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Hearing Through Their Ears

Developing Inclusive Research Methods to Co-Create with Blind Participants

GREGORY WEINSTEIN

This paper recounts research into the orientation and mobility experiences of people who are blind or visually impaired, and describes the novel sonic research method I developed for this purpose. "Participant Phonography," as I call the method, aims to empower research participants with low or no vision through the self-guided creation of sound recordings that represent their experiences of the world in a first-person perspective. More broadly, the paper highlights the inadequate efforts of ethnographers in industry to tackle challenges of disability and reflects on the ethical challenges that face researchers who want to include disabled people in research. Inclusive methods like participant phonography have great potential to break down traditional power structures that have rendered non-normative groups marginal in user research, but these methods also come with substantial barriers to their implementation in a corporate context.

> I begin to hear the old sounds as though they are not worn out. Obviously, they are not worn out. They are just as audible as the new sounds. Thinking had worn them out. And if one stops thinking about them, suddenly they are fresh and new.
>
> —John Cage

Julie

It is late on a Monday afternoon and I am making my way up Market Street in San Francisco. I am holding a digital recorder and walking alongside a woman I'll call Julie. Julie is holding a shotgun microphone in one hand, which is connected to my recorder, and in her other hand she grips the harness for her guide dog. I offered Julie the option of taking more control of the recording equipment, but she pointed out the obvious: since she needs one hand for her guide dog, it was probably safer if she only held one microphone in the other hand.

We've been on the move for about 20 minutes. Eventually, we cross 4th Street and stop near the entrance to the BART station. "That's too bad," Julie says. "There are usually drummers playing on this corner, and I thought that would've been interesting to get on the recording." Julie makes recording on her own sometimes, but today she is trying to give me some insight into the role that sound plays in her everyday life. Because she has no sight, Julie relies heavily on sound to make her way around the city, to stay safe in heavily trafficked areas like downtown San Francisco, and to interact with people both in person and digitally.

We are recording entirely for my benefit. Julie has already told me quite a bit about the value of sound to her daily routines—basic things like detecting the direction of traffic when you want to cross the street, and more advanced ideas about the subtleties of navigating obstacles by herself and with her guide dog—but I am hoping to capture, with her help, some trace of her subjective sonic experience to help me understand the difficulties that blind people face every day when they commute, take the bus, or walk on the sidewalk.[1]

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INTRODUCTION: HEARING THROUGH THEIR EARS

There is a well-known cliché about "seeing something through someone else's eyes." The saying is about the power of empathy: when you can see through another's eyes, you can understand their experiences of the world, their motivations, and their actions. The saying relies on a *visual* metaphor: empathy comes from *seeing* through another person's eyes. Such linguistic artifacts subtly occlude the reality that sight is not the only sense through which we experience the world, and for many people, is not even the primary sense. If we see through someone else's eyes, is it also possible to *hear* through someone else's ears? Can we develop empathy through someone else's sonic experiences, and use that empathy to motivate design choices?

This paper proposes to do just that. The research I describe was conducted at Uber with the goal of understanding the transportation experiences of people who are blind or visually impaired.[2] I wanted to develop a holistic understanding of how blind and visually impaired people travel and navigate, and to do this, my insights would need to be largely sonic. Visual information is, at best, a very small part of how someone who is blind or visually impaired understands the world. Therefore, I developed a sonic ethnographic method that would allow me to understand how participants use sound to navigate a world whose design often assumes that users are sighted.

I argue that we need new methods to research the experiences of people with diverse abilities, and that these methods are hardest to implement in a corporate setting where business concerns are sometimes at odds with the ethics of good ethnography. Further, researching the experiences of disabled people is politically fraught, since historically this sort of research has granted no agency or ownership to the people at the center of the research. More recently, disability researchers have worked to create more inclusive methods and to empower disabled people through research. Researching inclusively is essential to creating inclusive services and products, and I attempted to make my own acoustic anthropological method as participatory as possible—albeit with only qualified success, as I discuss near the end of this paper. In the end, I propose that we must develop inclusive research methods in all sorts of ethnographic work if we wish to design a world that is itself truly inclusive.

INCLUSIVE DESIGN…

There is a clear moral imperative for companies to provide services and products that do not exclude people by the nature of their design. And it is equally clear that a great number of companies struggle to meet this usability standard (if they even try at all). The world abounds with examples of products that cannot be used by disabled people. Sometimes these are the result of ignorance or neglect, and sometimes companies make strategic business decisions not to design for people that they consider to be on the margins of their customer base. There is a perception that designing for people with disabilities is too costly and cannot be justified by revenue generated by such designs.

Such thinking is short-sighted, and it means that people with cognitive and physical impairments are often discriminated against, if not outright prohibited from consuming and participating in equivalent ways to non-disabled counterparts. Which brings me to the core tenet of this paper: Inclusive design requires inclusive research.

