustrate how I have used AUMI to help people with developmental disabilities.

AUMI and Supporting Individual Patients: Kelly's Story

Kelly is an eight-year-old girl diagnosed with spastic cerebral palsy admitted to the rehabilitation unit. Kelly has been a patient at the hospital for repeated admissions due to feeding difficulties and self-injurious behaviors requiring frequent use of physical restraints on her arms and being constrained in bed to prevent falls. I received a physician consultation to work with Kelly to support rehabilitation goals such as cognitive motor and communication skills as well as supporting relaxation due to Kelly's more frequent agitation behavior during her current admission. Kelly displayed a highly positive response to music, smiling and enthusiastically initiating movements as I played and sang her preferred music. Along with supporting her rehabilitation goals, I wanted to bring Kelly musical experiences that would allow her to experience autonomy and control as cocreator of the music. I believed that experiencing agency in controlling the AUMI musical experience would let Kelly feel a deeper sense of connection with me as well as change her own awareness of her abilities.

I have primarily used AUMI on an iPad due to ease of movement and positioning in crowded hospital environments. I introduced AUMI to Kelly using a wide rectangular grid setting to accommodate her repetitive head/body movement. I placed the iPad screen in front of

Kelly using an E major pentatonic scale and a soft bowed-string sound setting to establish an open, inviting musical space to orient Kelly into musical engagement. Kelly gradually slowed her head movement as she listened to AUMI track her movement along with a corresponding repeated step-wise pentatonic melody. Kelly appeared to repeat this behavior several times as her facial affect changed to a more curious, anticipatory expression. I joined Kelly in music making by singing a simple two-note root-fifth bass line in an echoing rubato manner. Kelly appeared to enjoy this interaction, smiling and initiating single-tone vocalizations while I continued to respond with "answers" to her musical "questions." This moment was clinically significant not just for the quality of our vocal interaction but also due to Kelly providing the majority of harmonic accompaniment using AUMI. By being offered a larger role in the musical conversation, Kelly displayed a noticeable shift in affect, sustained attention, and quality of music making, indicating there was also a shift in her self-perception. When I switched the AUMI to a more percussive piano sound in the A minor key, Kelly's vocalizations assumed a more forceful and purposeful quality while displaying a wider pitch range. Kelly oriented her gaze and activation of AUMI toward the lower register of available pitches, initiating a repeated series of musical phrases of roughly two to three pitches at a time. I observed how Kelly appeared to return to specific pitches in an intentional manner. Throughout Kelly's interactions with AUMI, she made progress toward her rehabilitation goals.

I have observed varied individual creative expression while using AUMI with patients. Some, like Kelly, appeared to enjoy learning to isolate specific pitches. In this manner, AUMI functions as an alternative to an instrument such as keyboard or guitar on which it may prove difficult for patients to independently obtain a satisfying sound. I have also observed how AUMI is a catalyst for supporting a patient's inclusion in music making with caregivers and peers.

AUMI and Supporting Inclusion in Group Music Making: Jack's Story

Jack is an eighteen-year-old man with multiple developmental delays and history of chronic heart disease originally admitted to the pediatric intensive care unit (PICU) due to acute respiratory failure. Before admission, Jack used a wheelchair, had hearing impairment in both ears requiring hearing aids, and communicated through gesturing and sign language. Jack's most recent illness resulted in Jack experiencing

additional difficulties such as acute paralysis of all extremities except for limited control of his head and neck, dependence on ventilator support for breathing, and unpredictable perseverative head movements. Although his condition improved, Jack continued experiencing challenges on being transferred to the general medical unit. Jack's mother and uncle are his primary caregivers and frequently visited Jack in PICU. Time constraints due to both caregivers returning to work left Jack alone for long periods. Jack's uncle shared how he has frequently engaged Jack in music through playing recordings of his favorite songs as well as songs written for Jack by musicians from his community. As I observed how Jack frequently engaged in music primarily as a spectator, I wanted to support Jack's role as an active participant in music making with family and peers.

In a session with Jack's mother and uncle, I engaged Jack's caregivers in collaborative instrumental play on ukulele and percussion along with Jack on AUMI to support family coping and promote collaborative engagement. By positioning an iPad operating AUMI on a tray on Jack's wheelchair, I provided accompaniment on guitar to support the group's music making while Jack played music alongside his mother and uncle. I introduced singing an improvised blues song in A major. As I sang lyrics narrating our current activity ("We're here playing music with Jack today . . ."), Jack's uncle joined me in singing along, initiating singing additional lyrics such as "We're here playing for Jack!" I then introduced stop-time musical phrases to allow each member to solo. I prompted Jack by singing "Listen to Jack play!" Playing AUMI with an A blues scale, Jack enthusiastically initiated back and forth head movement to trigger musical phrases while displaying a wide, beaming smile. Jack's mother and uncle encouraged Jack's activity by responding with singing "Go Jack, go!" I further supported this interaction through introduction of brief "rapid fire" alternating turns. This way of relating between Jack and his caregivers continued throughout the session and subsequent "family jam sessions."

