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Sound-Informed Mysticism and Mysticism-Informed Sound: How the Experience of Sound Influences Spiritual Experiences in the Context of Jewish Mysticism and the Science of Vibration

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Contents

Abstract

This thesis explores sound as a spiritual tool through the lenses of scientific study and Jewish mystical texts. It opens with a brief introduction, which offers some practical definitions of sound and music and outlines the following chapters. The first chapter examines some scientific understandings of sound, both as a physical/vibrational phenomenon as well as a psycho-acoustic experience. It addresses sound and overtones as mathematical concepts, and references literature about the effects of different sounds on the body and brain. The second chapter explores sound as a concept in Jewish mystical texts, discussing the potential power of sound as a creative tool, the meaning and use of letters/vocables, *nigunim*, and possible understandings of the voice of G-d. The third chapter describes observations of the soundscapes at five synagogues in Brooklyn and Manhattan: Park Avenue Synagogue, Congregation Beth Elohim, Sephardic Congregation of Har HaLebanon, Congregation Beit Simchat Torah, and Minyan Atara. In the final chapter, I conclude by reframing some of my observations through the lenses of the science and mysticism chapters, and suggest potential applications of this research and approach through congregational workshops and evaluations.

Introduction

In Jewish tradition, sound has played a crucial role in ritual, practice, and learning. We read in Nehemiah about the necessity of hearing Torah chanted aloud from the scroll, rather than merely seeing the text, so that it may be properly experienced and understood.[1] Our rituals and liturgy are brought to us through sound and song, with *nuscha'ot* (the appointed modes and sounds of particular liturgy/times) dictated by the text, service, and season. For many, the most memorable elements of Jewish experience are wrapped up in sound: my father would frequently tell me that his most vivid memories of going to synagogue as a child were marked by hearing and feeling the vibrations of his own father's baritone voice vibrating next to him in the congregation. Our ritual and spiritual experiences have the capacity to be shaped by our sonic landscapes, both by adjusting the sounds we create and also by changing the frameworks with which we understand them.

In this thesis, I will explore two lenses with which to consider sound—science and Jewish mystical texts—with the goal of creating more accessible inroads for Reform Jewish congregations, which have sometimes displayed over-intellectualization and skepticism regarding mystical experiences (that is, personal experiences of connection with Divinity). This accessibility can theoretically be achieved by either changing the sonic experiences themselves, or, as I found more effective in my own experiences, finding ways to change congregational relationships to the sounds of their spaces and services. By the conclusion of the research, I was left believing that the more effective

[1] Nehemiah, 8:8

means of providing these experiences for our congregants would not be in changing the sounds they experience, but providing clear frameworks with which they can experience them. This project outlines some research that may be used for teaching these frameworks, so that congregants and clergy can develop their own preferences and combinations of approaches.

Beyond the elements of memory, comprehension, tradition, and culture, however, sound can be understood through lenses of both science and Jewish mysticism, both in the context of music and outside of it. This presents a complicated question: at what point does sound become music? Neither science nor mysticism provide definitive claims on this subject, but for the purposes of this project, I propose that we think about this expansively: that music exists both as a purposeful assemblage of sound in patterns, but also that depending on our intent, any sound (including physical vibrations audible or otherwise as well as non-physical audiation/psychological experiences of sound) can be understood as music or song. In fact, Jewish texts contain many terms that could be interpreted as song or music, including but not limited to *shirah, zimrah, nigun, ranan*, cantillation of Tanach, the sounding of the shofar, etc.[2] Jewish mystical texts often refer to the importance of words and letters as powerful tools of creation, as well, and as argued by Moshe Idel, it is likely that the importance of these were as much oral and aural as they were graphic or linguistic.[3]

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[2] Shiloah, Amnon, and Ruth Tene. 2009. "Music Subjects in the Zohar." Edited by Joseph Levine, Richard Berlin, and Cantors Assembly. *Journal of Synagogue Music* 34, p. 132

[3] Idel, Moshe. 2019. *Vocal Rites and Broken Theologies: Cleaving to Vocables in R. Israel Ba'al Shem Tov's Mysticism.* Herder & Herder.

The first chapter will address the framework of science, delving into mathematical, physical, and psychological understandings of sound and how it can affect us. I will bring together literature regarding the influence of sound and music on our emotional states, the physical experiences of vibrations and hearing, and the mathematical relations of different sounds with one another. These include studies addressing how sound and music can affect the brain and emotions, which can be translated into states of mind that are more or less open to mystical experiences.

The second chapter explores a small selection of Jewish spiritual and mystical texts regarding sound and music. These texts cover such ideas as sounds as forces of creation (both by G-d as well as by creators of sound in the world, human or otherwise), mystical associations with letters and words as vocables, the inherent sounds of celestial and earthly bodies, the power of *nigunim*, and our understanding of the voice of G-d. While Jewish mystical texts abound regarding the spiritual aspect of sound and music (and for that matter, non-Jewish texts that extol sound as a spiritual tool), the focus of this chapter is highlighting a few perspectives that could reshape our understandings and experiences of sound.

The third chapter explores a small selection of local Jewish prayer spaces (Park Avenue Synagogue in Manhattan, Congregation Beth Elohim in Brooklyn, Congregation Beit Simchat Torah in Manhattan, Har HaLebanon in Brooklyn, and Minyan Atara in Brooklyn), observing some notes about the experiences of sound (both purposeful and accidental) in those contexts. These observations provide an opportunity to connect the

sonic experiences to the mystical and scientific explorations of the previous two chapters, in order to allow for a deeper understanding of the sounds present in those spaces. Through my visits to these prayer spaces, I ultimately suggest that by developing a deeper understanding about the ways that sound functions and acts upon a person (both scientific and mystical), individuals can develop more meaningful prayer practices.

Upon beginning the project; I had initially believed that the primary goal would be to adjust our soundscapes (managing sounds such as shuffling feet, jingling *rimonim*/torah dressings, flipping pages, amplification/feedback, etc.) to facilitate these experiences for our congregants. The learning, I will argue, can make any sonic experience potentially more meaningful via a greater understanding of the mystical and physio-/psycho-acoustic potential of any sound, and is ultimately more valuable than adjusting the sounds themselves. I suggest that once a new experiential framework, informed by science and/or spiritual texts, is in play, the sounds could potentially be adjusted; however, I believe that one of the takeaways of this thesis is that all sound is inherently holy, if we allow ourselves to hear it as such. Rather than determining what sounds needed to be adjusted, I believe we can learn to understand all sounds as having the capacity to evoke mystical experiences.

Ultimately, I hope that the research assembled in this thesis will be utilized in the future to help educate ourselves and our congregations about the potential of sound to open the door to mystical and spiritual experiences. While I do not believe these to be the only frameworks with which to understand sound's capacity to do this, I would argue that

the lenses of science and mystical texts, individually and in tandem, provide within themselves a wealth of entryways into these experiences. By changing our approach to listening, experiencing, and understanding sound—sound that we hear, make, and experience as inaudible vibrations—we may create new ways of connecting with and relating to G-d and each other.

Chapter 1: The Science of Sound

Purposes for exploring sound through a scientific lens

A greater understanding of sound in a scientific context provides one doorway into a deeper and more expansive understanding of what sound can be, and how it can affect our physical and spiritual selves. When considering what sound is and can be, our congregations and cantorial leadership often think solely about specific pieces of music, but may not consider the depth of the elements that make up this music or the broader soundscape of audible/vibratory prayer, of which music is only one example. By exploring sound more broadly, considering each sound in vibratory and auditory contexts, and recognizing the rich series of overtones and harmonics that create the timbres and sonic experiences that affect us with or without our knowledge, congregations and leaders alike may allow ourselves to be open to deeper relationship with the sounds themselves, and the greater vibratory world that they represent. In this chapter, I will explore a selection of scientific approaches to sound, including: how to define and measure sound in physical and psychological frameworks, the development of hearing in an evolutionary context, the effect of audible and inaudible vibratory stimuli on the body and brain, and the neurological response to audiation without said physical vibratory stimuli.

Physics vs. psychology: defining and measuring sound

Scientists generally approach the study of sound through the disciplinary methods of physics and psychology.[4] Within the realm of physics, sound is an acoustical phenomenon that is measured by frequency (the speed of the vibrations), amplitude (the high and low peaks of the vibrations), waveform (the amplitude measured along a timeline[5]) and phase (the position of a point within a repetitive waveform, most meaningful in how it relates to other sound waves).[6] These measurable aspects of sound can speak to the vibratory nature of it in a purely acoustic sense; however, the experience of sound within the human body and in a complex environment presents an entirely different realm of science.

Sound as a purely physical concept can refer to the full range of vibrations and pressure changes, regardless of perceptibility by the human ear and brain. In understanding sound phenomenologically (that is, as defined by the experience thereof) the vibrational nature of sound is filtered through a complex network of biological and psychological frameworks to be, ultimately, heard and interpreted by the brain. The cochlear system filters and maps vibratory stimuli onto the psychophysical experience of

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[4]Horowitz, Seth. 2012. *The Universal Sense*. Bloomsbury Publishing USA. (Location 263)

[5]Purves, Dale, George J. Augustine, David Fitzpatrick, Lawrence C. Katz, Anthony-Samuel LaMantia, James O. McNamara, and S. Mark Williams. 2001. "Sound." *Neuroscience. 2nd Edition*. https://www.ncbi.nlm.nih.gov/books/NBK11126/.

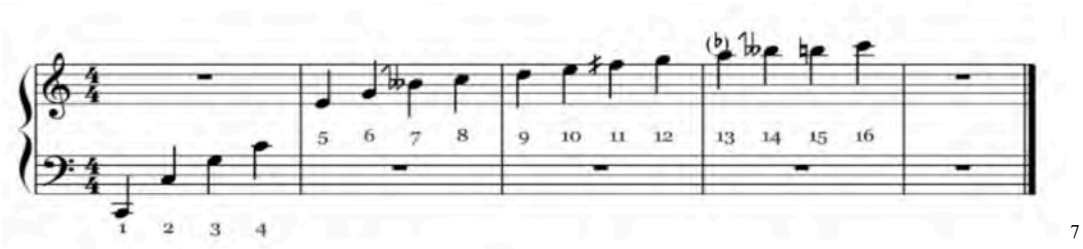
[6]Knowlton, Chris. 2021. "Introduction to Phase." Discovery of Sound in the Sea. 2021. https://dosits.org/science/advanced-topics/phase/#:~:text=An%20important%20characteristic%20of%20a.

sound. Because of this, the experience of sound as a heard experience, perceived by humans, is limited to the limited spectrum of frequency and amplitude that the human ear and nervous system can detect.

Similarly, the quantifiable descriptors of sounds as a strictly physical/acoustic phenomenon become different qualities when filtered through the lens of human perception. Amplitude is perceived as volume/dynamics, and frequency as pitch. Waveform and phase contribute to the timbre or quality of the sound, by means of affecting the perceived harmonic overtones of the fundamental pitch.

These overtones are a critical element to how sound is perceived, and their relationship to one another and to the fundamental pitch are what is known as the musical harmonic series. This series is a set of partials, or overtones, that sound naturally above the original pitch, following a pattern of small integer ratios increasing by one for each subsequent pitch (i.e. 1:2, 2:3, 3:4, etc.; see Figure 1 for a depiction of the harmonic series built over the fundamental pitch of C2 through the sixteenth partial).