Before discussing the concept of inclusive design, however, I must briefly unpack the term "disability." The social model of disability distinguishes between "impairment" (which refers to the individual) and "disability" (which is a structural problem). For instance, not being able to see is an individual impairment, but it becomes a disability when we consider all the ways in which the world is not designed for the experiences of people who are blind. In the social model, the term disability itself comes to represent a condition of oppression, wherein people with impairments are excluded from participating fully in society by the design of the world around them. "The social model [of disability] is a deliberate attempt to shift attention away from the functional limitations of individuals with impairments onto the problems caused by disabling environments, barriers and cultures" (Barnes 2012: 18). Because disability is a problem of the world not being designed to be used by people with impairments, its solution must be a design solution: how can we create a world that is inclusive in its design so that people are not excluded from participating in it?

By "inclusive design" I mean what is (in the United States) generally referred to as "universal design." When we think in terms of inclusive or universal design, the financial case against designing for the needs of disabled users simply falls away. Inclusive design, as the name suggests, strives to include as many people as possible in the use of the product or service in question without needing to modify the product. The antithesis of "accessible" design, inclusive design does not mean designing a product meant to be accessible to a small number of people with disabilities, but rather, that by considering the use cases of people with a variety of abilities, one can design for an extremely broad and diverse user base. According to Steinfeld and Maisel, thinking only in terms of "accessibility" leads designers to believe that there is only a small "niche market" in serving people with disabilities (2012: 68). However, that is only true if one thinks of products that serve disabled people as being completely separate from a company's "normal" products. Good inclusive designs are easier and friendlier for *all* users, and thus, are precisely the opposite of a niche.

The classic example of an inclusive design is the "curb cut," the gentle ramp in sidewalks that make it easier to cross the street. Popularized as a way for World War II veterans in wheelchairs to get around, curb cuts have proven useful for a huge number of users: people pushing children in prams, people pulling luggage, workers wheeling heavy equipment from a truck into a building, and people on roller skates, to name only a handful. From the 1960s, curb cuts began to be joined with another innovation: the truncated dome. Often in high-visibility yellow, truncated domes are a patch of low bumps that alert blind and visually-impaired people to the end of the curb and the beginning of the street. And again, these provide valuable warnings for many people, not only those with visual impairments.

By finding "curb cut" solutions to design problems—by creating inclusive designs that address a wide range of people's abilities and use cases—companies can actually increase their customer base because they have included even more potential users in their designs. Ensuring that disabled users can use a product or service is hardly an unprofitable niche. It makes good business sense, and it is the only ethical way to address users' needs inclusively.

…REQUIRES INCLUSIVE RESEARCH

Intuitively, it might seem obvious that we need inclusive research in order to create inclusive designs. One cannot design for a broad, inclusive group of users without understanding the variety of needs and use cases that are found among them. However, far too often, social scientific research relies on traditional models and methods of research, limiting the user base that is included and consequently restricting the potential findings before the research has even begun.

Inclusive research has developed in many forms during recent decades. Melanie Nind proposes that inclusive research is less a research method and more of a philosophy—namely, the belief that research participants ought to have more control over how research is conducted, more input into the meanings and outputs generated by the research, and generally a greater level of ownership of the research process (Nind 2014).

For Nind, the difficulty with much qualitative research, even some research that is described as "human-centered," is its inherent power dynamics. She remarks, "Most qualitative research…retains the status quo of the researcher being the person who defines the questions, handles and controls the interpretation of the data, and makes and communicates the conclusions" (2014: 4). Inclusive research, in contrast, aims to disrupt this traditional power dynamic by shifting control and ownership to research "participants" (a term that should be used lightly, since people participating in inclusive research are usually better described as co-creators, collaborators, or co-researchers). Nind is acutely aware of this power dynamic: in shifting the balance away from the scholarly researcher, she advocates for "research *with*, *by* or sometimes *for* them…in contrast to research *on* them" (2014: 3).

There are a number of research forms that can be thought of as subcategories of inclusive research. Participatory research is a fairly conservative form compared to some others, although it seeks to involve "participants" to a greater degree than traditional research. "Emancipatory research" is far more political in its aims and it seeks the most radical refiguring of research power dynamics of any inclusive approach. Emancipatory research emerged from disability studies, where the distinction between research *on* and *with* was acute, and some of its goals are to make research and researchers accountable to the people impacted by the research, to provide opportunities for disabled people to shape and conduct research, and for research to improve the lives of disabled people (Ramcharan et al., 2008: 86, citing Chappell 2000).

The concept of research as emancipatory reminds us of the imperative to design inclusively. Steinfeld and Maisel define universal design not in terms of how many people it serves, but rather in terms of its ability to promote agency in users. Inclusive design is "a process that enables and empowers a diverse population by improving human performance, health and wellness, and social participation" (Steinfeld and Maisel 2012: 29). Considered in this way, the transformative power of inclusive design is clear, as is the need to include diverse groups (including individuals with disabilities) in design research.

AGENCY IN PARTICIPANT PHOTOGRAPHY RESEARCH

Ethnographic researchers have long understood the value and power of photography. The ability of photography to make an argument in its own right—and to affect social change—has an even longer history. The late 19th century photographs of New York City by Jacob Riis are a famous early example, and the powerful Depression-era images by Dorothea Lange and Walker Evans are iconic representations of the hardships faced by Americans of the era. Photojournalists use images to tell a story faster, and with more emotional power, than words can convey.