In another scenario involving a dyad session with Jack and his roommate, who did not have significant physical limitations, I engaged Jack in assisted play using AUMI while his roommate supported him by playing a steady beat on a hand drum. Upon completion, I engaged Jack and his roommate in collaborative musical turn-taking activities using AUMI. Using hand-over-hand support to assist Jack in holding the iPad, Jack's roommate initiated a series of playful improvised dance movements coordinated with the screen's grid setting. I then offered Jack's

roommate an opportunity to hold the iPad so that Jack could also play. Throughout this interaction, Jack displayed a bright, smiling affect and enthusiastic activation of AUMI. He and his peer shared the moment's spontaneity and fun. This interaction became increasingly more humorous as we switched to "sound effects" settings on AUMI such as dog and cat sounds.

Conclusion

AUMI remains significant to my clinical work as a tool for facilitating creative expression, supporting functional outcomes, and eliminating physical barriers to inclusion and musical participation. I continue exploring different ways to use AUMI for helping patients, a process that has expanded my creative growth as a clinician due to AUMI's flexibility and ease. Indeed, as more music therapists explore its use in different clinical contexts (Dvorak and Boresow 2019), I am hopeful and eager to learn more about AUMI's potential to allow individuals with diverse needs to use its technology to connect meaningfully with others in music.

Note

1. The term "client" refers to the individual receiving music therapy services. In this chapter, the term "patients" refers to clients in the author's current hospital setting.

Section V

Dreaming AUMI Futures

> Bruce Duffie: [With a gentle nudge] You're not suggesting that we
> lose the past, are you???
> Pauline Oliveros: No! But why do we have to do it so much?!!
>
> Pauline Oliveros and Bruce Duffie, 2012[1]

What is the future of AUMI? How does AUMI improvisation help us to imagine and enact more inclusive futures? This book began with dreams. And it ends with dreams.

First, we travel with Julie Unruh's poem about the familiar landscape becoming surreal on the way to performing in IONE's 24th Annual Dream Festival in 2018. Visit the link, and experience the performance, as improvisers in Kansas played AUMI and other instruments (flute, cello, and voice) for Dream Festival participants in New York. The featured sounds included Oliver Hall's respatialized recordings of sonified planets from NASA.

IONE meditates on Pauline's futurism, of AUMI on the moon, and AUMI as reaching beyond; a way to connect embodied experiences of past and present with creating of new futures. Sharing conversations, writings, and dreams, IONE guides us to consider her creative and life partner's thoughts on technology, listening, and inclusivity, in order to consider the "future for AUMI that Pauline might imagine."

Note

1. "Composer Pauline Oliveros, a Conversation with Bruce Duffie." Evanston, IL, 2012, http://www.bruceduffie.com/oliveros.html.

THIRTY-THREE | Dream Music

JULIE UNRUH

Driving on many roads,
by the ancient dark buildings
lit up stop signs
and wet fountains.
Chapel bells ring as we turn away from the
Brightly lit coffee shop to
the theater building to perform
with the sounds of Neptune.
The blind photographer,
flute players,
a woman who sings opera to the
sound of the singing bowl.
Poetry is read over the sound of the waves
from Pluto
accompanied by a cello.

*Driving to the theater to be part of playing the sounds of the planet, notic-ing the most trivial things, everything became surreal to me. I write poems of what I see, but I wish I could write what I hear. (*https://doi.org/10.3998/mpub.11969438.cmp.52*).*

| Dreaming AUMI's Future

I O N E

> I feel myself existing as an atom of world culture.
> I bond and break apart with other atoms to form
> molecules, entities and ever-changing networks in the
> world of my work. I seek to understand the mysterious
> chemistry of life as it is probed by quantum mechanics.
>
> —Pauline Oliveros, "The Quantum Avant-Garde"

When Pauline left her physical body, peacefully but unexpectedly on Thanksgiving morning 2016, there were shock waves around the globe. There was "trending" on Twitter as the hard news spread and dismay throughout our international community.

For me, the home we made together was and is "ground zero" for these shock waves. As I write this, however, it occurs to me that it could be valuable to consider moving away from an image of tragedy to a metaphor of another kind. We could go green, for example, and consider the growth rings of trees, as we travel from a rich and mysterious epicenter into a future toward—or perhaps with—Pauline.

"Still Listening" had been Pauline's chosen motto for her eightieth birthday celebrations and festivities facilitated by our organization Deep Listening Institute, Ltd., and there was a special concert including Jonas Braasch's newly completed Fort Worden Cistern Simulation at EMPAC. An astounding eighty-candle cake was lovingly served up afterward in the café.