Figure 1:



[7]

[7]Some of the notes in Figure 1 have unusual markings (or "accidentals") next to or above them. These markings denote pitches that are not typically part of the Western scales. The seventh and fourteenth partials are slightly lower than the typical B flat, the eleventh partial is an F quarter-sharp, and the thirteenth partial

These ratios correspond to consonant intervals tuned justly, so that the waveforms of the fundamental are compatible, and not interfering with one another. These also correspond approximately with intervals in a major or minor scale in Western musical notation; however, because of the asymptotic nature of the series, the math does not allow for these justly-tuned intervals to function in relation to one another within a fixed system. For example, the interval of a perfect octave has a ratio of 2:1, and the major third 5:4; however, despite an octave being comprised of three major thirds, there is a slight difference in the tuning of each, and the mathematical sum of three major thirds, $(5:4)^3$ equals 125:64, rather than 2:1. Larger intervals are literally different from the sum of their parts, and the series itself never converges upon its absolute limit (with fractions represented by the rations getting infinitely smaller, but never reaching zero—½, ⅓, ¼, *ad infinitum*).

The discrepancy between frequencies is called a "comma," and historically, tuners and builders of statically tuned instruments have sought ways to hide the comma in their temperaments. The current most prevalent system of tuning is "equal temperament," in which the 2:1 ratio of a perfect octave is split into twelve equal semitones, allowing for all keys to function with the same intervallic relationships, but at the expense of justly tuned intervals within the perfect octave. These mathematical limitations are still present when dealing with unfixed instruments, such as the voice, but the flexibility of the instrument allows for real-time fine-tuning to approach greater consonance. That said,

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is a slightly flat A. Notably, the 6:7 ratio involving the extra lowered B flat does find its way into Western music in blues and jazz, and that extra-small minor third ratio is known as the "blues third." (Diagram by author)

because of the extreme prevalence of equal temperament in Western music, truly consonant intervals are not necessarily the goal in practice, but rather musicians and singers tend to use their memory of equally tempered instruments as the basis of what they consider in-tune intervals. This means that the intervals in most music are not small-integer ratios, and thus the "out of tune" waveforms interfere with one another, creating acoustical beats, which manifest in a wavering sound.

This is notable because it suggests that even the intervals that are considered consonant and in-tune by Western ears are, besides the octave, distinctly out of tune, and have simply become accepted. Their acoustic properties, however, create a beat pattern that could otherwise be (and, historically, would have been) heard as out of tune. That said, it is important to note that some cultures do not perceive dissonance as unpleasant; the tradition of Javanese *gamelan* music, for example, suggests that the acoustical beats created by the interfering waveforms as particularly beautiful, and will purposefully tune instruments slightly off from one another to enhance that aspect. A study by Carterette and Kendall confirms that "the Javanese people crave stretched octaves in their gamelans," in which the 2:1 ratio of a consonant interval is expanded to at least 2.015:1.[8] Regardless of the cultural approach to tuning, however, the difference between consonance and dissonance has a physical and mathematical basis, and can affect the listening experience.

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[8]Carterette, Edward C., and Roger A. Kendall. 1994. "On the Tuning and Stretched Octave of Javanese Gamelans." *Leonardo Music Journal* 4: 59. https://doi.org/10.2307/1513182.

Evolutionary development of hearing

The precursor to hearing—sensitivity to vibration—developed in early, simple organisms to sense changes in the water currents as an evolutionary development that allowed for awareness of nearby predators or potential food sources.[9] As simple organisms grew in complexity, the ability to also make purposeful sounds developed, and hearing became a means of communicating and coordinating with other organisms well before the development of vocal apparati, which became the primary form of communication for terrestrial vertebrates.[10] The human hearing apparatus developed over time to hear best through the medium of air, with the changes in air pressure and vibrations vibrating the eardrum via the focusing cone of the outer ear, or *pinna*, which provides information on directionality of sound and boosts the ability to perceive lower frequencies. From the tympanic membrane of the eardrum, vibrations then pass to the hearing bones (*ossicles*) of the *malleus*, *incus*, and *stapes*, and from there, to the "oval window, the portal to the fluid-filled cochlea of the human inner ear," which houses tiny hair cells that convert them into signals that can be understood by the brain.[11]

These hair cells transmit the sound-based signals through the auditory nerve to the nuclei of the cochlea, which sort them by their aforementioned properties of frequency, amplitude, and phase, and then to the lateral lemniscus, processing the properties related to timing[12]. The signals continue to the inferior colliculus, where sound is localized

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[9] Horowitz, 2012 location 317-320
[10] *Ibid*, location 317-329
[11] *Ibid*, location 679
[12] *Ibid,* location 1313

(utilizing input from both ears in relation to each other), and once it has parsed that orienting information, it is responsible for the "startle response" as a reaction to sound stimuli.[13] The inferior colliculus then sends the information to the area of the brain known as the auditory cortex, which brings awareness into the equation, decoding the information into understandable elements (addressing things such as word comprehension, tone identification).[14]

Effect of audible/inaudible vibrations on the body and nervous system

The experience of vibrations continues to have a primordially instinctive effect on humans, just as humans have dramatically affected the soundscape of the modern world. The ecological soundscape—the way in which a space relates to the sounds therein—consists of a combination of sounds labeled by Bernie Krause in 1987 as "biophonic" (sounds created by organisms) and "geophonic" (sounds created by non-biological, natural sources such as weather and earth movements), with the later addition of the term "anthrophonic" to describe sounds specifically created by humans.[15] All of these categories of sound can affect the human experience in a variety of manners,

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[13]Driscoll, Margaret E, and Prasanna Tadi. 2023. "Neuroanatomy, Inferior Colliculus." Nih.gov. StatPearls Publishing. August 14, 2023. https://www.ncbi.nlm.nih.gov/books/NBK554468.

[14] Horowitz, 2012, location 1319

[15]Pijanowski, Bryan C, Luis J Villanueva-Rivera, Sarah L Dumyahn, Almo Farina, Bernie L Krause, Brian M Napoletano, Stuart H Gage, and Nadia Pieretti. 2011. "Soundscape Ecology: The Science of Sound in the Landscape." *BioScience* 61 (203): 203–16. https://doi.org/10.1525/bio.2011.61.3.6.

including emotional, physical, perceptual, cognitive, existential, and developmental responses.[16]

Notably, the brain can be physically re-wired to respond in certain ways to auditory input. Exposure to certain sounds can create neural pathways that allow, for example, greater recognizability of that sound, even within a noisy environment that makes it difficult to separate from the background.[17] Similarly, the size of the auditory cortex, specifically in the left hemisphere of the brain, in humans who have received musical training is demonstrably greater than those who have not.[18] It follows that emotional responses (which are usually most associated with the left hemisphere of the brain) can be conditioned to respond positively or negatively to sounds through exposure.

The range of auditory frequencies perceptible by most humans runs from approximately 20 Hz to 20,000 Hz[19], with perceptibility of the extremes decreasing with age and exposure. That said, the full range of measurable frequencies ranges from the low end of the sound of black holes at a B flat 57 octaves below middle C (over a million, billion times lower than humanly-perceptible sound[20]) to the high end of 9,192,631,770 cycles per second, the sound of "an energized cesium-133 atom."[21] Despite being outside

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[16]Juslin, Barradas, and Eerola. 2015. "From Sound to Significance: Exploring the Mechanisms Underlying Emotional Reactions to Music." *The American Journal of Psychology 128 (3): 281. https://doi.org/10.5406/amerjpsyc.128.3.0281.*

[17] Horowitz, 2012*,* location 1420

[18]Hodges, Donald A. 2000. "Implication of Music and Brain Research." *Music Educators Journal* 87 (2): 17–22. https://doi.org/10.2307/3399643, p. 19

[19] Horowitz, 2012, location 443

[20] Whitehouse, David. "Black Hole Hums B Flat." BBC News. September 10, 2003. http://news.bbc.co.uk/2/hi/science/nature/3096776.stm.

[21] Horowitz, 2012, location 121

the realm of auditory sound, "non-auditory physiological acoustics" in the ranges of infrasound (frequencies too low to be heard) and ultrasound (frequencies too high to be heard) can cause physical and neurological responses in humans, such as low, ultrasonic frequencies causing nausea and affecting the enteric nervous system.[22]

Within the realm of audible frequencies, there are various aspects of sound that can create intense psychological responses. A 1986 study by D. Lynn Halpern, Randolph Blake, and James Hillenbrand explored the elements of sound that contributed to negative responses, specifically informed by the negative "chilling" effect of nails on a chalkboard and similar noises. They determined that a number of elements, including particularly low frequencies (rather than their anticipated result of high frequencies), aperiodic temporal structures, an irregularly and rapidly shifting amplitude/intensity, and strong resonance of particular overtones above the fundamental (see Figure 2). The strength of the response also increased when the subjects were aware that it was coming, and anticipating the unpleasantness.[23] The study's findings reported that the acoustic phenomenon of scraping across a chalkboard resembled the warning calls of macaque monkeys, and the authors suggest that the intensity of human response to this sound could be a vestigial reaction to what sounds like either that or another "naturally occurring, innately aversive event" or similar predatory call.[24]

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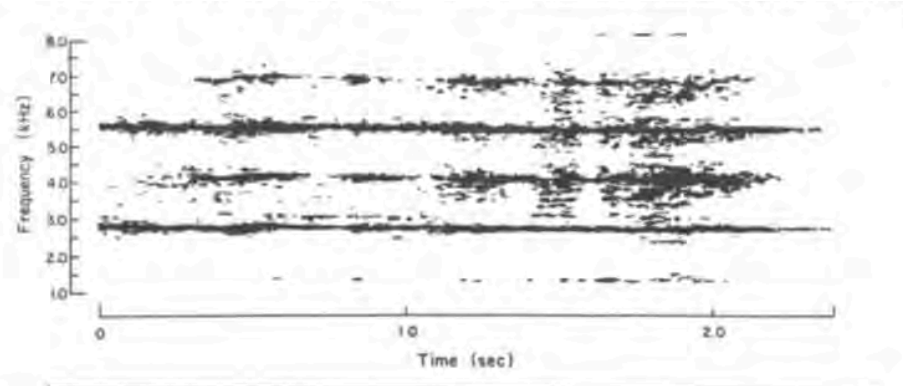
[22] *ibid.*, location 1533-1539
[23] Halpern, D. Lynn, Randolph Blake, and James Hillenbrand. 1986. "Psychoacoustics of a Chilling Sound." Perception & Psychophysics 39 (2): 77–80. https://doi.org/10.3758/bf03211488
[24] *Ibid,* p. 80

Figure 2: Spectrogram of scraped-blackboard signal (mapping frequency over time with prominent overtones) in the Halpern, Blake, and Hillenbrand study[25]



Horowitz, in his 2013 book, expanded upon this study to determine that the structure of the study's most unpleasant sounds displayed that the waveforms were "pseudo-random," repeating in an almost-periodic manner but with random variations. He suggests that these pseudo-random variations are what elicit the intense negative response, introducing an element of uncontrollability and unpredictability. Horowitz notes that sounds that have regular and periodic waveforms are not necessarily pleasant; the sound of angrily buzzing bees, for instance, can reliably arouse fear in human and animal subjects alike. He suggests that the responses are based on association, echoing the potential of neuroplasticity in response to sound stimuli mentioned previously.[26]

In the 2015 paper "From Sound to Significance: Exploring the Mechanisms Underlying Emotional Reactions to Music" by Juslin, Barradas, and Eerola, the authors identify eight underlying mechanisms of music that might be responsible for emotional

[25] *Ibid*, p. 78
[26]Horowitz, 2012, location 1586

responses to what is referred to in the study as the "musical event." These mechanisms include:

(1) Brain stem reflex: a hardwired attention response to simple acoustic features such as extreme or increased loudness or speed (Sokolov, 1963)

(2) Rhythmic entrainment: a gradual adjustment of an internal body rhythm (e.g. heart rate) toward an external rhythm in the music (Harrer & Harrer, 1977)

(3) Evaluative conditioning: a regular pairing of a piece of music and other positive or negative stimuli, leading to a conditioned association (Blair & Shimp, 1992)

(4) Contagion: an internal mimicry of the perceived voicelike emotional expression of the music (Juslin, 2000)

(5) Visual imagery: inner images of an emotional character conjured up by the listener through a metaphorical mapping of the musical structure (Osborne, 1980)

(6) Episodic memory: a conscious recollection of a particular event from the listener's past that is triggered by the music (Baumgartner, 1992)

(7) Musical expectancy: a response to the gradual unfolding of the syntactical structure of the music and its expected or unexpected continuation (Meyer, 1956)

(8) Aesthetic judgment: a subjective evaluation of the aesthetic value of the music based on an individual set of weighted criteria (Juslin, 2013) [27]

The authors of the study acknowledge that because humans rarely have a clear sense of the causality of their emotions and behaviors, studies that rely on self-reporting of emotional responses can be unreliable. Additionally, these eight mechanisms are difficult to separate from one another to determine the particular effects of each one. With that in mind, the study sought to test half of the mechanisms: brain stem reflex, contagion, episodic memory, and musical expectancy. Using pieces by highly-regarded composers that were unlikely to be known by the subjects (to have more control over the episodic memory element), sixty participants aged 19-58 with a variety of musical experience were asked to rate their emotional responses on fifteen scales, in addition to having their facial expressions and autonomic activity measured.