The use of photography as a *participatory* method is far more novel in both academic and industry research. "Participant photography"[1] combines core elements of inclusive research with the apparent immediacy of photography to produce evidence and analysis that are otherwise inaccessible to researchers. Ozanne et al. argue that participant photography is primarily about granting agency to research participants. They write, "When people take pictures, they acquire great power to represent the personal, cultural, and economic influences that shape their lives and present obstacles to their vitality" (Ozanne et al., 2013: 46). The authors present examples of a number of methods of participant photography, but they repeatedly emphasize the active role of participants in shaping the research through their photographic choices. Participant photography thus draws heavily on the central belief of inclusive research that participants ought to control and guide research—that research should be *with* instead of *on*.

Steager similarly recognizes a central problem in ethnography that can be solved by participatory photography. Namely, since ethnographic research is necessarily and deeply subjective, how can researchers attempt to bridge the gap between their own perspectives and those of participants? As she asks, "How…to share what our eyes took in and our brain and psyche processed? How do we know if what we see is the same as what someone else sees?" (Steager 2018: 162). In other words, researchers always have their own subjective positions and perspectives, and as the "reflexive turn" of the 1980s has taught us, there is consequently no way to moot the subjectivity of the ethnographer. The solution proposed by participant photography is not to make a half-hearted and futile attempt at objectivity, but rather, to elevate the perspectives of research participants by giving them more agency over the form and focus of the research.

The various forms of photographic research in which participants wield the camera are not necessarily inclusive in form. Describing the method known as "photovoice," Ozanne et al. say, "Although participants are given considerable freedom, researchers usually ask participants to focus on a specific subject matter" (2013: 47). In this form of photographic research, the researchers are still exercising considerable control over the form of the research, directing participants in specific directions that interest them. Steager recognizes this as a potential problem, in that it maintains the core authority of the researcher, and she thus distinguishes between photovoice and her preferred term, "participant photography." She argues:

> Participatory to me implies an active role on the part of the research participant, which is not always the case with photo voice. Rather than imposing my presuppositions on the experience and telling my participants what photos they should make, I wanted the participants to lead the process, not only in what and how they chose to photograph but also within the interview process itself when we discussed their photos, so that they were working with me to build a shared understanding, of a shared experience, of place. (2018: 163)

Ozanne et al. note that photographic research methods are especially prominent in research among marginalized groups. They argue that "because of their historical and ongoing experiences of oppression, these groups are often suspicious of outsiders (including academic researchers)." Consequently, "Photography is an attractive research approach because participants have greater potential power to author their individual and collective stories" (Ozanne et al., 2013: 48). Clearly, then, participant photography is very much of a piece with the democratizing ideals of inclusive research.

For this reason, participant photography has the potential to generate tremendous empathy among stakeholders of a research project. Faulkner and Zafiroglu observe that "participant-made videos" "have a sense of immediacy and intimacy, and elicit emotional responses and curiosity to learn more on the part of our stakeholders. Unlike our [ethnographer-made videos], the videos our research participants make using video cameras…offer a glimpse of participants doing activities they normally just talk about when we are there" (Faulkner and Zafiroglu 2010: 114). Allowing participants to create the form of their story, rather than simply recounting it to a professional observer, creates an immediacy to the story that ethnographic accounts often lack. To some extent, this is likely just a property of the medium of photography (or, in Faulkner and Zafiroglu's case, video): the visual form engages people differently than written or spoken text and it often feels more direct. But some of that directness also comes from knowing that the participants themselves created the visual products that relate their (own) stories.

And yet, while the rise of inclusive research has been driven substantially by research into disability and the social structures that produce it, there are remarkably few participatory models using multiple media in this realm. Of the multitude of examples of inclusive research presented by Nind (2014), only two involve participants creating in a medium other than spoken or printed words. This seems a remarkable shortcoming, considering how vehemently inclusive researchers advocate for participants to shape both their story *and* the form in which it is presented.

On reflection, though, there are some reasons why multimedia methods may be absent from inclusive disability research. First, inclusive multimedia research (such as participant photography) raises pragmatic and ethical questions beyond more traditional methods. Participants need to be literate in the medium to be employed, they need to learn how to use the equipment to conduct research (such as a digital camera or video recorder), and they need to understand the ethical implications of photographing people. Second, and related, inclusive multimedia research places substantial time (and possibly financial) demands on participants. Participant photography requires participants to invest a lot of time into the project, which can be a difficult demand of people in any circumstance. Only in a few circumstances can a researcher ask so much of participants and more traditional methods may be easier to implement in an inclusive way.

Chuck

Chuck is a quality assurance engineer for an e-book company, and he has been blind since birth. Chuck relies on sound to help him find his way and to stay safe. He described for me the sorts of information he can gather about his surroundings just from sound—echos and reverberations, subtleties that are many sighted people overlook:

> Walking down the sidewalk, I could tell if I was going by a parked car, you could hear walls far ahead of you. As I've gotten older this has diminished. However, I still feel very comfortable using a cane, and one of the things that I've learned is…that tapping of the cane is also a form of echolocation.