Still Listening was chosen as the title of the seminal exhibition of works created in honor of Pauline at McGill University. It was lovingly curated by Professors Eric Lewis and Ellen Waterman, who had planned a wonderful surprise exhibition for Pauline's eighty-fifth birthday. A call

had gone out to the community of composers and musicians, students and colleagues.

Eric Lewis and Ellen Waterman described it this way:

"[W]e should do something big to celebrate Pauline's 85th birthday on May 30, 2017. It should be as diverse, creative and inclusive as Pauline and it should be a surprise. She had touched the lives of so many creative people! Why not ask 85 composers to write 85 pieces to be performed in 85 seconds each to celebrate her 85th birthday?"[1]

But by the time Pauline's next birthday came around, the event was revisioned as a tribute or memorial in honor of Pauline.

Did Pauline know or suspect that this big surprise had been in the works for many months? Several have asked. I would have to answer, "Yes," in the sense of her own philosophies, particularly that of "Quantum Listening" and "Yes" to the concept that she is listening still.

It was in January 2000 that Pauline was invited to Hong Kong, where she gave her paper "Quantum Listening; From Practice to Theory (to Practice Practice)" as the keynote address at the International Congress on Culture and Humanity in the New Millennium: The Future of Human Values—Chinese University.

"Quantum Listening is listening to more than one reality simultaneously," she explained.

Pauline further describes a Quantum level of listening using the terminology "The Listening Effect."

"As you listen, the particles of sound decide to be heard. Listening affects what is sounding. The relationship is symbiotic. As you listen, the environment is enlivened" (Oliveros 2005, 40).

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Dreams of Pauline

In the days following that Thanksgiving morning in 2016, I could feel the grieving of so many in the world. All of Pauline's students and colleagues, all of her fans. I could feel their sense of enormous loss of Pauline. How could we find her again? The following week a double rainbow appeared above the Rondout Creek in our town of Kingston, New York. (Among many Buddhists, this is an auspicious sign of a great spiritual being's enlightened transition.) I felt there could be a way.

Listening Practice, Dream Awareness, and Movement are the three basic modalities in the ongoing study of Deep Listening® developed on Rose Mountain Retreat Center in New Mexico by Pauline, Heloise Gold, and myself and continued via Deep Listening Certificate programs through the Center For Deep Listening at Rensselaer.

An environment of "twenty-four-hour listening" evolved during the twenty-seven years of retreats at Rose Mountain and internationally, as we practiced awareness of dreams of the night as well as the dreams of the day. Among the rock formations and shimmering aspen groves of Rose Mountain, Pauline's understanding of "Deep Listening" became ever more profound, and all of our dreams flourished. In 2001, Heloise had shared a memorable dream communication from Pauline:

Dear Pauline:

I had two great dreams about you while I was in New Mexico. In the first one you were talking about what you were sure would happen when you die. You somehow were indicating that this is info for everyone; that everyone experiences this whether they are aware of it or not.

You said that at the moment of death we hear every single sound in the universe—first each one separately—one after another, then we hear one single sound that is the combo of all sounds. You said it is The Most Extraordinary Sound. As you described it I said that I understood what you were saying and that I was able to visually see the sound! The dream had a very beautiful luminous feel to it!

The next night, I dreamt that your left ear started growing right before our eyes (we were leading a Deep Listening Workshop). We knew it was growing because your hair above your ear was moving. Your ear kept getting more and more gigantic and then everyone realized that you had a Trick Ear and it was a teaching device to demonstrate Deep Listening!

(IONE 2005, 22–23)

And so, in the winter of 2016, in my role of "Dream Keeper," inhabiting the numinous aspect of our Deep Listening teachings, I sent out a call to the community for "Dreams of Pauline."

A sampling from the ensuing collection shows her willing to join us in this new dimension, still outrageous, still challenging, still playful, still teaching, and, of course, still listening:

D.o.P

Dream One:

For a week now I have been in retreat, with very little email access, but today I need to write to you. Last night I didn't sleep most of the night and had to be up at 5:30 am. Even though I was frustrated about my insomnia, I had an incredible dream visit with Pauline in the morning.

The dream started with the sound of us giggling. We were sitting together at the corner of a table, facing each other and making super silly noises . . . we were fluttering our lips, making gorilla sounds, fart sounds, and giggling, and giggling and giggling. Pauline was wearing a brown leather bomber jacket. She reached across her chest to a pocket and then handed me a brown leather button.

When she put it in my hand I curled my fingers around the button and then I woke up! That was a very powerful dream! During meditation today I realized I had tears on my cheeks, as the power of the Pauline dream flowed into me.

The button! . . . such an important fastener, connector, a little object but one that is key.

—Tomie Hahn

Dream Two:

Her presence is felt, not seen in my dream. This presence is smiling, gently, softly, and feels like a support, somewhere between a pillow and a pillar. Her presence feels like a soft cloud.

—Jane Rigler

Dream Three:

sitting enjoying the sun sparkles on a morning pond, Pauline spoke to me from behind the image: seeing is from the distant sun. to connect with life, close your eyes. i knew then that light is vast, constant, indifferent; and sound is local, immersing me in the energy of a million moving Living bodies with and all around me.