The authors hypothesized that "the brain stem reflex condition would evoke mainly surprise, the contagion condition would evoke mainly sadness, the expectancy condition would evoke mainly anxiety, and the memory condition would evoke mainly nostalgia and happiness."[28] The findings largely supported these theories, both as self-reported by the subjects and using the psychophysiological factor, which confirmed that these emotions were legitimately experienced, rather than just perceived in the music itself. Notably, the brain stem reflex mechanism provided the most uniformity in response,[29] connecting it to the similarly hard-wired "startle response" previously

[27] Juslin, Barradas, and Eerola, 2015, pp. 283-284
[28] *Ibid*, p. 286
[29] *Ibid*, p. 300

mentioned in relation to the inferior colliculus.[30] The results show that while emotional responses to music are certainly dependent on a number of individualized factors relating to the particular subject, there are both regular psychophysiological responses that can be expected from some specific factors, and also an ability for the brain's response to musical stimuli to be shaped by personal experience.

Additionally, though the Juslin et al. study focused on Western music and participants, a 2009 study by Fritz et al. studied participants familiar with Western music in conjunction with native African Mafa participants and music. The ability to recognize three basic emotional responses—happiness, sadness, and fear—was determined to cross cultural borders, and certain musical stimuli can reliably convey emotions regardless of familiarity with the style. Elements such as upbeat tempi and major modes were considered to elicit happy responses by both Mafa and Western subjects, slower tempi and minor modes evocative of a fear response, and indefinite mode correlated to sadness.[31] For both categories of participants, the experimental manipulations of the pieces had similar effects; increased "sensory dissonance" and spectral complexity elicited responses of unpleasantness for both, despite the Mafas' general preference for more instruments in a recording.[32]

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[30] Horowitz, 2012, location 284
[31]Fritz, Thomas. 2009. "Universal Recognition of Three Basic Emotions in Music." *Current Biology* 19 (7): 573–76. https://doi.org/10.1016/j.cub.2009.02.058.
[32] *ibid.*

Neurological response to audiation without vibratory stimuli

While this paper has mostly explored sound as both a physical- and psycho-acoustic phenomenon, the experience of sound as a solely psychological/neurological experience, without the actual physical stimulus of vibration, can also elicit strong responses. The brain, for instance, has the ability to calculate missing frequencies and "hear" things that aren't there; Horowitz provides the example of most phones and inexpensive speakers being unable to transmit frequencies lower than 300-400 Hz, which doesn't cover the fundamental frequency of an adult bass/baritone speaking range, between 150 and 200 Hz. When the sound comes through the speakers, what the ear hears are the patterns of overtones above the fundamental, rather than the fundamental itself. Reflexively, the brain computes the missing fundamental by the relationships of the harmonics, and, neurologically speaking, actually hears the missing fundamental pitch.[33] The brain also has the ability to audiate, or to imagine sound stimuli without the physical existence of even some harmonics, as a form of musical imagery. Studies using neuroimaging technology have shown that the auditory cortex responds in some ways as if the sound is physically being heard, activating as if sound is being perceived in real time.[34]

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[33] Horowitz, 2012, location 881-887

[34] King, Andrew J. 2006. "Auditory Neuroscience: Activating the Cortex without Sound." *Current Biology* 16 (11): R410–11. https://doi.org/10.1016/j.cub.2006.05.012.

Chapter 2: Sound in Jewish Mystical Perspective

Defining Sound in a Mystical Context: Practical and Ethical Concerns

Jewish mystical texts, both modern and ancient, uplift sound and music as tools of spirituality, *d'veikut* ("cleaving" to G-d), Torah, and creation itself. In many ways, the kabbalistic views of sound and its effects on the body and spirit align with the scientific studies of the previous chapter. That said, this paper does not seek to prove or validate mystical claims through scientific means; rather, it seeks to assemble views on the use and effectiveness of sound and sound manipulation to facilitate mystical experiences, with both scientific and mystical perspectives.

Though mystical texts may not "define" sound in a unilaterally clear way, there are several ways of understanding what it is and how it functions. The question of whether sounds are music only due to or regardless of our ability to hear them as such is a phenomenological argument outside the scope of this paper, but for the purposes of this chapter, as stated previously, all sounds have the potential to be interpreted as music or song by the listener. In his book *Sound and Vibration: Tuning to the Echoes of Creation*, Rav Dovber Pinson posits that "the physical vibrations and movements of this world reflect spiritual movements and vibrations emanating from within the 'stillness' and Oneness of the *Ohr Ein Sof* / Infinite Light out into the world," and that in this sense, "all

of Creation is therefore quite literally an echo of the Song of the Creator."[35] From this, we can extrapolate that existence is a vibratory reality that can be understood as the echoes of the sound of creation/the Creator. Sound, Pinson claims, is a tool for releasing our "egoistic dependencies and defense mechanisms" as we "merge our vibration into the cosmic sonic stream."[36] In Pinson's definition, as in the eyes of many mystical writers, sound operates both as physical as well as spiritual/cosmic/Divine vibrations, and these vibrations can be attuned to each other. G-d is the "cosmic Source of All Sound,"[37] and the world is comprised of sound and vibration itself.

While sound/vibration as a concept is omnipresent in this cosmology, it is considered to be a component or building block of some other notable terms, among them music and utterances. Pirkei Avot 5:1 suggests that the world was created through "Ten Divine Utterances" or *asarah ma'amarot* (עֲשָׂרָה מַאֲמָרוֹת).[38] These *ma'amarot* are themselves composed of two stages: a "unified, undifferentiated *Kol* [קוֹל] / voice or sound coming from deep within [...] prior to articulation or specific meaning;" and speech, or *dibbur* (דִּבּוּר), which forms words with meaning beyond the "primordial sound" of the *kol* through the use of *otiyot* (אוֹתִיּוֹת) or letters.[39]

Music, on the other hand, is a matter of perspective, in the ear of the beholder, to repurpose the cliché. Midrash T'hilim 33:1 states that "everything sings before [G-d], the

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[35] Pinson, Dovber. 2019. *Sound and Vibration: Tuning into the Echoes of Creation*. Iyyun Publishing. pp. 13-14
[36] *ibid*.
[37] *ibid.*
[38] Pirkei Avot, 5:1
[39] Pinson, 2019, p. 14

heavens and the earth, the sun and the moon, and the stars of light."[40] The *Zohar* refers to the movement of the celestial bodies as "songs," but states that only Moses and Joshua were able to hear "the melodious sound of the sun" (and, for that matter, Joshua was unable to bear its sound).[41] Throughout Tanach, the movements and actions of celestial beings are referred to as "singing," such as in Job, 38:7:

בְּרָן־יַחַד כֹּוכְבֵי בֹקֶר וַיָּרִיעוּ כָּל־בְּנֵי אֱלֹקִים׃

"When the morning stars sang together, and all the divine beings shouted for joy."[42]

Interestingly, the word used for "sang," *b'ran* (בְּרָן), is itself an ambiguous verb, from *ranan* (רָנַן): it can mean to "ring out," "cry out," or "shout for joy," in addition to "singing out," creating an expansive understanding of song and singing.

In his *Guide for the Perplexed*, Moses Maimonides (Rambam) supports this idea that the sounds of the celestial spheres are music, but not always heard or understood by human ears:

מן הדעות העתיקות הנפוצות אצל הפילוסופים וכלל בני האדם, היא שתנועת הגלגלים גורמת לקולות מבהילים מאוד ואדירים. ראייתם לכך היתה שהם אמרו: כשהגרמים הקטנים

It is one of the ancient beliefs, both among the philosophers and other people, that the motions of the spheres produced mighty and fearful sounds. They observed how little objects produced by rapid motion a

[40] Midrash T'hilim, 33:1
[41] Yeruḥam Fishel Lachower and Isaiah Tishby, *The Wisdom of the Zohar, Vol. II.* (Oxford University Press, 1989), 660-661
[42] Job, 38:7, JPS translation

הנמצאים אצלנו נעים תנועה מהירה, נשמע מהם קול שקשוק אדיר וזמזום מחריד; קל וחומר גרמי השמש והירח והכוכבים, בגודלם ובמהירותם כפי שהם. כל סיעת פיתגורס מאמינה שהם משמיעים קולות עַרֵבים והרמוניים למרות גודלם, כהרמוניית הלחנים המוזיקליים.	*loud, shrilling, and terrifying noise, and concluded that this must to a far higher degree be the case with the bodies of the sun, the moon and the stars, considering their greatness and their velocity. The Pythagoreans believed that the sounds were pleasant, and, though loud, had the same proportions to each other as the musical notes.*[43]

Rav Pinson expands upon this idea, suggesting that the celestial bodies and in fact all things are creating not just sounds, but songs/music: "as everything moves, including stones, everything is emitting sounds, vibrations and music. The sounds produced by the tree 'treeing' and the lion 'lioning' make up their languages and means of expression. Certainly, it is easier to appreciate the 'language' of creations that have perceivable vocal communication. But this is also spiritually and poetically true of all nature, even the seemingly silent stones. Everything is singing its own song, and there are some very sensitive souls who are attuned to the world's whisper."[44] Similarly, in describing the references to music in the *Zohar*, Amnon Shiloah tells us that "not only the angels sing: the stars, the spheres and the *Merkavah*, the trees in the Garden of Eden and their perfumes, indeed the whole universe sings before G-d. The great power of this song, and the fact that the people of Israel sing below in parallel with the Divine music, makes the

[43] Moses Maimonides, *Guide for the Perplexed*, 1190 (trans. Friedlander, 1903) 2:8:1

[44] Pinson, 2019, p. 44

Jews' singing exercise an influence both on the supernal song and on the Divine world itself."[45]

We can explore these songs of the world through our texts, such as *Perek Shirah*, which begins with a story of King David completing the book of Psalms and proudly boasting, "Is there any creature you have created in your world that says more songs and praises than I?" In response, a frog calls out, "David! Do not become proud, for I recite more songs and praises than you. Furthermore, every song I say contains three thousand parables, as it says, 'And he spoke three thousand parables, and his songs were one thousand five hundred.'"[46] It continues by exploring the songs of the world from all of the inhabitants of the earth, not merely those who emit vocal utterances. Pinson reminds readers that *Perek Shirah* is not giving literal lyrics to the sounds of nature, but rather giving humans a means of understanding the sounds themselves as music and song, when it is not necessarily in our nature to understand them as such.[47]

Just as these texts have the capacity to help us understand the songs/sounds of all things, the sounds of things also have the ability to help us understand texts. In a letter to his brother-in-law, the Ba'al Shem Tov offered a means of praying that might help him better understand Torah:

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[45] Shiloah, "Music Subjects in the *Zohar*," 135

[46] Slifkin, Natan, and Aharon N. Varady, trans. 2009. Perek Shirah. Zoo Torah. https://www.sefaria.org/Perek_Shirah%2C_Introductory_Text.3?lang=bi&with=About&lang2=en.