After our interview, I went for a walk with Chuck and observed his listening skills in action. As we walked, he gently held my elbow—a technique called "sighted guide" in which a blind person receives directional signals from the movements of a sighted person—although his pace was so brisk and confident, I ended up feeling like he was guiding me from the shop back to his house. As we walked down the sidewalk of a strip mall, he pointed out the concrete columns as we passed by, noting that he could hear the change in the reflectiveness of the space occupied by each column. In his housing complex, he identified each house as we passed by based on the echo of its carport. (His always echoes more than those of his neighbors, because he doesn't own a car.) On his own house, he had hung a windchime to help him identify it, but there was no wind that day, so Chuck had to find his house simply based on his mental map of the housing development.

AGENCY THROUGH PARTICIPATORY PHONOGRAPHY

When I began my research with blind users at Uber, I weighed the value of a participatory method. Obviously, a visual method like participatory photography was not viable, but I believed that a participatory *sound* method could reveal otherwise unavailable insights into the everyday realities of the research participants like Chuck. I will describe the particulars of my research design later in this paper, but here I wish to reflect more generally on sound as means of knowing the world and, therefore, its potential value to ethnographers who have largely neglected it in research methods.

First I offer a definition, necessarily vague but still useful in its inclusiveness: Sound is firstly a physical phenomenon, encompassing the compressions and expansions of air waves which for most people are interpreted by our brains as auditory phenomena. (Sound vibrations can also be felt in the body, particularly at very loud volumes and very low frequencies.) While such a definition may seem too broad to be of much value, it is essential for what sound is not (or at least, not only): music. Music is neither coterminous with sound (which should be obvious), nor is it precisely a subset of sound (less obvious, unless you have encountered the work of historical musicology, which very often has nothing at all to do with sound). The world is saturated with sound, very little of it music. In this paper, and indeed, in this research method, I am not concerned with music, but instead, with the rather less remarkable quotidian sounds that permeate our everyday lives.

And it is because I am interested in the ordinary lives of people—the day-to-day travails with transportation and mobility that all blind or visually impaired people deal with—that I wanted to use a *participatory* sound method. As Faulkner and Zafiroglu observe about their participatory video research method, giving the participant independence and control over their self-representation ultimately give the researcher access to parts of the participants' lives that would otherwise be off-limits. Their participants "captured scenes and moments that we were not invited to witness first-hand, and that any outsider would be unlikely to see. The videos are simultaneously intimate and mundane" (2010: 117). Thus, why I conceive of my research method as "hearing through their ears," attempting through a participatory multimedia method to access the subjective sonic perspective of blind individuals, to understand how they navigate their worlds using sound, and to figure out what sorts of needs they have that are not being met.

I can find no attempts to employ a sound epistemology in design research. There are, of course, researchers who have considered the design impacts of sounds in their products (see Case and Day 2019), and "earcons" are becoming a mainstay of UX and UI design. These are important and insightful uses of design through sound; however, here I am interested in something slightly different (though related). I am interested in how sound can be used as a means of understanding the world—and, just as with visual means, how individuals have unique subjective experiences of the sound in the world around them.

My primary inspiration for the sound recording component of my research comes from the work of the prominent ethnomusicologist Steven Feld. Feld has conducted research over several decades among the Kaluli people in the Bosavi rainforest of Papua New Guinea, and during that time, he grew increasingly reflexive and inclusive in his research and analysis. *Sound and Sentiment*, his first book based on his Bosavi research, was published in 1982; five years later, he described a process he called "dialogic editing," an effort to include the Kaluli people in critical commentary on his book (Feld 1987). Feld took the dialogic editing method a step further when he partnered with drummer and producer Mickey Hart to release an album of Kaluli song and rainforest sound, *Voices of the Rainforest* (1991).

For the *Voices of the Rainforest* project, Feld used recording and editing technologies to construct an hour-long sonic evocation of a full day in the life of the Kaluli. He recognizes that such a recording can provide an evocative first-person experience of the rainforest in a way that a text—or even a record of discreet tracks (the more standard form of academic ethnomusicological releases)—could not. "Without academic explication," Feld says, "the recording allows the listener to enter and subjectively experience what the Kaluli call *dulugu ganalan* 'lift-up-over sounding' [the complexly layered acoustic world of the rainforest]" (Feld 1994: 280).

Further—and most important for my purpose in this paper—Feld developed a participatory research method in order to create a recording that was engaging and authentic to the Kaluli experience. Using a variety of microphones, he captured the overall sonic picture of the rainforest, but he also used parabolic microphones to record the sounds of birds and insects in isolation, to be mixed in later. In fact, Feld asserts that recording enabled him to understand the Kaluli sonic ecology in a way that he couldn't before, as his Kaluli informants became collaborators in the production of the record. "Playing back transfers of component tracks on two cassette recorders, I asked Kaluli assistants to adjust volume controls on the two machines until the composite sounded good to them. When the tracks combined musical performances and environmental surround sounds, Kaluli tended to amplify the surround tracks, particularly on the middle and upper forest canopy… This kind of bush premixing studio put Kaluli in a directly dialogic editorial role in the project" (Feld 1994: 283).

Rereading this passage now, I am amazed at how forward-thinking Feld was in the research design. Certainly, he did not abdicate his authority as a researcher, but his methods are remarkably participatory, particularly by the standards of ethnographic research as it was practiced in the early 1980s. He allowed the participants in his research to become co-creators of the research product, directly shaping what would become a major-label release in the United States. (Feld was also acutely aware of the potential ethical problems of this work: while he retains legal authorship of the record—and there was no way around this, since American copyright law does not make allowances for the notion of cultural ownership—he attempted to mitigate the privilege of ownership by creating a trust to receive royalties from the record's sale and using those proceeds to support conservation work in Papua New Guinea.)