—Keith Lay

Dream Four:

We were in a kind of cave with walls of molded stone. It was enormous, maybe endless. We kept curving around due to the shape of the cave. It was a warm, lit up and friendly cave, not cold, dark or

dank. Wait a minute, PO said, This is eerie. I looked at her puzzled and saw the twinkle in her eye that seemed to shout PUN! Ear-y, she had meant. That is when I saw it. We were looking for something in a huge, perhaps infinite *Ear*!

Of course. How silly it seemed to be looking for something inside a big ear. Shouldn't we be listening? This is as close as I can get to what I somehow saw or heard or felt in that twinkle, looking for something, wandering around. IONE was present looking very regal. Pauline was her usual, playful self—and serious fun was afoot.

The source of all true listening, seeing, feeling, touching, tasting, smelling, knowing is the heart. It is both the receiver and the creator of perception of all categories. IONE started to do a swaying dance with elegant turns and twirls. She was mimicking the spirals of the ear. Then as I had heard her so often do in the past, she started reciting the Heart Sutra . . . Gate Gate parasamgate *parasam* gate bodhi svaha . . . etc.

PO said in her plain and matter of fact way: We are in the Heart where the Ear lives . . .

Then I heard/saw the sounds of twittering song birds in high treetops zipping from tree to tree and branch to branch leaving unbelievably beautiful trails of colors and I woke up weeping from the beauty.

—Abbie Conant

Dream Five:

A group of monks, including me, were to tour around and we are to tell people of Pauline's passing, or not tell them, transmit or teach something. Then we learned that she hadn't died or we hadn't a need to do it. It made sense in the dream. We were the communication system. No electronics.

—Michele Lunt

Dream Six:

Pauline's face was the Moon, a very close Moon.

—Keith Lay

Dream Seven:

The most beautiful search adventure with Pauline

I am part of a group of people searching for something or some-one. We are about 10 people. Pauline is part of the group. We go quietly at night in a forest. I feel that as we are advancing step by step, some people are dropping, giving up this mission. I wonder if I will be one of them, as I have always been slow and somehow weak for physi-cal work, or nervous passing trunks, climbing, etc. So I follow them but I fear they will be faster than me and I get lost. I start to scream "Dónde están? Where are you?"

I see people in a small river in the night, with water up to their knees. Pauline and others are there. I am seeing through space as I am not with them. Pauline sees me through space, and hears me. So she comes closer to me, and she shows me an acoustic tip to find them, a bit like echo-location. It seems they can hear me. When I scream, the sound bounces in spaces (I can listen to it in the dream!!!!), Pauline asks me where the echo is coming from. She shows me her left hand, and says that I should focus, when screaming, on the middle of the fourth and fifth finger, so I can locate where I am acoustically and where I am being heard. I can hear the source of the sound and the echo in the same space though. But with her technique I could locate myself and the others better through acoustics.

I treasure this beautiful dream!

—Ximena Alarcon

Dreams of Pauline, November 2016

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AUMI to the Moon

AUMI is a means for people of all levels of physical and intellectual abili-ties to "listen to their own listening," to improvise and to bring their own sounds to the listening universe. It's about Community, Pauline might say, and this community building is expansive as well as inclusive as it stretches many boundaries.

In his article "Listening Changing Itself: A Future for Pauline Oliveros" (2017), Ed McKoen, a UK-based music producer, researcher, and writer, suggests, "Pauline's practice of listening through technology concerns the future of listening *and the future as such*, as a practice of transformation."

In Athens during 2017's documenta 14, Ed suggested a new kind of performance that we would both undertake. He had never done such a

thing and we had never performed together. As photos of Pauline played behind us, Ed read his paper, while simultaneously I moved through the audience, listening for cues that would cause me to make sounds or words while performing Pauline's piece *Song for Margrit*. Linear and non-linear were engaged in this as well as during a subsequent performance later in the year at Leeds College. The audiences were placed in a position where they *had* to listen to their listening in order to take it in. We could both hear Pauline chuckling in approval.

McKoen also reminds us that Pauline frequently presciently envisioned the time beyond her life span. She was thinking of us early on, a futurist, folding the future into the mix for us.

Again and again, she addresses the listening to come, not only in the future as such, but specifically in a future *after she has passed*. Her earliest collection of prose writings, published in 1984 as *Software for People*, begins with this epigraph:

> With Gratitude
> to those who came before me
> to those who are with me and
> to those who will come after me (Oliveros 1984, front matter).