[47] Pinson, 2019, p. 45

> …that during your prayer and your study [of the Torah] you shall comprehend and unify each and every speech and you should understand the utterance of your lips, because in each and every letter/sound there are worlds and souls and divinity, and they ascend and combine and unify with each other and with the G-dhead, and afterwards they [the vocables] combine and become a word and they unite in a perfect union with the G-dhead, and [then] the soul will be integrated [into the G-dhead] with them in each and every aspect of them, and all the worlds are united as one, and they ascend and become joy and great delight."[48]

The practice of cleaving to the sounds of the letters as a means of cleaving to G-d is a common one for the *Besht*; as the vocables ascend, so too can the one vocalizing/pronouncing them, facilitating a sense of increased closeness with the Divine.

Sound as Creation

In the first chapter of the first book of the Torah, *B'reishit*, the days of creation are marked by speech; G-d speaks aloud the things to be created, often with the formula *vayomer Elokim* (וַיֹּאמֶר אֱלֹקִים), "And G-d said" in the pattern of the aforementioned *asarah ma'amarot*. However, as we are reminded in Talmud Tractate Rosh Hashanah 32a, this pattern of *vayomer Elokim* actually only takes place nine times, rather than the aforementioned ten. The Gemara's response to its own question is that the first word of

[48] Idel, 2019*,* pp. 55-56

the Torah, *b'reishit*, (בְּרֵאשִׁית), meaning "in the beginning," is the tenth utterance. With the proof text of Psalm 33:6 "By the word of Adonai were the heavens made," it suggests that in this single utterance, this *ma'amar echad,* all matter came into existence, and was then differentiated by the following nine utterances, bringing the entire world into being.

In *Sha'arei HaYichud vehaEmunah*, from the *Tanya* by Rabbi Schneur Zalman of Liadi, this idea is explored further; the text acknowledges that in the *asarah ma'amarot*, stones are not mentioned. This raises the questions: how did they get created, if speaking things into existence is how they are made, and how are the letters/sounds of the ten utterances incorporated or "enclothed" within them?[49] It explains:

אַף־עַל־פִּי־כֵן, נִמְשָׁךְ חַיּוּת לָאֶבֶן עַל יְדֵי צֵירוּפִים וְחִילּוּפֵי אוֹתִיּוֹת	Nevertheless, life-force flows to the stone from the ten utterances by means of combinations and substitutions of their letters[50]

These re-combinations are known as *tziruf* (צירוף), the art of rearranging letters into new permutations that create new realities.[51] Similarly, substitutions may take place, in which related letters can be used in place of one another to create new *d'varim*, words/things.

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[49]Rabbi Schneur Zalman of Liadi, elucidated by Rabbi Yosef Wineberg. n.d. "Tanya." Chabad.org. Kehot Publication Society. https://www.chabad.org/library/tanya/tanya_cdo/aid/7987/jewish/Chapter-1.htm.

[50] *ibid.*

[51] Sefer Yetzirah, 2:2-6; Pinson 2019, pp. 27, 76

The parallels between this cosmological concept and the scientific idea of the Big Bang are striking indeed, as is the overlap between the vibrational understanding of all matter and energy with the concept of string theory. As expressed again by Rav Pinson: "to create physical reality, a spiritual vibration or metaphysical sound is uttered, giving rise to a defined physical vibration and flow of energy, which gradually condenses and is then solidified as actual matter."[52] Existence is brought into being through a cosmic vibration, from which distinctions and differentiations develop. In that vein, language and sound as we as humans can wield it also can be understood to hold creative power; in Talmud tractate *B'rachot* 55a, for example, Betzalel's creative ability in designing the tabernacle is due to his ability to know "how to join the letters with which the heaven and earth were created."[53] Even the ubiquitous magical phrase "abracadabra" is arguably from the Aramaic *ab'ra k'dab'ra* "I will create as I speak."[54]

The Power of Letters/Vocables

The ancient kabbalistic text *Sefer Yetzirah* delves deeply into the letters that, it claims, are the sounds of creation. It speaks of the "עשרים ושתים אותיות יסוד," the "twenty-two letters of foundation," which consist of "three mothers [*aleph* (א), *mem* (מ), and *shin* (ש)], seven doubles [*bet* (ב), *gimel* (ג), *dalet* (ד), *chaf* (כ), *pei* (פ), *reish* (ר), and *tav* (ת)], and twelve simple ones [*hei* (ה), *vav* (ו), *zayin* (ז), *chet* (ח), *tet* (ט), *yud* (י), *lamed*

[52] Pinson, 2019, p. 32
[53] B'rachot 55a:13
[54] Pinson, 2019, p. 30

(ל), *nun* (נ), *samech* (ס), *ayin* (ע), *tzadik* (צ), and *kuf* (ק)]."[55] The "mother" letters are associated with fire, water, and air, and from these primordial elements proceed the differentiations between heaven and earth, and themselves can be combined through the aforementioned art of *tziruf.*

Aleph is the "silent beginning of all sound," the "quiet opening of the throat" that precedes vocalization.[56] *Sefer Yetzirah* posits that it reigns in the air (**אויר**), and that it is sealed in the world and in the lungs of humans[57]. Similarly, *mem* reigns over water (**מים**), residing in the waters of the earth and the stomachs of humans,[58] and is the "end of all sound," the sound of a closed mouth.[59] Finally, *shin* is the sound of "hushing," as confirmed by Rashi in his commentary on Numbers 13:30 (speaking of the sound Caleb made to hush the people before Moses)[60]; it reigns in fire (**אש**) and is sealed in the heavens (**שמים**) and in the heads of humans.[61] Notably, these sounds of creation are also sounds heard in utero, and replicating the humming and shushing as heard in the womb is distinctly calming for most humans (particularly infants).

The seven double letters are those which can be altered in sound through the use of a dagesh, such as *bet/vet, kaf/chaf*, etc. Some of these letters are not understood to shift in pronunciation in modern Hebrew, but do in specific dialects (such as a Yemenite differentiation between and hard or soft *gimel* or *reish* and some Sephardim's

[55] Sefer Yetzirah, 2:1
[56] Pinson, 2019, p. 27
[57] Sefer Yetzirah, 3:6
[58] *Ibid*, 3:7
[59] Pinson, 2019, p. 27
[60] Rashi on Num 13:30
[61] Sefer Yetzirah, 3:8

differentiation between the hard and soft *dalet*), and it is understood that all once had "harsh" and "soft" pronunciations.[62] The first three and last four of these letters spell *beged* (בגד) and *kaporet* (כפרת), meaning garment and covering respectively. These letters (and thus, sounds) can be seen as clothing the universe, creating more distinctions and differentiations to the primordial vibrations of existence; Rav Pinson notes that the final four letters of this category also can be rearranged to spell *parochet* (פרכת), referring to the curtain or partition that separates the Holy of Holies in the Mishkan, or the curtain of our modern ark/*aron hakodesh*.[63] As they number seven, they are assigned associations with the days of the week, the seven (observable, at the time) planets, the "orifices of perception" (nostrils, ears, eyes, and mouth), etc.[64]

The remaining twelve letters/sounds also have kabbalistic associations with directions in space, divisions of the heavens, organs of the body, and months. They additionally each have associations with "fundamental properties:" those of "sight, hearing, smell, speech, desire for food, the sexual appetite, movement, anger, mirth, thought, sleep, and work."[65] With the previously listed letters, these can be combined to not just name, but, mystical thought suggests, create all things; paraphrasing the words of Abraham Abulafia and the *Sefer ha-Peli'ah*, Dov Schwartz says "as the series of sounds

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[62] Pinson, Sound and Vibration, 28, 42
[63] *ibid.*
[64] Sefer Yetzirah, 4:4
[65] *Ibid.,* 5:1

creates a melody, and the series of different sounds simultaneously create harmony, combinations of letters create words and even objects.[66]

Besides these consonants, the vowels, as demarcated by *n'kudot*/vowel points, also have mystical associations. The kabbalistic text *Sefer HaBahir* claims that these vowel points "are to the letters like the soul, which lives in the body of man."[67] The vowel sounds represented by these *n'kudot* are considered to correspond with the ten basic *sefirot*, aspects of the Divine as mapped onto the kabbalistic tree of life. They also have associations with their phonetic qualities; the vowel of *kamatz*, sounding as "aw" or "o," is considered a "closed sound," just as the name itself is related to the verb *likmotz*, to close/clench a hand. It even closes from the "aw" to the "o" sound depending on its context within a word, as if clenching itself like its namesake verb. Rabbeinu Bachya, in his Torah commentary, refers to it as the "highest ranking" of all the seven main vowels, which he suggests are the pillars upon which Torah (and thus, everything) rests.[68] It is considered to bridge the division between Unity/Oneness and multiplicity, as well as silence and sound, and is associated with the *sefirah* of *Keter*, the "bridge between the *Ein Sof* and all the lower *sefirot*."[69] The vowel *patach*, on the other hand, means "opening," and the sound it makes is also a sound of the mouth opening expansively, or the sound we make "when an idea or concept becomes clear to us, as in, 'Ah, now I am

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[66]Schwartz, Dov. 2022. The Soul Seeks Its Melodies: Music in Jewish Thought. Translated by Batya Stein. Brookline, MA: Academic Studies Press, p. 179
[67] Kaplan, Aryeh, trans. 2001. *Sefer HaBahir.* Weiser Books, p. 30
[68] Rabbeinu Bachya, Bereshit 18:3
[69] Pinson, 2019, p. 180

beginning to understand,' or 'This was an *aha* moment for me;" it is thus associated with the *sefirah* of *Chochmah*, wisdom.[70]

The aspect of *Binah*, comprehension and understanding, is associated with the vowel *tzeirei*, making the "ei" sound; a shift from the initial understanding of "aha" to the vowel heard in "hey!"[71] When a dot is added to this vowel, it expands into the more open vowel of *segol*, making the "eh" sound.[72] This expansiveness contributes to its association with *chesed*, the attribute of lovingkindness. The *sh'va* vowel is associated with *G'vurah*, meaning strength/restraint: an appropriate association for a vowel that functions as a brief pause itself. The "penetrating" sound of the *chirik* ("ee") is associated with the aspect of *Netzach*, perseverance/victory.[73]

The "oh" or "oy" sounds of the *cholam* are sounds of compassion, associated with *Tiferet*, the aspect of beauty, harmony, and compassion itself. These are sounds one might make unbidden when seeing another in distress, or feeling pain oneself. The "oo" sounds of the *kubutz* and *shuruk* are associated with *Hod* (thankfulness/humility) and *Yesod* (foundation/relationship) respectively. While the vowels themselves might make the same sound, the placement of them as vowel markings around the consonants give them different meaning; the *kubutz,* found under the vowel as most of the other vowels are, has the association with wonder and awe associated with the "oooh" one might say at seeing something amazing. The *shuruk*, on the other hand, is found in front of its associated

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[70] *Ibid*., p. 181
[71] *Ibid.*
[72] Rabbeinu Bachya, Bereishit 18:3
[73] Pinson, 2019, p. 182

letter, suggesting "an outward movement;" this, says Rav Pinson, "is the idea of *Yesod*, to connect and form relationships with others."[74]

Finally, the lowest *sefirah* of *Malchut* (sovereignty, or, with its parallel association with *Shechinah*, the indwelling presence of the Divine) is associated with the absence of a vowel; Pinson explains that as this aspect "simply 'receives' from Above and has no Light of its own, so too this vowel has no sound of its own. It only receives the resonances that are given to it from beyond it, or it may remain silent.[75] That said, as will be explored in the following chapter, silence or complete lack of vibration is not a practical reality in our world, and so it rather could be understood to make space for the ambient sound, another example of receptivity.