In addition to Feld's participatory research design, there is an instructive lesson in his discussion of "lift-up-over sounding," the term that refers to the sonic density of the rainforest, the Kaluli's interaction with it, and the system of knowledge that encapsulates it. The Kaluli's worldview cannot be disentangled from their singing: their singing is always in dialog with bird song, and these conversations with birds are how Kaluli know about the world around them. There are two key points here. First, to grasp their meaning and importance, sounds need to be understood in context rather than in isolation. And second, sound (for the Kaluli and more broadly) is not only the content of knowledge, but is actually the medium in which knowledge is acquired and communicated. Feld is acutely aware that written language can, at best, only provide an approximation of Kaluli knowledge; the knowledge is the medium of sound itself.

The sonic contexts like the Bosavi rainforest can be referred to as "soundscapes," a term popularized by the composer and ecologist R. Murray Schafer. Schafer describes the "soundscape" "as any acoustic field of study" (1977: 7), an inclusive concept that can refer to any sound environment in its totality. There can be natural and human-made soundscapes; urban and rural soundscapes; dense and sparse soundscapes. Schafer further introduces three kinds of sound that constitute a soundscape: "keynote sounds," which are the constant and often unnoticed features of a soundscape; "signals," which convey needed information and are therefore consciously listened to; and "soundmarks," which (via the visual term "landmark") denote sounds particular to a place or community (Schafer 1977: 9–10).

The soundscape and its related concepts are not analytical unto themselves. They simply provide a framework through which we can perceive and organize sounds in any given location. The analytical value of the soundscape emerges when we begin to describe and contextualize the meanings of sounds. Moreover, these concepts are not static; they can change as a soundscape changes, and as the people occupying it change. For example, the soundscape of the street where I live is generally quiet. Few cars drive past, and the relative quiet is punctuated only by the fleeting conversation on the street or a barking dog (often my own dog). These are the "keynotes" of the soundscape. Recently, however, construction crews began major work on three houses on my block. They arrive early, yell jovially across the street, and hammer loudly throughout the day. These sounds were "signals," in that they were consciously perceived and, at least when walking on the street, conveyed necessary information. However, over time, these sounds have become so routine that they, too, have become keynotes. Finally, the weekly tolling of the local church bell is a soundmark, signaling the presence of the church to everyone in the neighborhood.

These layers of sound are valuable because they capture the different registers in which people listen to sound as part of their lives. The brain is quite adept at filtering out the "noise" of everyday life—treating such quotidian and unnecessary sounds as "keynotes," to use Schafer's terms. However, because sound is so present and informative, it is also a fertile ground on which to understand people's experiences and to inform design decisions. In the rest of this paper, I will describe and reflect on my efforts to use sound as part of the research process with blind people, and I will provide some ideas about how sound can help researchers in the future.

Finally, as both Feld and Schafer recognized, sound recording can be an extremely engaging medium, and as such, it can generate awareness and empathy among listeners. I believe that much of the value of sound recording in industry is its ability to give a variety of stakeholders insight into otherwise invisible user experiences—but doing so requires some knowledge of how recording works. Recordings convey movement and dimension through the stereo field, loudness, and harmonics. Stereo recording has been used since the 1950s to convey position and lateral movement; its use in this way was pioneered by the producers and engineers at Decca Records and used to convey drama in opera recordings. The feeling of "depth" in a recording—the impression of space on a line away from the listener—is more complicated to create. Volume plays a partial role: a sound getting louder can give the impression that the entity generating the sound is getting closer to the listener. However, loudness by itself is not enough. Harmonics play a role, too. Higher frequencies dissipate faster than lower ones, so a sound with fewer high overtones (pitches that can't be heard individually, but which contribute to the overall "color" of a sound) is perceived as being farther away than a sound with a lot of high overtones. Knowing all this, one could fairly easily make a recording of traffic that conveys the movement of cars around the listener, creating a purely sonic experience of traffic and thus conveying a trace of a blind person's experience of crossing the street.

Laura

I went on a "soundwalk" with a participant named Laura. We took a trip that she often takes when she does her shopping: a shared Uber to the grocery store, walking across the street and down a half mile to the Target, and then to the bus stop behind the Target. Laura gets around with a white cane and her mental map of the area. She narrated during quite a bit of the recording, including explaining how she finds the correct bus at a station with three separate shelters. As we walk past the shelters, she tells me, "I had a friend help me memorize which buses are at which [shelter]…because you're not always going to have mobility training." What was most interesting, though, is how Laura orients herself in this location and finds the correct bus stop. "I know when I'm near the bus shelter because my voice will echo. That's how I know I'm passing the shelter." She stopped and gestured towards the second bus shelter: "I know there's no people in here because it's super echoey." Focusing my attention, I heard Laura's voice echo in the shelter as she spoke; and listening later, I noticed that the recording had captured the echo, preserving a sonic element that Laura uses to navigate without much conscious effort.[4]

DOING PARTICIPANT PHONOGRAPHY

Because I wanted my research design to be as participatory as possible, I initially intended to equip research participants with their own microphones. I debated the merits and drawbacks of two different sorts of recording devices: a stand-alone digital recorder and a microphone that plugs into the lightning port of an iPhone. The stand-alone recorder would have been easier in the long run, but it would require more effort for participants to learn how to use it. The iPhone microphone would work with a device that participants already owned, so I ultimately decided to go this route. I selected a microphone and Uber's Research Operations ordered four of these devices for me. Only then, when I unpacked one and began to use with it, did I discover an insurmountable problem: the microphone wasn't accessible.