Did Pauline envision that one day, AUMI's sounds would be so "far out" they would go to the moon? We always spoke of doing her literally "out of this world" historic piece, *Echoes from the Moon* again. *Echoes from the Moon* had four presentations between 1987 and 1999. In these pieces Pauline was able to send sound to the moon and to listen and play with the hissing galactic space sounds mixed into the echo that returned two and a half seconds later. Musician and engineer Scot Gresham-Lancaster supported her throughout her planning, locating the first ham radio operators and helping determine the technology necessary to perform *Echoes from the Moon*. In 1987 she performed with ham radio operator Dave Olean in New Lebanon, Maine. In 1996, with Scot's engineering, she created "Echoes" for a large audience in Heywood, California. In 1999 "Echoes from the Moon" was presented at the "Brunnenhof" Hofe Fest in St. Polten, Austria, with sound artist Andres Bossard's sound design. In this presentation, which included a festive marching band and many players, including Pauline, I moved through the audience, inviting them to send their voices to the moon prior to the performance. I sent out and received a version back of my lunar invocation *Lune, Luna, Mond*

composed for the occasion. Later that year, Pauline performed powerfully with the lunar echo in the Salzburg Festival's amphitheater.

I was delighted to receive an invitation from media artist and licensed radio operator Daniela De Paulis, whose Optics/Astronomers Without Boundaries coalition embraces new technology and sends both sound and visuals to the moon with some regularity.

She was well aware of Pauline's pioneering work and wanted to present new performances as a tribute.

The July 2019 telematic performance included Pauline's solo accordion music, my own original Moon Invocation, and Lisa Barnard Kelley playing Pauline's Conch. AUMI codeveloper Leaf Miller and Lisa performed with AUMI from Leaf's studio, Andrea Goodman contributed vocals from Maine, and composer Oliver A. Hall of the AUMI Dream Ensemble in Lawrence, Kansas, contributed his music.

Daniela describes the event this way:

> During our performance of *OPTICKS/Echoes from the Moon*, we reflected Pauline Oliveros' sound off the surface of the Moon, while a global audience experienced the online event as part of Global Astronomy Month 2019. Connected from different locations on Earth, voice and sound performers connected to the Deep Listening community, interacted with Pauline's music in real time, re-staging some pivotal moments of *Echoes from the Moon*.

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AUMI continues to expand in time/space as more and more individuals and groups explore its musical parameters. Professor Sherrie Tucker and the ever-growing, enthusiastic AUMI ensemble in Lawrence, Kansas, have found new sonic "grooves." They have joined in with my annual international celebrations of dreams called Dream Festivals in telematic performances that offer new ways of performing, listening, and dreaming.

The Dream In/Dream Out Concert in December of 2018 was a durational overnight event beginning at 7 p.m. Saturday, December 8, and concluding at dawn Sunday, December 9. The event featured AUMI, for overnight listening and dreaming, and Dreaming in Your Own Bed, Telematic Transmission from the AUMI Dream Ensemble of Kansas (AUMI-KU InterArts, Lawrence Public Library AUMI jams, and students from Sherrie Tucker's "Music, Culture, Power" seminar at the University

of Kansas), and Alan Courtis from Buenos Aires. (See Uhruh, chapter 33, and https://doi.org/10.3998/mpub.11969438.cmp.52). Participating artists live from Craive Lab in Troy, New York, included Anne Bourne, IONE, Jonas Braasch; with Fort Worden Cistern Simulation, Tomie Hahn, Lisa Barnard Kelley, Norman Lowrey, and Tuku.

Sherrie shares one of her dreams in which she is playing with AUMI.

"Stretching Out with the Combo"

The combo is set up at the side of the floor space (like at a tap jam session); a couple horns and a bass, no drums, no piano. In the middle of the floor is an arrangement of iPads on mic stands. The AUMI improviser is to move among these, triggering a variety of sounds and the band supports that player. A succession of AUMI improvisers get up, one at a time, and their movements make these like sort of swirling wind chime sounds. When it is my turn, somehow I happen upon an iPad with a drum setting on the AUMI, and the combo and I fall into a kind of groove. Then all the iPads suddenly have the sounds of assorted parts of a typical jazz drum kit. I am so happy, dancing and playing the drums with the jazz combo. What is different between this sound and a typical combo is that the AUMI tempo is not exact, but the band follows me so well that there is this amazing elongation of drum patterns that would normally be steady, fast, and driving. The band follows me and the feeling and sound is magical. We sound like a jazz combo only stretched out!

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As a composer and improviser with such a profound interest in the ways technology can not only interface with, but enhance human experience, and with her abiding interest in interdimensional and extraterrestrial investigations, Pauline might imagine a future for AUMI that would seem considerably different from today. ("Keep evolving it!")

Yet on close examination, I'm certain we would find a continuation of Pauline's ideas and dreams for humanity manifested through AUMI.

Pauline considered her performance tool, the Expanded Instrument System, as a "Time Machine."

Might AUMI's interface also dabble in intelligent "machine mind" delays and layers as EIS does?

Might thought waves soon manipulate the mechanisms of sound and images? Might screens no longer be bound to concrete manifestations, but float in air around the users? Will AUMI develop for those without

hearing? For those without sight? Might AUMI develop a holographic interface? Touch and scent are already possibilities; might they easily manifest? In line with the Singularity, might AUMI become a (hopefully comfortable) part of the physical body?