Though we have been primarily discussing Hebrew words (as Hebrew is ostensibly *lashon haKodesh*, the holy language), even our mystic writers and sages acknowledge that these sounds exist and contain power outside of the language itself. In Talmud tractate Shabbat 88b, both Rabbi Yochanan and the school of Rabbi Yishmael say, "each and every utterance that emerged from the mouth of the Almighty divided into seventy languages."[76] As seventy is often a stand-in number for any large or unmeasurable quantity, this suggests that all languages, not just Hebrew, are composed of the same sounds of creation. The mystic Abraham Abulafia notes that the phrase *shivim l'shonot* (שבעים לשונות), seventy languages, has the same numerical value (in accordance with *gematria*, which assigns each letter a number) as the phrase *tziruf ha'otiyot* (צירוף

[74] *Ibid.*
[75] *Ibid*.
[76] Translation from William Davidson Talmud, 2017, Shabbat 88:b

האותיות), suggesting that all languages are themselves recombinations of the primordial sounds used to create the universe.[77]

Nigunim

A discussion of sound and mysticism would be incomplete without mention of *nigunim*, melodies without or beyond words, though a full exploration of the meaning and application of this art and practice are beyond the scope of this paper. In chasidic thought, teachings and wisdom can be transmitted through *nigunim*, which go beyond mere songs and melodies into something that (like the aforementioned sounds/letters) can raise up the listener to closeness or *d'veikut* to G-d.[78] Rabbi Nachman of Breslov, in his *Likutei Moharan,* suggests that *nigunim* are made by "gathering the good *ruach* (energy or breath) from the *ruach* of gloom, depression; [...] music is made through the separation of good from evil; by selecting and gathering the good points from the bad, melodies and songs are created."[79] The creation of *nigunim* thus mirrors the biblical act of creation; from the chaos of homogeneity to the order of distinction. Just as G-d brings about differentiation (creating identity, separating waters above from below, determining goodness, as in "G-d saw that it was good," etc."[80]), so too does humanity have the ability

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[77] Pinson, 2019, p. 35
[78]Dovber Pinson. 2000. *Inner Rhythms: The Kabbalah of Music.* Northvale, NJ: Jason Aronson, Inc., p. 17
[79] Likutei Moharan 282:2
[80] Gen. 1:1-31

to create *nigunim* as song out of a chaos of noise, bringing meaning into what was otherwise *tohu vavohu* (תֹּהוּ וָבֹהוּ)[81], the formless void before the creative act of distinction.

The creation of *nigunim* by master teachers imbues them with the character and teachings of the creators themselves. In some cases, it was understood that teachings could *only* be understood through melodies; Rabbi Schneur Zalman of Liadi, author of the *Tanya,* is reported to have told a group of *chasidim* who approached him about their inability to understand the text: "You can't *get* half of anything. To understand the *Tanya* you need the music that comes with it."[82] According to Shalom DovBer Schneerson, fifth Rebbe of Chabad, "Early chasidim would say: When you tell a story about the Rebbe, you bond yourself to the Rebbe's faculty of action. When you repeat a teaching of the Rebbe, you bond with the Rebbe's faculty of speech. When you sing a melody composed by the Rebbe, you bond with the Rebbe's faculty of thought."[83]

Besides the intention and spiritual power imbued into the *nigunim*, the movement of the melodies themselves also pulls the one singing and hearing it into different states of being. For an example: in describing *Arbah Bavot*, otherwise known as the Alter Rebbe's *nigun*, Rabbi Shalom DovBer describes the four sections (or "portals") of the melody having distinct effects on the singer/listener. The first portal, which starts low and

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[81] Gen 1:2

[82] Rabbi Shalom DovBer Schneerson of Lubavitch, and trans. Eli Rubin and Tzi Freedman. 2012. "Chabad in a Song: How Rabbi Schneur Zalman Captured the Soul of His Teachings in a Melody." Chabad.org. December 29, 2012. https://www.chabad.org/library/article_cdo/aid/2087237/jewish/Chabad-in-a-Song-How-Rabbi-Schneur-Zalman-Captured-the-Soul-of-His-Teachings-in-a-Melody.htm.

[83] *ibid*

reaches upward before falling back, quickly obscures its own tonality, making it unclear where the tonal center lies by emphasizing both the starting note and the fourth above. Rabbi Shalom DovBer explains that by doing this, "the melody shakes you up. It shifts you from your place, so that you break away from the mundane environment, from mundane worries and concerns, from all the things you need. Then it continues, taking you into a yet deeper state of thought. You begin to ponder why you are needed, what is the purpose of being in this world."[84] This existential crisis creates a state of vulnerability that removes some of the boundaries to the possibility of *d'veikut*.

The second portal continues reaching upward, before sliding back down to even lower than it began; that is followed, however, by a new reaching up, higher even than before. DovBer describes it as beginning with bitterness, but quickly moving into hopefulness, as if the upward movement of the melody "emerges from a sense of your essential self-worth—from the sense that after all, regardless of your lowly spiritual state, you are a human being, the chosen of all creations, and you can always return and set yourself back in the place where you belong."[85] After the ascent, this section ends back where the first started, but the singer is changed by the movement of the melody, not returning to the same state of bitterness or hopelessness, but carrying the hope of the uplift with them.

The third section, beginning low again, bridges the divide between the bitterness still present in the second portal and the heights (both literal and spiritual) of the fourth

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[84] *ibid.*
[85] *ibid.*

portal. With greater energy and movement in its rhythmic content than found so far, it takes on the role of creating space for "transcendent elevation along with an outpouring of the soul."[86] It continues the journey of shifting off the boundaries and barriers to *d'veikut*, and, staying in the lower/mid range of the composition, stirs a deep longing for greater ascent/elevation.

Finally, in the fourth and final portal, the melody quickly reaches heights not yet heard, ultimately leaping up to a perfect fifth above what was previously the highest note of the *nigun*. It soars upwards, creating what Rabbi Shalom DovBer refers to as "Not mere elevation of the soul (רוממות הנפש), but euphoria of the soul (עליצת הנפש)."[87] The soul is purified and uplifted to a point of "quintessential euphoria born of the quintessential delight that derives from the quintessence of the soul (עליצה עצמית פון תענוג העצמי מצד עצם הנשמה)."[88] And yet, the ascent of the melodic line is followed by a dynamic descent, creating a push-and-pull experience of *ratzo v'shov* (רצוא ושוב), running and returning, that can allow for *d'veikut* and openness to the Light of *Ein Sof*, the infinite Divinity.[89] The teachings of the Alter Rebbe, we see, cannot be understood in their quintessence except through the experience of the music bringing the soul into the necessary state, and the music is the teaching itself, imparting the necessary wisdom into the one who repeats it.

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[86] *ibid.*
[87] *ibid.*
[88] *ibid.*
[89] *Likutei Moharan* 4:9:9; Ben-Moshe, Raffi. 2015. *Experiencing Devekut: The Contemplative Niggun of Habad in Israel*. Jerusalem: Yuval Music Series 11, Jewish Music Research Center.

The Power of the Voice of G-d

Examples of sounds and music facilitating spiritual and mystical experiences, or being expressions of Divinity, abound in Tanach, liturgy, and mystical texts. The sound of the *shofar gadol* (the great shofar) in our High Holiday liturgy causes the angels themselves to tremble[90], reveals G-d to the people upon Mount Sinai (in addition to, or as a way of understanding, the glory of G-d's voice as stated in Rosh Hashanah Musaf liturgy, הוֹד קוֹלֶךָ), and similarly evokes feelings of urgency and heightened awareness in those experiencing the earthly *shofarot* in modern services.[91] Psalm 29, which is sung as a part of *kabbalat Shabbat* liturgy, reminds us of the power of G-d's voice:[92]

קוֹל-ה' עַל־הַמָּיִם אֵ-ל־הַכָּבוֹד הִרְעִים ה' עַל־מַיִם רַבִּים:	3: The voice of the Ad-nai is over the waters; the G-d of glory thunders; Ad-nai, over the many waters.
קוֹל־ה' בַּכֹּחַ קוֹל-ה' בֶּהָדָר:	4: The voice of Ad-nai is in power; the voice of Ad-nai is in majesty;
קוֹל ה' שֹׁבֵר אֲרָזִים וַיְשַׁבֵּר ה' אֶת־אַרְזֵי הַלְּבָנוֹן:	5: The voice of Ad-nai breaks cedars, and Ad-nai shatters the cedars of Lebanon.
קוֹל־ה' חֹצֵב לַהֲבוֹת אֵשׁ:	7: The voice of Ad-nai kindles flames of fire;
קוֹל-ה' יָחִיל מִדְבָּר יָחִיל ה' מִדְבַּר	

[90] Un'taneh Tokef, RH Musaf
[91] Atah Nigleitah, RH Musaf
[92] Translation by author

8: The voice of Ad-nai convulses[93] the wilderness;
Ad-nai convulses the wilderness of Kadesh;

קוֹל-ה' יָחִיל מִדְבָּר
קָדֵשׁ:

9: The voice of Ad-nai causes hinds to calve, and strips forests bare; in G-d's temple all say "Glory!"

קוֹל-ה' יְחוֹלֵל אַיָּלוֹת וַיֶּחֱשֹׂף
יְעָרוֹת וּבְהֵיכָלוֹ כֻּלּוֹ אֹמֵר כָּבוֹד:

Here, Divine Sound, the Voice of G-d, has the ability to create and destroy, and to facilitate emotional/spiritual responses from humans and animals alike. As humans are created *b'tzelem Elokim*, in the image of G-d, it stands to reason that humanity has the ability to create and facilitate spiritual/emotional responses through our voices as well, to use sound as a spiritual tool. Rav Pinson suggests that sound can even be used to purify the body (and ostensibly the soul) as a sound bath, a musical *mikvah*: "when a person sings a melody prior to prayer, with concentration and intensity, until his entire body is covered with perspiration, then we say that the water of his sweat becomes like the waters of the mikvah: They transform into holy water, since it is sourced by an act of preparation for prayer."[94] Through the power of the sounds of the letters as the fundamental building-blocks of existence to the ability to use melody to teach, uplift, and create closeness to G-d, our tradition is rich with powerful and meaningful opportunities to use sound towards spiritual growth and personal experiences of *d'veikut*.

[93] Alternate translations: "causes the wilderness to dance/writhe in birthing pains"
[94] Pinson, 2019, p. 89

Chapter 3: Soundscape Analyses of Several Jewish Prayer Spaces

Intentions/Goals of Visits, Choice of Locations

Over the course of the summer and fall of 2024, I attended five Jewish prayer services in Brooklyn and Manhattan. At these services, I noted some key elements of the soundscape, the sonic landscape created by factors such as the music, the acoustics, the instrumentation/lack thereof, any amplification, vocal diversity, congregational involvement, proximity of all involved, cultural traditions, etc. I additionally observed the congregants and visitors, to see how the soundscape and environment facilitated their experiences. These observations are not meant to cover all sounds and music of any of the synagogues, but rather to highlight a few notable sonic experiences. They do not represent the fullness of the sounds and experiences represented by each location. Similarly, the selection of locations and experiences are not intended to cover the full range of Jewish service experiences, but are limited to a small selection available in my research time-frame and proximity.

For each visit, I attempted to balance a full engagement with the sonic environment and ritual experience with the intent to study and recall particular elements. I strove to keep an open mind, but recognize the biases I have towards certain sounds and traditions. I acknowledge that I am less inclined to have a positive sonic experience in a location where I am separated from the males of the congregation because of my gender. I also have an existing preference towards lower sounds and keys, partially due to my

own lower vocal range, and also because I find it to be more personally spiritually engaging. While I will endeavor to make my personal biases clear throughout this chapter, there is an inherent subjectivity that makes completely objective observations unlikely. For each location, I will share my relationship to that congregation/community, to clarify any particular predispositions or conflicts of interest.