I learned that once you plug the microphone in to the phone's lightning port, there is no way to get the phone to give audible VoiceOver readouts. (VoiceOver is the accessibility feature on the iPhone that allows blind users to interact with the phone via sound and touch.) Since the research participants rely on VoiceOver to use their phones, plugging in the microphone essentially made their iPhones completely unusable. There would be no way for them to navigate around the phone because the audible cues and readouts that they used were simply not available. I contacted Apple and the microphone company, and they predictably blamed each other for this problem. However, they agreed that it was indeed impossible to use a lightning port microphone with VoiceOver, and my initial research plan was scuttled before it even got off the ground.

Back to the drawing board. I decided not to return to the option of stand-alone recorders, a decision I made primarily because of the time constraints on my research and the additional demand it would place on participants. Instead, I opted to try a form of co-creation with participants, where we would together use my own recording equipment to make recordings. The first few attempts at co-creation showed some promise but were not ultimately as collaborative as I hoped. These mostly involved me walking along with a participant as they narrated their experience, highlighting sounds that were giving them useful information about their surroundings. The process was certainly insightful—for instance, several people demonstrated how the combination of sonic and haptic feedback from their cane can convey critical information about an environment—but the resulting recordings had very little that I could play for others as a representation of a blind person's experience of the world.

Unsure why the co-creation process did not go as I hoped, I stepped back and tried to workshop it with colleagues in Uber's office. Several people volunteered to be guinea pigs for me, and I gave them instructions about how to use the equipment and what I hoped to capture, just as I had done with the blind research participants. The workshopping of the method was extremely revealing. All of my colleagues insisted on moving around with the microphones, even when I explicitly instructed them to remain in one place. They were very surprised to hear how differently the office sounded through microphones and headphones, compared with their normal experience. I discovered that I needed to give much more specific instructions in order for participants to make clean and insightful recordings.

Emboldened by my experiments with my Uber colleagues, I decided to do another round of recordings where I was more explicit and insistent in my directions. I instructed participants to select a location to record, and to remain stationary in that location. Having found a safe place to stand, I gave them instruction in how to use the recording equipment: the broad sweep of the stereo pair of microphones and the highly directional shotgun microphone. I insisted that participants wear headphones so that they could hear what they were capturing on their recordings. The participants who did this were initially quite uncomfortable with the new sonic surroundings, but they adapted quickly and seemed to be intrigued by this new sonic perspective on the world.

Christina

I met Christina at a school for the blind where she had been living for the past few months. Christina had lost her sight a couple years ago, and at the school, she received training in how to go about ordinary tasks without sight. She used to take for granted her ability to go to the nearby Starbucks for a coffee, but now she was relearning how to walk in a straight line and safely cross the street. She explained to me that sound is crucial in crossing the street. Sometimes, signaled intersections have special auditory signals for blind pedestrians that indicate when and in which direction a light is green. Even so, Christina has been taught to always listen for traffic: if the traffic is moving parallel to you, then you can move with it, but if it is perpendicular (i.e., across your path), then you need to wait for the light to change.

REFLECTIONS ON THE RESEARCH METHOD

Although my research was not as participatory as I had initially hoped, my project indicates that there is value in participant phonography. Even in its imperfect initial forms, the research revealed key elements of participants' sonic worlds, sound cues that they rely on that might otherwise escape notice of a researcher. These were classic "soundwalks": "a form of active participation in the soundscape…the purpose of [which] is to encourage the participant to listen discriminately, and moreover, to make critical judgments about the sounds heard and their contribution to the balance or imbalance of the sonic environment" (Truax 1999). Participants recounted some very valuable insights about how they use sound in their everyday lives. Those individuals who were blind since birth told stories about using sound without even realizing it; it was second-nature to them. For instance, Chuck, who I mentioned earlier, told me about running and climbing trees as a child, oblivious to any potential limitation from his blindness. Participants who had lost their vision more recently had often learned to use sound as a navigation tool through mobility training, such as learning to listen for the sounds of traffic moving parallel and perpendicular to them at intersections, as Christina learned. These were key insights into the quotidian experiences of the blind individuals whose mobility experiences I was hoping to help improve.

As useful as these insights were, however, my initial methodology was only minimally "participatory." There was very little real collaboration in those interactions—very little control given to (and taken by) participants—and both I and the participants fell into our familiar roles of researcher and researched, respectively. I discovered that many of the people I worked with had participated in some sort of research before—not with Uber, but with a number of other companies who had already been trying to understand the experiences of blind users. Looking back, I believe that many people I interviewed were accustomed to the traditional dynamic of having research done *on* them, and they were uncomfortable with my proposal to do research *with* them.