Pauline describes Deep Listening® as:

> listening to my listening and discerning the effects on my body mind continuum, from listening to others, to art and to life. . . . It is a determination and commitment to reconcile and resolve conflicts. (Oliveros 2005, xxiii–xxiv). Pauline's visionary dream on Rose Mountain in 2005 expresses a lifelong underlying concern: "I see a woman in white on a mountain peak releasing white doves to fly over the world for peace."

Certainly, Pauline's future for AUMI points the way for us all to find a constantly renewing sonic harmony of being.

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Dream Eight:

   With a large group of people at night. Walking quietly through the trees in the dark. I become fearful and separated from the group. At night lost in the dark jungle, Pauline finds me over distance. I do not see her, but she shows me how to locate where I am through echo acoustics.

   —Dreams of Pauline, November 2016

END

Note

   1. "Still Listening: New Works in Honour of Pauline Oliveros," 2017, McGill University. http://stilllisteningoliveros.com/, accessed May 3, 2021.

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Sergio Hazard is a teacher, music therapist, biodynamic craniosacral therapist, and director of the Biosintonización Project in Santiago, Chile, where his focus is on developing programs for personal and community well-being and health and personal development and neurorehabilitation in children, youth, and adults.

Michelle Heffner Hayes holds a PhD in critical dance studies from UC-Riverside. She is a professor of theatre and dance at the University of Kansas, where she teaches flamenco, contemporary dance, qigong, improvisation, choreography, critical dance studies, and career preparation in the arts. Hayes has a wide-ranging career as a choreographer and dancer. Her many publications include *Flamenco: Conflicting Histories of the Dance* (2009), and "Grafting and Other Ramifications: Improvisation Across American Studies and Dance," coauthored with Sherrie Tucker, *Critical Studies in Improvisation*, 2020.

Nicole Hodges Persley is associate professor of American studies and African American studies, vice provost for Diversity, Equity, Inclusion and Belonging at University of Kansas, and artistic director of KC Melting Pot Theater in Kansas City. Her specializations include hip-hop studies, acting and directing, and African American performance. An actress and director (SAG/AFTRA/SDC), her credits include theater, television, and film. She is the author of *Sampling and Remixing Blackness in Hip-Hop Theater and Performance* (University of Michigan Press, 2021) and coauthor, with Monica White Ndounou, of *Breaking it Down: Audition Techniques for Actors of the Global Majority* (Rowman and Littlefield, 2021).

Jessie Huggett is a dancer, visual artist, advocate, and public speaker from Ottawa, Ontario, Canada. For more than fourteen years, she has been a member of Propeller Dance, one of Canada's foremost integrated contemporary dance companies. Recently, she received professional development grants from the Ontario Arts Council and the City of Ottawa. In 2005, Jessie was given the Jane Cameron Award for an artist with Down syndrome.

Jennifer Hurst holds a PhD in social and cultural studies in education at the University of Kansas. Jennifer became involved with the AUMI in 2018. Jennifer's research examines changes in the Black teacher labor market since *Brown v. Board of Education.*

IONE is an author/playwright/director whose numerous publications include *Pride of Family: Four Generations of American Women of Color* and *Listening in Dreams.* With Pauline Oliveros, her creative collaborator and spouse, she created *Njinga the Queen King, Io and Her and the Trouble with Him, The Lunar Opera: Deep Listening For_tunes,* and *The Nubian Word for Flowers, A Phantom Opera.* IONE is the former artistic director of Deep Listening Institute, Ltd. and founding director of the Ministry of Maåt, Inc. a not-for-profit organization emphasizing women's spiritual and educational well-being (ionedreams.us).

David Knott, MM, MT-BC, is a board-certified music therapist, fellow in the Academy of Neurologic Music Therapy, and improviser and composer living and working in Seattle. Since 2002 he has worked as a music therapist at Seattle Children's Hospital. He is especially interested in using improvisation to engage and facilitate therapeutic change in critically ill children, and regularly introduces AUMI to patients and families.

Caleb Lázaro-Moreno (See Elem) is a Peruvian American artist-scholar, music composer, and multi-instrumentalist. As PhD candidate in American studies, University of Kansas, Lázaro-Moreno studies how stories are shared, how dreams inform our sense of what's real, and how we might dream up states of embodiment and communication that are creatively decolonial, nonauthoritarian, and postexpertise. Their work on AUMI appears in *Sounding Out!* (2017).

Carrie Lennard has taught in special schools for more than forty years and worked in educational publishing for nine years. Her greatest joy is finding musical pathways in creativity and communication with her students who have severe, profound, and complex learning needs, encouraging them to play, explore, and discover, giving everyone time and opportunity to process ideas in their own individual way.