Park Avenue Synagogue (PAS): New York City, NY

Park Avenue Synagogue is a large Conservative synagogue on the Upper East Side of Manhattan, with over 2,600 member households.[95] Its current cantorial leadership—Senior Cantor Azi Schwartz, Assistant Cantor Mira Davis, and Cantor-Educator Arielle Reisner—work with music director David Enlow and a full band in the main sanctuary on Friday nights and Saturday mornings from September through June (plus a professional vocal quartet on Saturday mornings), and the service is amplified by a large team of sound and video technicians. In the summers, Friday nights are accompanied by the cantor leading on guitar, and Saturday mornings are a cappella; these services take place in the smaller chapel on the third floor, and are still amplified (with a smaller team of technicians). Weekday services occur either in that same chapel or in the much smaller Minyan Chapel on the ground floor, and are not amplified or accompanied. High Holiday services take place in the main sanctuary, the third floor

[95]A note on positionality: having worked at this synagogue as a Cantorial Intern since June 2023, my views on the soundscape and congregation are colored by my professional position.

chapel, the lower level (a series of ballrooms connected and set up as a sanctuary space), and a nearby church (Church of the Heavenly Rest). These services have extended band and choir, depending on location, with a fleet of orchestral instruments piped into the main sanctuary live for Kol Nidre.

At regular-season Shabbat services, in-person Friday night attendance has increased substantially after the October 7th, 2023 attack by Hamas, and the soundscape has changed accordingly. Services that ranged in attendance from 120-150 people now number around 160-210. The *shlichei tzibur,* prayer leaders, usually do a shortened *Kabbalat Shabbat* liturgy, followed by a full *Ma'ariv* service of evening prayers. The communal singing has increased with the attendance, but many congregants and visitors prefer just to listen in silence, comparing the service to a "Broadway show." Musically, the choices lean towards composed pieces with occasional interspersed improvised *nusach* in the appointed mode. The musical pieces consist mostly of contemporary compositions, such as Debbie Friedman's *Mi Chamocha* and Noah Aronson's *Bar'chu*, both regular inclusions in Saturday mornings. The majority of these pieces, though, are commissions specifically for this congregation, making the musical soundscape different from any other. Commissioned composers include Oran Eldor, Natalie Young, Laurie Akers, Zina Goldrich, Beth Styles, and more. Because of these commissions, it is often the case that congregational music seems inaccessible for communal singing to those who are not familiar with the PAS musical landscape; however, because communal singing is not the priority, many are willing to simply join along with what they know, or just listen. These commissioned pieces tend to be upbeat, in major keys, and written to especially

utilize the instrumentation of the PAS band, with guitar (electric and acoustic), bass (electric and acoustic), piano/organ, winds, and percussion (kit and auxiliary).

The professional quartet on Saturday mornings serves several functions: besides providing beautiful and meditative listening moments, as well as back-up vocals for the cantors, it also serves as a congregational voice, responding to prayers such as the *kaddish* to cue the congregation to join in. Because of its professionalism and high quality of work, however, sometimes congregants feel intimidated rather than empowered to join in. They are more inclined to listen as if at a concert; the harmonies of the singers, several congregants told me, tend to distract them from their own responses. I've noticed that this response is more common among the women; male congregants, especially those from approximately ages 65-85, tend to be more vocal and unintimidated by the professional singers. The placement of this quartet, as well as the band, is off to the side of the clergy, in view of the congregation (except for the High Holidays, when they are moved to the loft to make space for more pews). They are in sight but out of the way, and heard mostly through the amplification rather than their physical placement in the sanctuary.

This year, the sound system has been upgraded to create a more balanced and clear sound throughout the sanctuary, to minimize muddiness of sound and heighten the quality. This has been met by overwhelmingly positive reviews by the congregants, except for a few who mentioned that it seemed a bit too loud in the first couple of months. The sound technicians and clergy were also very happy with the updated system,

except that occasionally a hearing aid will be audible throughout the space, and that high-pitched sound causes substantial dismay among those trying to create the cleanest possible sound. The sound team makes sure to eliminate any "white noise" elements; static or fuzziness when a mic is on, etc. Because the clergy use over-ear and lapel microphones, which they turn on and off themselves, this white noise element is not constant, and disappears as the microphones are switched off. If the white noise were constant, it could, I believe, be more easily ignored; however, with it coming in and out, it is substantially more noticeable (and experienced as distracting).

For services with b'nei mitzvah, which are most weekends during the September-June season, one of the most notable non-musical sound experiences occurs towards the end of the Haftarah blessings, when candy is passed out to the congregation to throw at the students. The crinkling of the plastic wrappers and the hushed, excited murmuring of the congregation create a crackling mood of excitement and expectation.Those making the noises themselves appear to be immersed in their own thoughts and conversations, not considering the broader soundscape. For the *b'nei mitzvah* and those on the *bimah*, watching and hearing this soundscape unfold, these sounds can create a heightened awareness of the joy to come, the knowledge that soon the students will have completed the most difficult parts of their service, and that we will be enthusiastically celebrating them with "*Siman Tov u'Mazel Tov"* with the throwing of the candies.

During weekday services, especially those in the minyan chapel for *mincha/ma'ariv*, there is often a lot of extraneous noise coming in from the lobby. The services are concurrent with congregational school pick-up times, as well as students coming for rehearsals/tutoring, and most notably, with the times that the facilities staff tend to move large tables and chairs through the lobby. The noise tends to cause a distraction from prayer among the congregants, many of whom are already in a state of some distress, to say kaddish for a loved one. There is often not quite a minyan in person, and the numbers are supplemented with those joining on Zoom. Those joining virtually are asked to keep their microphones off until they are ready to give a name for Kaddish, because the sound is, again, distracting. Between the small numbers in person, the likelihood that many in attendance are not regular attendees (but rather only there to say kaddish), and the many distractions, the congregants present rarely engage much in vocal davening.[96]

In the weekday morning services, there are usually 10-20 people in attendance in person, with occasional instances of b'nei mitzvah students coming with their families to have an aliyah in advance of their Shabbat service. Weekday services generally begin at

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[96]In one notable instance when I was leading this service, a congregant there to say kaddish was weeping loudly during the silent amidah. Though the minhag is not to sing any songs or do anything beyond the normal liturgy, I chose to hum Nurit Hirsch's Oseh Shalom just loudly enough to give those present another sound on which to focus. One congregant told me afterwards that it sounded "otherworldly," or as if it were coming from within me, but not as a voice. This moment both demonstrated the discomfort a sound could cause without framing for congregants present, struggling with a sound of despair for which they had no remedy, but also the ability we have as *shlichei-tzibbur*, service leaders, to reshape the soundscape to provide comfort and calm in the face of audible emotional distress (for those in distress and all those present).

7:15am, and because of this timing, are mostly attended by congregants who have reached the age of retirement. For these services, there is much more responsiveness in the *kahal*, with (mostly male) voices responding to prayers and murmuring liturgy throughout. There is one voice in particular that tends to hold a drone-like tone through his davening, and while I cannot speak to the response of the rest of the group, I find it very grounding. The constancy of sound allows, I believe, for some of the greater comfort in responding as a group, and helps congregants shed some of the self-consciousness that I notice in the *mincha/ma'ariv* services.

For the Holiday services held in the Church of the Heavenly Rest, there is a general agreement among those who sing and attend there that it has the "best" natural acoustics. I acknowledge that some of this may be a response to any possible frustration over not being able to get tickets to the main sanctuary, which are often cost-prohibitive, and tickets to the church location are more accessible. That said, I agree that the stone walls of the church create a much more naturally resonant acoustic space. While it lacks the clarity of sound of the sanctuary, it has a satisfying sound delay/echo that creates a sense of sound washing over those in attendance in a wave, like the sound-mikveh as described in the previous chapter.

Congregation Beth Elohim (CBE): Brooklyn, NY[97]

Congregation Beth Elohim is a large, progressive, Reform synagogue in Brooklyn with approximately 1,300 member units. They normally hold Friday evening services in their smaller chapel (which continued throughout the summer) and Saturday morning services in their large sanctuary (which was replaced with informal services in a basement rotunda with a portable ark). Services are amplified by a single sound technician and accompanied by cantorial leadership, on guitar and/or piano. Approximately once a month during the regular season, they have a jazz quintet join for Friday night services, for which there is a circle of musicians and clergy set up in the middle of the pews. When the jazz quintet is not present, that circle is filled with congregants, and there are even some seats available for congregants in the circle when the musicians are there.

The music/sound *minhag* of CBE is largely driven by their cantor, Cantor Josh Breitzer, who began serving the pulpit 2011 following a period of interim leadership, which featured a rotating cast of leaders and soloists. This allowed him to have what he described in a July 2024 interview as a "clean slate," and, in partnership with the senior rabbi, he was able to create a new soundscape. His goals in crafting this new soundscape were to meld his outsider's perspective with the inherited traditions, introduce nuscha'ot that could only be heard on Friday nights, expand the *Kabbalat Shabbat* portion of the

[97] Note on positionality: my experience at CBE was in relation to a summer internship for which I both attended and led Shabbat services, and my observations here are also informed by my professional position.

Friday night service, and foster a mood "informed by the Shabbat table."[98] To do this, he begins and ends Friday nights in the lobby with a "pre-neg," a pre-service *oneg* featuring snacks, drinks, socializing, and then *nigunim* before and after the candle blessings. In my experience, the lobby's stone walls and wide open areas create a "bathtub"-like acoustic space that is characterized by resonance and a reverberation of the sound off the walls and furniture (creating, again, a "bath" of sound). In some ways, this causes a muddiness of the sound, and it can be difficult for a leader to be heard if everyone joins in the singing. There is also no amplification in the lobby. Cantor Breitzer will often use his guitar to lead the communal singing, which helps cut through the reverberations, and his tenor voice is well-suited to the acoustics for being heard over a talkative congregation.

After the candle blessings, the service moves into the chapel, which has a slightly less muddy but still very resonant acoustic quality. Cantor Breitzer notes that the goal was to bring the informal feeling of the lobby "pre-neg" into the more "formal" space of the chapel (which, he added, isn't actually more formal at all; the service is still just as communal and participatory). This informality is also aided by his more recent choice to disband the congregational choir, which had previously led special choir *Shabbatot* with his predecessor and prior. By the time of the Covid pandemic, it became clear that "the job of the choir was over:"[99] that it had become a singing congregation without the need for a separate choral ensemble. The goal was to "bring the musical experience down from the choir loft to the congregation," making it a choir of the congregation rather than a

[98]Interview with the author, July 2024
[99] Breitzer, 2024

special congregational choir. Though several past members of that choir commented on their disappointment that the choir no longer existed, the full singing of the congregation suggests that the goal was achieved. The decline of the choir also occurred parallel to the diminished interest in the use of organ, which was the instrument of choice when the synagogue was initially constructed, but which hasn't been used in 15-20 years. Cantor Breitzer suggested that there is something "otherworldly" about the sound of the organ, and his intent was to bring about a new world from within the *kahal*: to "create a different world together, to do the work ourselves rather than feeling like it's being done upon us."[100]

Cantor Breitzer's choices of keys and inclusion of *nuscha'ot* also allow for smooth transitions between settings of prayers, enhancing the sound-bath experience with uninterrupted song; in some spoken moments of prayerfulness, such as the giving of names for the prayer for healing, he continues to underscore the speaking with gentle guitar, allowing the speaking to feel similarly prayerful. This also creates a stark difference when there are moments without music, and the relative silence feels palpable in the space. Often, congregants will close their eyes and breathe into those moments of quiet, though they also close their eyes to allow full engagement with the music and sound during the communal musical moments.