The last few recordings were much closer to what I envisioned, in that the participants physically took charge of the recording equipment and the recordings were, in a very real sense, *theirs*. The insights generated in those recordings are, in large part, the product of the agency taken on by participants. By listening to the recordings as they were happening, they were able to focus attention on sound elements that were important to them, and to create recordings that offered more of a first-person experience of their sound worlds than I might otherwise have gotten.

At the same time, I have some ethical qualms with the methodology as I implemented it. By insisting on certain parameters for the research, I was perhaps undermining my desire to shift the balance of power away from myself. I insisted that participants stay in place; that they wear headphones during the recording; and that they hold and aim the microphones. While participants were generally curious and willing to try this, it was clear that they were initially uncomfortable with what I was asking of them. The discomfort I caused these people troubles me. How can I claim to be conducting ethical research when I was asking participants to do something they would otherwise prefer not to do? Is it possible that the participants in the research were opposed to what I was asking, but felt that they couldn't refuse or challenge my instructions? Like most researchers with good intentions, I want to believe that this was not the case, but because of the engrained power structures around ethnographic research, I cannot be certain.

POSSIBILITIES FOR PARTICIPATORY RESEARCH IN A CORPORATE CONTEXT

My approach to this research was substantially shaped by the corporate context in which I was conducting the research, which in turn created some of the ethical dilemmas I continue to grapple with. I was working for Uber, and while some of my remarks here may be construed as critical of Uber specifically, I insist that my observations describe the constraints and pressures of conducting ethical research in industry more generally.

As my research plan began to take shape, it quickly became apparent that recruiting participants for my research would be no easy task. Like far too many companies, Uber had no procedure in place to conduct research into the experiences of blind users (or users with any disability, for that matter). Most of my colleagues can easily find a group of potential participants in the company's database by identifying key characteristics like number of rides or frequency of use. However, because Uber does not ask blind users to self-identify (an issue that would be a major point of discussion and debate later in my research), there was no way for me to internally identify potential research participants.

Thus, the first ethical challenge: how could we recruit a reasonable pool of blind Uber users without violating people's privacy? We solved this problem by approaching organizations in the Bay Area who serve people with visual disabilities and asking if they could pass on our screener to their constituencies. As long as we did not retain any internal record of the research participants, this met the company's mandate to not identify users by their disability. However, it created a new power imbalance between Uber, the large for-profit corporation, and the relatively small non-profit organizations we approached for help.

Mobility is a substantial challenge for people with visual disabilities. Driving oneself is not an option, public transportation options are very limited and time consuming, and private rides can be extremely expensive. Consequently, the organizations we approached for help with recruiting participants were excited that Uber was investigating the experiences of blind riders. However, while they all had institutional structures in place to help companies with recruiting blind participants for corporate research, Uber had never before undertaken this sort of research and it would not have been possible to onboard these organizations as "vendors" within the time frame of my research. Thus, I was in the very uncomfortable position of asking small non-profits essentially for a handout to the large corporation: forwarding our screener to their constituencies for free. We were very humbled by the willingness of people to help—and it bothers me immensely that we were not able to do anything reciprocal to help the organizations that assisted us with the research.

After the recruiting challenge, a second ethical matter arose. Namely, how much participation could I reasonably ask of people? One challenge with using participatory research methods in a corporate context is that these methods often require much more time from participants than traditional user research techniques. Under my initial plan, I would have asked participants to spend time over the course of a week making recordings, and then to talk with me about them. Even in the revised research plan, I needed time to explain my methods and goals to participants, to teach them how to use my recording equipment, and to make and reflect on recordings. The method cannot easily fit into the 45-minute or 1-hour research sessions that are typical of this type of user research.

In her manual on the topic, Nind (2014) provides many examples of successful inclusive research designs. Interestingly—and tellingly—none of her examples are from industry. There are cases where research is led by non-professionals, cases where academics and community members collaborate on research, and examples of academics involving participants in more substantial ways than is typical of social science research. However, she has no examples of how inclusive research design can be used in industry. I imagine this is less an oversight of Nind's and more an illustration of how difficult it will be to introduce truly inclusive research design into a corporate context.

Because of the constraints of time, confidentiality, and finance that I faced at Uber, the participatory phonography method as I enacted it barely meets the broad criteria for "inclusive" research. My methods were indeed participatory, but not nearly to the degree I had hoped in the early stages of my research design. The empathetic value of a user-created soundscape recording never came to fruition (although I fortunately had plenty of other evidence that I could deploy to generate empathy and insight among my colleagues).

Reflecting on the project, I sense that researchers in industry who want to work inclusively are trapped between two opposing forces. On the one hand, we recognize the moral imperative to work inclusively if we are to generate meaningful insights into the experiences of people who typically exist at the margins of industry research. Inclusive research can both convey these perspectives *and* allow these individuals to retain control over their own narratives. On the other hand, the structures of industry research discourage the sort of inclusivity that has been so successful in academic and community research. There was no possibility for the participants in my research to have "ownership" over the research at Uber in any meaningful way, no matter how much I may have wished it to be so. I am left rather pessimistically wondering whether it is *ever* possible to do truly inclusive research in a corporate context.