Grace Shih-en Leu is a high school teacher and doctoral candidate at the University of Kansas. Her academic interests include exploring ways to teach literacy, redefining student identities, and inclusivity in class-

rooms. Outside of school and work she lives a seminomadic life with her Honda Element, thriving on the unusual experiences and opportunities this affords.

Eric Lewis is a professor of philosophy at McGill University and active improviser on brass and electronics, whose research centers on the philosophy of improvisatory arts. His most recent book is *Intents and Purposes: Philosophy and the Aesthetics of Improvisation.* His public-facing work includes working with AUMI in the Montreal school system, directing the Laboratory of Urban Culture, and serving as president of the NFP AIM (Arts in the Margins).

George Lipsitz is research professor emeritus of Black studies and sociology at the University of California, Santa Barbara. His books include *The Possessive Investment in Whiteness, How Racism Takes Place,* and *Footsteps in the Dark.*

Jack Hui Litster is a Canadian musician, composer, producer, and educator. His compositions and recordings in various musical genres have been featured in concert, opera, theater, dance performances, film, video, and podcasts. In 2022 Jack completed his master of arts degree in music and culture at Carleton University, where his thesis explored intercultural composition in Tan Dun's score for the film *Crouching Tiger, Hidden Dragon.*

Henry Lowengard is an experimental composer, musician, computer programmer/developer, and designer of internet applications and online media since the beginnings of the publicly accessible internet in 1991. Among his creations are the iOS apps SrutiBox, Droneo, Enumero, Yes Session, synthicity itself, and many more; explore: (http://www.jhhl.net/iPhone/). He worked closely with Pauline Oliveros to create AUMI for iOS, and he plays live music as well as the electronic stuff.

Alex Lubet is a composer, multi-instrumentalist, and researcher and holds the Morse Alumni/Graduate & Professional Distinguished Teaching Professor of Music at University of Minnesota. As a scholar, Lubet is a founding leader of the field of disability studies in music. His writings include the book *Music, Disability, and Society,* and dozens of chapters and articles on disability issues within and beyond music.

James Maxson, MM, MT-BC, LCAT, has worked at the Elizabeth Seton Pediatric Center since 2009, where he has developed uses of technology to increase the residents' freedom of improvisation, expression, and care. He has collaborated with students and instructors at the NYU Tisch School of the Arts and Sarah Lawrence College to create adapted technology and has cohosted workshops with DIYAbility to teach colleagues the fundamentals of adapting toys to be used by individuals with various special needs.

Leaf Miller is a musician, composer, occupational therapist, teacher, instrument builder, and Jewish lesbian feminist, performing on drums/percussion in African and Afro-Brazilian traditions for more than forty years. A primary collaborator with Pauline Oliveros on the AUMI Project, Leaf piloted the prototype in her drum class in 2007. With her students, she created the "Play the Drum Band," an all-abilities performance group. She leads AUMI trainings, workshops and Soundlabs, nationally and internationally, celebrating inclusive musical expression and improvisation.

Ray Mizumura-Pence is associate teaching professor of American studies at the University of Kansas. He has participated in AUMI-KU InterArts since 2011. His publications appear in *Review of Disability Studies: An International Journal, American Quarterly*, and *American Studies*. Ray currently focuses on veterans with disabilities, the impact of multiple sclerosis on the late Richard Pryor, and oral histories by disabled people in Kansas.

John Mulcahy is a board-licensed and Nordoff-Robbins certified music therapist currently working with the pediatric population in medical and rehabilitation settings. Over the past ten years, he has developed and grown a private practice specializing in providing music instruction to individuals with developmental disorders such as autism spectrum disorders and ADHD.

Deborah A. Nelson has a bachelor's of music education from Florida State University, has a master's in special education with endorsements for gifted students and students with severe or profound disabilities, and holds certificates in autism movement therapy, drum therapy, and Orff Levels One and Two. She teaches music at a school for K-Transition students with severe cognitive and physical disabilities. Among her many national awards, she is most proud of winning Palm Beach County

School District's First Place for Innovative Educator (2014) for use of technology in teaching.

Nicola Oddy is a music therapist (MTA), workshop leader, and vocal improviser. She completed her PhD in cultural mediations at Carleton University exploring singing as a listening practice through singing in situ to learn about self and place. She teaches at Carleton and Concordia Universities. Her work appears in *Voicework in Music Therapy: Research and Practice* (2011), *Canadian Journal of Music Therapy* and *Voices: A World Forum for Music Therapy.*

Matt Robidoux is an Oakland-based composer, improviser, and community organizer interested in accessibility within contemporary music and the healing potentials of improvisation. In 2017, he established the Mills AIE (Adaptive Instrument Ensemble), a community-based group committed to expanding the improvising community (across abilities, demographics, geographies) and exploring embodied modalities of music making. He has published on improvisation and inclusion in *Contemporary Music Review.*

The St. John's Vocal Exploration Choir meets each month in the MMaP Gallery at the Arts and Culture Centre, St. John's. No previous vocal experience is necessary, just a willingness to use your voice and to respect that all vocal sound is meaningful and valuable. Their mission is to encourage exploration of your voice within the context of a group using conduction for emergent composition as well as free and scored improvisation. http://facebook.com/stjohnsvocalexploration.