The jazz quintet that joins once a month on Friday nights began as a collaboration with a local community music school, which needed a place for their orchestra to rehearse. CBE bartered with the school by having a trio of faculty join regularly for

[100] *ibid*

Friday nights in exchange for a rehearsal space. Ultimately, the cost of retaining the ensemble was built into the budget, because their effect on the soundscape and congregational experience was overwhelmingly positive. The choice of instrumentation was intentional; Cantor Breitzer wanted jazz musicians who could improvise and feel the room, inspired by the quote "prayer is like playing jazz" from Rabbi Levi Weiman-Kelman in the Kol Haneshama siddur.[101] The initial trio was jazz guitar, percussion, and upright bass; Cantor Breitzer purposefully avoided melody instruments such as violin or clarinet to allow the prayers themselves to act as the melody. Once this was established, melody instruments could be added back in, contributing additional voices so as to have a "musical conversation"[102] with the prayers.

On Saturday mornings during the main season, the services are centered around the b'nei mitzvah students and their families. Because of the teen songleading program headed by Teen Music and Engagement Director Rose Snitz, the students have been able to contribute more to the musical soundscape of these services. Though this was not particularly the case at the services I attended, the atmosphere of inclusivity and all-age engagement was made clear, both through the musical choices and the spoken intentions. The presiding clergy, in their spoken introductions to the services, specifically state that the services are "not a performance," and that people are expected to join in fully, rather

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[101]Weiman-Kelman, Levi. 2007. "סדור העבודה שבלב | Siddur Ha'Avodah She'Balev, for Shabbat and Yom Tov." The Open Siddur Project פְּרוֹיֶקְט הַסִּדּוּר הַפָּתוּחַ. Kehillat Kol Haneshama Jerusalem. 2007. https://opensiddur.org/compilations/liturgical/siddurim/shabbat-siddur/siddur-haavodah-shebalev-for-shabbat-and-yom-tov-of-kehillat-kol-haneshama-jerusalem-2007/. p. 3

[102] Breitzer, 2024

than merely listen. This is exemplified in choices such as having the congregation rise and come together in front of the bimah to sing Psalm 150 (using the melody attributed as "Sufi Chant"[103]) together, after which attendees take some time to introduce themselves to someone they don't know. The joyful setting of the psalm is exuberant and buoyant, leading many congregants to jump or dance a bit, and at the end of the setting, Cantor Breitzer has them bring down the volume and delivery to a whisper, drastically changing the sound production and the experience of it in the space. Rather than bringing down the energy entirely, it just changes it to a hushed excitement, which translates effectively into the introductions to follow.

Over the summer, without *b'nei mitzvah*, the Saturday morning services are very sparsely attended, sometimes barely (or not at all) reaching a minyan. Because of this, and because of the lack of air conditioning in the main sanctuary, it seemed unreasonable to hold services in the large sanctuary, and services were moved to the aforementioned rotunda. Though this space has enough of a resonant acoustic to not require microphones with such a small group, it did not have the numbers to allow it to create the sound-bath experience of Friday nights. Additionally, on the days I was present, the air conditioning experienced some difficulties, and small units were brought into the space to try to cool and dehumidify the room. The noise of these machines filled the space in a way that was usually easy enough to forget, until, for instance, a congregant came up to deliver a d'var torah, and it was difficult to hear them over the white noise. To allow us to honor the congregant's words and give our full attention, I turned off some of the machines for the

[103] As found in The Complete Shireinu, 2001, p. 115

duration of their speaking; despite the heat, and people perhaps having forgotten that the machines were running, there was an audible sigh and sound of relief among the group when the sound dissipated. The relative silence compared to the drone of the noise created a sense of simultaneous calm and expectation of the words to come.

Sephardic Congregation of Har HaLebanon: Brooklyn, NY

The Sephardic Congregation of Har HaLebanon is an Orthodox synagogue that serves the Sephardic community in the Homecrest neighborhood of Brooklyn. I attended this synagogue on a Friday night in late October, 2024, just after Simchat Torah, with about 100-150 men in attendance. Because it is an Orthodox community, men and women are not permitted to sit together, and after some confusion about whether I would be allowed in at all as a non-member (I had already been turned away from another congregation that evening), I was directed to the balcony reserved for women. While the room below was full of men and boys, the balcony consisted of just myself and two other women, with another joining late. When I reached the balcony, there were facilities workers mopping the floors, and a table full of only *machzorim* and festival *siddurim* from the recent *Simchat Torah* festival. I was only able to find a Shabbat *siddur* by going down the hall, along the wet floors, to some shelves that I happened to find. When the woman who joined late came into the balcony, she wasn't able to find the *siddurim* at all, and had to ask those of us there for help. My point in sharing this is that my experience is colored by the confusion and disarray of the women's section right after Simchat Torah,

which is not a judgment regarding the denomination as a whole, but did affect my relationship to the sonic experience.

The men and boys in the main level of the synagogue were very engaged, vocally and physically, in the prayers, especially compared to the silence in the balcony. The pews below were mostly filled, and there was a *hazzan* leading from an *amud* in the center of the kahal, facing the ark. The placement of the *hazzan*'s voice was very forward, utilizing nasal resonance in a manner typical of Sephardic music and prayer, and creating a bright tone that cut through the voices of the group without amplification. The responses from the kahal were hearty and full, consisting of a mix of chanting, mumbling, and even shouting, and were noticeably lower in pitch than the voice of the *hazzan*. This created a very interesting antiphonal effect of the high, musical voice of the *hazzan* and the lower, guttural, shout-like responses of the congregation. Rather than the silent personal recitation of prayers that I experienced at Park Avenue Synagogue, where beginnings and endings of prayers are chanted aloud but the rest is mostly silent with some occasional murmuring, all of the words were davened aloud.

The soundscape below did not have the same effect on those of us in the balcony, unable to be physically immersed in the vibrations and sounds below. That said, there were still some very noticeable and effective sound-moments in the experience. In the chanting of the *sh'ma*, the *hazzan* and congregation slid up dramatically in pitch on the word *echad* (אחד), so as to especially emphasize the *dalet* (ד) at the end of the word. As the voices rose up over an octave into a falsetto tone, it seemed to me as if they were

reaching up, finding G-d in the heavens and connecting through their voices. The silence after that letter, enlarged in the Torah from which that line of text comes, and which is traditionally supposed to be emphasized, in which the next line of text was recited under their breaths, gave even more emphasis to it. It also gave logistical time for a group of young boys (below bar mitzvah age) to come up to the *amud* to chant *V'ahavta*, each taking a turn to lead a section, and wrapped up at the end by the *hazzan*. This again gave a very interesting differentiation in sound, with the sweet voices of the boys, many whose voices had not dropped, in contrast to the very masculine sound of the rest of the congregation.

Congregation Beit Simchat Torah (CBST): New York City, NY

CBST is a non-denominational congregation that specializes in providing a space of welcome and inclusiveness to the LGBTQIA+ community. I attended a Friday night service on the Shabbat just after the 2024 presidential election, which clearly informed the mood of this particular congregation, and had an effect on the soundscape and atmosphere as a whole. The service leaders (a rabbi, an HUC-trained cantor, and a rabbinic intern from the Reconstructionist seminary who is also an opera singer) were all amplified, as was the music director and pianist, Joyce Rosenzweig. There was a group of approximately 30 Israeli students visiting who had never attended services at this location, but generally those present were regulars who sang along to almost every prayer.

Attending this service in the middle of the *kahal* after having attended Har HaLebanon from the distance of the balcony was a stark change; being in the midst of the sound was deeply energizing and spiritual. This was particularly exemplified in the singing of Goldfarb's classic *Shalom Aleichem*, which was set in a low key (D minor, as opposed to the more typical E minor or even G minor), and for which the congregation was invited to put their arms around each other. The experience of these low vibrations from the singing community while everyone was physically connected was such a physically embodied one. Rather than simply existing within a sound-bath, it was as if the congregation had become one single instrument, vibrating together as one in a shared experience.

The keys for settings of the prayers were generally quite low, so as to be fully congregational, and the congregation responded by singing enthusiastically. There were only a few moments in which the cantor, Cantor Sam Rosen, and the musical rabbinic intern sang from the front of the room without congregational participation. These listening moments were meditative in tone, leaving the more energized musical moments for communal singing. Many of the congregants could be seen closing their eyes to take in the sound, usually while still singing, and at least one was dancing ecstatically to all of the music.

In a moment in which we were invited to introduce ourselves and speak openly with our neighbors, I was able to speak with one of the visiting Israeli students about her experience visiting CBST. She mentioned that she felt that the service was very unique

and energetic, and mentioned that she approached it with "curiosity," as it was so different from what she knew. She told me that she was finding that Jewish services in the United States have been much easier for her to connect to spiritually than any service she had attended in Israel, even if she didn't know the music, especially because of the communal nature they fostered.

Minyan Atara, Brooklyn, NY

Minyan Atara is a traditional egalitarian minyan, an all-gender gathering that meets several times a month in various locations for Shabbat and holidays, prioritizing "spirited davening and an informal atmosphere."[104] I attended a Friday night service in November 2024, which was held in the Repair the World Brooklyn space rather than a synagogue. Because of this, the space was not visually decorated or acoustically set up as most of the other locations I attended, and was most similar in style to the lobby of CBE, which shared the intention of building an "informal atmosphere." The bare walls and hard floors combined with the oblong shape of the room did not seem like they would be a particularly effective acoustic space, but the space was soon brimming with around 70-100 people of all ages and traditions. The visible diversity, observed by markers of age and dress, ranged from older gentlemen wearing *tallitot k'tanot* under their clothes, to young families, to modestly-dressed women, to genderqueer young adults in tank tops.

[104] https://www.minyanatara.com/

The sheer number of absolutely engaged people praying and singing created perhaps the most effective "sound-mikveh" experience of all of the locations studied for this thesis.

The *Kabbalat Shabbat* portion of the service was led by a young woman with a beautiful treble voice; I later found out this was the very first time she led a service. She led facing the eastern wall, facing away from the *kahal*, but her sound carried effectively throughout the small space, echoing off the wall to the group without amplification. The melodies chosen for the psalms of *Kabbalat Shabbat* were all very communal and easy to catch on to, even if they were unfamiliar, as many were for me, and the keys chosen (a cappella) were extremely accessible for most voices. The style of singing brought together elements of many of the other locations I attended: there were bright voices in the same style of the Sephardic *hazzan* at Har HaLebanon and shout-like singing similar to that of the men in their *kahal*, people singing with their eyes closed and dancing ecstatically like I experienced at CBST, and the aforementioned informality and "Shabbat-table-informed" quality of the lobby at CBE.

The musical elements within each section of the service (*Kabbalat Shabbat* and *Ma'ariv*) were only broken up by a male voice calling page numbers from the back. The energy of the settings grew quickly in enthusiasm and intensity, especially as the space quickly filled with more people than they had chairs or prayer books. When the service arrived at *L'cha Dodi*, it was standing-room only, and the group was singing full-throatedly and full-heartedly, and rhythmically stomping and clapping along with the two settings used for the prayer. Once the group had stood for the final verse, this

stomping and clapping extended to also banging on any available surface, including walls and shelves. The whole space reverberated in song, rhythm, sound and vibration, and there was full-bodied engagement everywhere I looked.

The high-energy musical sound-bath of *Kabbalat Shabbat* was followed by some words of Torah by one of the members of the *kahal*. While this did break up the intensity of the preceding music, it also created a meaningful contrast between the continuous singing and rhythmic engagement and the simple spoken words of a single person. I found it valuable to have a bit of time between the spiritual intensity of *Kabbalat Shabbat* and *Ma'ariv* to focus instead on a bit of intellectual learning and engagement, a time to reset and focus our intentions before the next part of the service.