Of course, I am not arguing that we should not do research among groups who are not often represented in our studies. To the contrary, it is essential that we advocate for such research in corporations because, as human-centered researchers, we are uniquely trained and positioned to push companies in socially progressive and inclusive directions, and we have a moral obligation to do so. However, I am also questioning the possibility of doing research that is inclusive within these corporate contexts.

How can we develop relationships over time with participants in a way that is collaborative and not exploitative? I was often acutely aware while interviewing blind individuals in the Bay Area that my mere presence in their homes was sending a message about Uber. Even though I was very careful not to promise anything about how Uber's service might be improved, I often realized that simply by asking them about their mobility experiences, they got the impression that the company wanted to understand their challenges and to help. Of course, anyone who has worked in a company will know that things are never so simple. We learn about users and we advocate for them in the push-and-pull of company politics and priorities. Some of our suggestions are taken up; many others fall away, seen as unnecessary or unworkable. That has been the case with my research: after I left Uber, there were improvements made to the accessible version of the rider app, but they were mostly nibbling around the edges. More substantial changes have been taking place, but at the slower pace that is unavoidable at a large corporation.

In a context like this, it could be deceptive or outright wrong to ask participants to invest the time and effort required for a truly inclusive research collaboration. The benefit to the company is clear: more knowledge of their users, more data about how their service works, more opportunities to turn these insights into profit. But what is the benefit for the potential co-researchers from outside the company, such as the blind individuals with whom I tried to co-create soundscape recordings and gain insight into their sound worlds? Unless they can advocate for their own needs in the corporate structure—in other words, unless they can own the research and speak for themselves—they can't ever be sure that they will benefit from a deeper research arrangement with the company.

Katie

Katie told me about a serendipitous experience she had finding an Uber ride she had ordered. She was waiting for the car to arrive in a difficult pick-up location, a narrow and crowded street with a lot of construction noise. As she usually does, Katie called her driver to tell him that she is blind and would need him to look for her. While she was on the phone, her ride pulled up. Katie described the experience:

> I was on the phone at the time and a car pulled up, and I heard my voice coming out of it. I heard their voice coming out of two places at once. So ok, there's the car.

Completely by chance, the driver had been talking to Katie on his car's speakers, so she could hear her own voice coming from his car, as well as his voice in both her phone and the car. This was not an intentional design solution (although it could be), but it was an absolutely perfect way for Katie to identify her ride through her sonic awareness.

FINAL THOUGHS

So where does this leave us? In general, companies have largely gotten better at creating products that can be used by people with diverse abilities, and the best companies even conduct user research into experiences of disabled people. But on the whole, industries are nowhere near truly inclusive research and design. Disabled people continue to be thought of as a "niche," users who exist on the margins of companies' core users, but such thinking will increasingly have adverse consequences for businesses—consequences in the form of financial losses and missed opportunities, as well as discrimination lawsuits against companies that exclude disabled users. Companies need to understand that inclusive design is not a niche; it is good for business.

The only path to inclusive design is via inclusive research, and the responsibility pushing for inclusiveness therefore falls on researchers. My acoustic anthropological methods are only one way of working inclusively. Participant phonography is not appropriate in all research situations, but as part of the ethnographer's sensory toolkit, it can provide a richer insight into the experiences of particular users. Such various sensory methods are necessary for inclusive research because they address the diverse ways that people experience the world. Only by adapting our methods to the needs and experiences of our users can we conduct research that faithfully represents their perspectives and ideas.

Gregory Weinstein is a design researcher and acoustic anthropologist based in Pittsburgh. After spending his first career teaching writing and studying the classical music recording industry, he now conducts research in areas such as disability, transportation, and sound. He makes soundscape recordings for fun, as well as for work. mahler123@gmail.com

NOTES

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1. You can hear an excerpt from my soundwalk with Julie here: https://soundcloud.com/mahler123/market-street-clip-mixdown-1/s-LhAkU. This clip has not been edited, other than selecting it from the more than 20 minute recording and mixing the three tracks down to stereo. In it, you can hear a lot of ambient city noise: a streetcar's poles on the overhead electric wires, trucks bumping on the uneven road, an audible signal of a walk sign. There are lots of people speaking, although they're mostly indistinct—except for the woman who apologies after walking into Julie while we were crossing the street. Shortly after, Julie praises her guide dog for navigating the busy crossing and finding the sidewalk. Note: this clip is under copyright and cannot be shared or reused for any purpose.

2. Different people make different arguments about how to refer to people with disabilities, and blind people specifically. There are conflicting arguments about whether it is preferable to use "people first" language (i.e., "someone who is blind") or "disability first" language ("a blind person"). In this paper, I vary between the two, primarily because that reflects the variety of ways the participants in this research referred to themselves.

3. There is no single name for this sort of participatory visual research. However, Steager (2018) adopts the concise phrase "participatory photography." I like this phrase, and I use it and "participant photography" interchangeably throughout the paper.

4. You can hear an excerpt from my soundwalk with Laura here: https://soundcloud.com/mahler123/laura-soundwalk-clip-mixdown-1/s-pCtXv. This clip is only the mono recording from my shotgun microphone, because this track captures both the ambient noise of the bus shelter and, critically, the change in the reverberation of Laura's voice when she is standing in front of a bus shelter. Note: the clip is under copyright and cannot be shared or reused for any purpose.

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