Nancy Sholin Patterson has a master's in special education from California State University and certification for working with students with severe or profound disabilities. She is currently a teacher of students with severe physical and cognitive challenges. Nancy taught for years for the Los Angeles County Office of Education and was director of a Very Special Arts program that implemented music and technology in presentations throughout Los Angeles County.

Gillian Siddall is the president and vice-chancellor of Lakehead University, Thunder Bay, Ontario. Her research area is Canadian literature, with a focus on musical improvisation, within and outside literary contexts.

Among her publications are *Negotiated Moments: Improvisation, Sound, and Subjectivity* (Duke 2016), coedited with Ellen Waterman; "A Musical Interface for People with Severe Physical Disabilities," *Music and Medicine* (2011), coauthored with Pauline Oliveros, Leaf Miller, Jaclyn Heyen, and Sergio Hazard. Siddall is a jazz vocalist, choral singer, and cofounder of the Guelph Jazz Festival.

Jesse Stewart is a composer, percussionist, artist, and writer, as well as a professor of music in Carleton University's School for Studies in Art and Culture. His writing has appeared in *American Music, Black Music Research Journal, Contemporary Music Review*, and many edited volumes. His numerous awards include a Juno Award (2012) for Stretch Orchestra's self-titled debut album, a D2L Innovation Award in Teaching and Learning, and the Order of Ottawa. He is the founder of We Are All Musicians (WAAM), an organization devoted to inclusive, accessible music making.

John Sullivan is a designer, digital luthier, and musician whose work focuses on human-computer interaction, music and movement research, and human-centered design. Sullivan is currently a postdoctoral fellow at Université Paris-Saclay, where he develops technology for dance and interactive media performers.

Clara Tomaz is an Italian American artist based in Chicago. She worked as a linguist and ESL teacher until tongue cancer treatments left her speech-impaired in 2007. As an MFA student of Pauline Oliveros's at Rensselaer Polytechnic Institute (2009–2011), she performed with Stretched Boundaries, an ensemble of artists embracing their disabilities as unique musical instruments. Her contribution to the group performance, "Deviations and Straight Line," developed into a solo show, "Linear and Aerial Perspective," which she performed at EMPAC (RPI) in 2011, and at the SONORITIES FESTIVAL (Belfast) in 2013.

Sherrie Tucker is a proud ADHD writer who teaches in the American Studies Department at University of Kansas. She is the author of *Dance Floor Democracy: The Social Geography of Memory at the Hollywood Canteen* (Duke, 2014), *Swing Shift: "All-Girl" Bands of the 1940s* (Duke, 2000) and coeditor, with Nichole T. Rustin, of *Big Ears: Listening for Gender in Jazz Studies* (Duke, 2008).

Julie Unruh grew up in Montezuma, Kansas. She is a human and animal rights activist living in Lawrence, Kansas, and is cofounder and co-owner of Global Green Publications. She is the author of *Vegetable Garden: A True Story*, about adjusting to living with traumatic brain injury, and two books of poetry, *Silence* and *Powerful Women*. https://www.juliebooks.net/.

Zane Van Dusen is a musician, curator, computer programmer, and product manager from Brooklyn, New York. In 2007, he developed the original AUMI prototype with Pauline Oliveros. Nowadays, he works with engineers and quantitative analysts to solve complex financial problems like measuring and mitigating the future impact of climate change on the economy.

Lise Vaugeois is a composer, musician, academic, educator, and workshop leader with a diploma in performance and communication skills from the Guildhall School of Music and Drama, a masters of education from Lakehead University, and a PhD in philosophy of music education from the University of Toronto. She has been leading creative music projects in schools since 1994, through the Ontario Arts Council, the Community Arts and Heritage Project of Thunder Bay (CAHEP), and the Thunder Bay Symphony Orchestra.

A music and sound studies scholar and a flutist specializing in creative improvisation, **Ellen Waterman** is professor and Helmut Kallmann Chair for Music in Canada at Carleton University. With Gillian Siddall, she coedited *Negotiated Moments: Improvisation, Sound, and Subjectivity* (Duke). Ellen is founder and director of the Research Centre for Music, Sound, and Society in Canada, dedicated to exploring the complex and diverse roles that music and sonic arts play in shaping Canadian society. www.carleton.ca/mssc.

Ranita Wilks is a disability rights advocate and targeted case manager for people with intellectual and developmental disabilities in Lawrence, Kansas. Ranita has been involved with AUMI performances, workshops, and other events through community partnership with AUMI-KU Inter-Arts since 2012. She is a graduate of the University of Kansas and identifies as a person with a physical disability.

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