The *Ma'ariv* portion of the service was led by my friend and fellow classmate Gabriel Lehrman, and while I acknowledge my predisposition towards enjoying his leadership, I can confidently say I was not alone in finding it every bit as engaging as the young woman leading *Kabbalat Shabbat*. His lower tessitura, with warmth and even a little gruffness, filled the space and encouraged communal davening without hesitation. In a conversation with him after the service, he confirmed that he embraced a more toned-down style of singing, with less vibrato, to help encourage congregational participation. The space was again a sound-bath, but with a somewhat more subdued quality, focusing on the meaning of the prayers and bringing the words into the space through our voices. There continued to be people closing their eyes and taking in the

sound, both while singing and even just while listening, in addition to those following along in their *siddurim*.

Conclusion: Processing Observations and Proposing a Framework for Understanding Synagogue Soundscapes

Response to Soundscape Analyses, and Relation to Scientific and Spiritual Understandings of Sound

In considering the soundscapes of the five prayer settings observed in the previous chapter, I have identified several of the most salient of the sonic features that contributed to my experience in those service: 1) the experience of continuous sound vs. interrupted sound, 2) substantive shifts in tone, pitch, and amplitude, 3) expectation vs. reality, 4) drones and choices of keys, and 5) mode and tempo. I will explore the ways in which these topics can be reexamined through the scientific and spiritual literature presented in the previous chapters, so as to better understand both the soundscapes themselves and my responses to them. I acknowledge the subjectivity of prayer practice and musical preferences, but regardless, I suggest that even those with different practices and preferences can apply these approaches in the service of considering how the soundscapes shape the experience of prayer (and how the understanding of sound shapes the experience of the soundscapes).

I found moments of continuous, unbroken sound/musical transitions especially effective, and was distracted and pulled out of the spiritual experience by things that interrupted that flow. At the Atara service, for instance, the regular announcements of the page numbers felt especially jarring; I noticed myself wishing that they were sung or

chanted in the key of the davening/tunes rather than spoken (especially by a male voice so starkly different from the treble voice leading the singing), so that it wouldn't interrupt the spirituality of the continued singing/chanting. The soundscape of Congregation Beth Elohim, for example, with Cantor Breitzer's leadership, most successfully maintains this sense of uninterrupted sound and music, with page numbers read in a similar tone and timbre to that of the music, and over a continual flow of guitar or ensemble instrumentation.

In the language of the Juslin, Barradas, and Eerola study from the first chapter of this thesis, the mechanism most responsible for my response to the Atara page numbers is likely the brain stem reflex, which responds to the simple acoustic features of extreme changes in dynamic, pitch, speed, etc.[105] In accordance with the findings of the study, the brain stem reflex mechanism elicits a response mostly of surprise. There may also be an element of "musical expectancy" at play, in which the expected structure of the unfolding soundscape is interrupted. This mechanism is mostly associated, per the results of the study, with the response of anxiety; indeed, I found myself disquieted by those moments in an otherwise deeply enriching, joyful, and comforting sonic environment. Similarly, in the Halpern, Blake, and Hillenbrand study, it was confirmed that irregularly- or rapidly-changing intensity/amplitude can result in negative responses of unpleasantness.[106]

And yet, if I had considered this sonic departure from what I expected in the context of Rabbi Shalom DovBer's explanation of the Alter Rebbe's *nigun*, I might have

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[105] Juslin, Barradas, and Eerola, 2015, p. 283
[106] Halpern, Blake, and Hillenbrand, 1986

been able to see it as a sound experience that "shakes you up [and] shifts you from your place, so that you break away from the mundane environment, from mundane worries and concerns, from all the things you need,"[107] as in the first portal of the *nigun*. When I consider sound as inherently capable of producing the spiritual or mystical experiences that can facilitate *d'veikut*, I can begin to move past those expectations that music is the only sound capable of eliciting those desired responses.

The sonic experience of *Har HaLebanon*, with the bright timbre and forward placement common in Sephardic pronunciation and singing, was one that was less familiar to me than the typical Ashkenazi sounds of the other spaces I attended and frequent. Because of this, it may have been more spiritually effective for someone for whom that soundscape is a substantial part of their memory. Even the expectation of the uplifted end of the *Sh'ma*, out of which the letter *dalet* was especially emphasized, could be something that brings about the musical expectancy response of the Juslin, Barradas, and Eerola study, resulting in the response of "nostalgia and happiness."[108]

I find myself wondering if the prayer format, in which the congregation prioritizes making sure each word is chanted aloud rather than davened privately, is informed by the kabbalistic teachings regarding sound. How would the experience of the especially-emphasized *dalet* (a common liturgical practice, because of the way that letter is larger than the rest in the Torah where this passage is found, but not always with the added emphasis of rising pitch) if it were accompanied by the association of fertility,

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[107] Rabbi DovBer Schneerson, trans. Rubin and Freedman 2012
[108] Juslin, Barradas, and Eerola, 2015, p. 284

Mars, Tuesday, and the right ear, as described in Sefer Yetzirah?[109] And: how would Reform congregations change our own prayer practices if they were themselves informed by these teachings?

The prevalence of major modes and upbeat melodies at Park Avenue Synagogue, to which the community seems to respond joyfully, aligns neatly with the findings of the Fritz et al. study, in which responses of happiness were found in all subjects regardless of culture when presented with similar factors (such as upbeat tempi and major modes). The response to the problems with the sound system, however, brought with it the unpleasantness mentioned in the Halpern, Blake, and Hillenbrand study, likely due to the overtones created by the stray drones, buzzes, and hums, which can result in an "automatic, almost visceral reaction."[110] It could, however, also be that the sounds were unpleasant due to negative associations developed over time, such as being reminiscent of the buzzing of angry bees.[111] On the other hand, the vibrations of the low keys and congregational involvement of the singing (especially while physically connected, as during the Shalom Aleichem) at CBST were noticeably comforting to the congregation. The use of a drone has incredible potential to be received either positively or negatively by those experiencing it, depending on pitch, amplitude, and association.

The moments of relative silence in all of these services, such as during the silent Friday night Amidah, or in the CBE service in which the hum of the air conditioners was turned off before the sermon, are of particular interest to me. Because of the factors of

[109] Sefer Yetzirah 4:7
[110] Halpern, Blake, and Hillenbrand, 1986
[111] *ibid.*

our environments, there is never truly silence except in clinical conditions of vacuum and careful soundproofing. In all other contexts, there are the sounds of our bodies and breath, the movement of the air in the space, the noises of the machines that operate within our spaces and the insects and creatures inside or out, etc. With that in mind, it is reasonable to make the connection here to mystical elements such as the "absence of vowel" associated with the *sefirah* of *Malchut/Shechinah*, which "simply 'receives' from Above and has no Light of its own, so too this vowel has no sound of its own. It only receives the resonances that are given to it from beyond it."[112] Similarly, the letter *Aleph* can be understood both as silent or as receiving the sound around it, taking on the quality and sound of the associated vowel markings. To understand these moments of relative silence as instead spaciousness or containers for the vibrations we may otherwise not notice creates room for possibility in spiritual experiences and associations.

Potential Applications in Reform Congregations, and Further Research

The broadest takeaway from the soundscape analyses I conducted was that the research I conducted on scientific and mystical approaches to sound themselves changed my experiences more than any particular sonic experience. I believe that by teaching elements of these approaches to our congregants, we can substantially change and improve their relationship to the sounds themselves, as well as their own personal relationships with the liturgy, their community, and particularly with the Divine. With the

[112] Pinson, Sound and Vibration, p. 182

importance placed in Reform Judaism on "informed choice," I suggest that we can apply this tenet beyond liturgical/halachic choices, and utilize it to mobilize Reform congregants to engage with the spiritual elements of sound in new ways. I believe that our ability to do so requires attention to both of these elements: being informed, and having choices for the means of engagement.

I hypothesize that by being informed about the basics of some scientific and mystical elements of sound, Reform congregations can be made aware of the more expansive nature of sound/vibration and how it can affect our bodies, minds, and spirits, and thus engage with sound more meaningfully. While both approaches, in many ways, can lead to the same conclusions, providing merely one or the other does not allow for the ability to choose their approach to sound as a spiritual tool. This can make some members feel that either an overly technical scientific understanding of sound or an overly spiritual understanding of it is being pushed upon them regardless of their own preferences. For many, a combination of these two approaches may be the easiest and most accessible way into spiritual experiences. However, as it stands, our congregants are not being given the chance to explore the depths of what sound and vibration can mean beyond the melodies we engage in and potentially some distracting or off-putting sounds.

Similarly, I think that sound experiences that require fuller congregational involvement, such as that of Atara, are seen as inaccessible by many Reform congregations, CBE excepted. However, if congregations are able to prioritize learning the sounds of the prayers, whether feeling like they can join in song or be sonically

otherwise engaged (recognizing the importance of the sounds, joining in hums/drones/*nigunim*, etc.), they can feel empowered to be a part of that sacred work of co-creation inherent in sound production (as in *ab'ra k'dab'ra,* "I will create as I speak"). I propose that this learning can extend beyond merely learning about the sounds as music, to engage in singing, but that it can instead expand to understanding the broader implications and applications of sound.

Toward this end, I believe that the next step in this area of research is to develop workshops specifically created for Reform congregations to expose them to these possible entryways to understanding sound as a spiritual tool. I propose that these workshops present options for connecting with sound through both scientific and mystical language, to give both the "informed" and the "choice" elements of that classic Reform tenet to those attending. Attendees would be encouraged to use these frameworks to find the best approach for their personal experience with sound and Divinity, whether that is through science, mystical texts, or a combination of the two. These workshops would be preceded and followed by surveys evaluating the responses to different types of sonic experiences typical of those communities, to see if the acts of learning and expanding understanding of sound change the relationship to it and its spiritual potential.

While I began this project with the belief that our next steps would be to use the frameworks of science and mysticism to change the soundscapes of our Jewish spaces, the research has instead led me to believe that what needs to change is instead our understanding of those soundscapes and their depth. By providing this educational inroad

to a fuller concept of what sound can be—vibrational, neurological, mystical, creative—we can introduce our congregants to the rich potential of sound to connect us to our individual understandings of the Divine. I propose that we next test this theory by providing qualitatively evaluative surveys for our congregations that measure:

- Their existing understanding of sound as a scientific concept
- Their existing understanding of sound as a mystical concept
- Their relationship to sound in and out of services
- How sound affects their experience of Divinity
- Their personal relationship to their concept of the Divine

This survey would be followed by a workshop or series of classes that would present the information found in the science and mysticism chapters of this thesis, providing opportunities for the congregants to learn and connect with the ideas. After this, another survey would be conducted, measuring any changes in the pre-workshop evaluation. I additionally suggest that a third evaluation be offered several weeks later, after the participants have had a chance to engage with this learning in multiple services, to see if and how their relationships to sound (and their sense of the relationship of sound to Divinity) change over time with this new knowledge. By examining the change in mystical experiences and relationships to sound as it relates to exposure to the materials, we can begin to quantify the effectiveness of these frameworks in facilitating mystical experiences among this particular demographic.

By engaging with sound through these newly-explored frameworks, I hope, and believe, that we can allow our congregants to feel more comfortable and empowered to connect personally and as a community with sound and the Divine. With these frameworks of science and mysticism, I hope that we will both honor the Reform commitment to education, as well as expand the possibilities of sound-based engagement with liturgy, music, ambient noise, Divinity, and community. I believe that sound as a tool has incredible versatility when studied in different contexts and applied in different ways, and I argue that this thesis demonstrates precisely that: that we can use sound to open doorways into great Jewish ritual and spiritual engagement, while honoring the different approaches needed by our congregants and inherent in sound itself.

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