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Samuel Berliner-Sachs March 28, 2023

Sonic Spirituality: Religious Rituals as Acoustic Events

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Abstract

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Sound has numerous functions within ritual contexts. Although functions vary according to differing cultural and religious practices, sound is a universal component of religious rituals, used to direct spiritual experiences across religious traditions. Employing a sound engineer's framework, we can explain spiritual practices by means of their sonic characteristics and acoustics, which sound-makers have orchestrated to address people's aesthetic preferences. An interdisciplinary approach to the study of sound and religious rituals—incorporating research from physics, sound studies, religious studies, psychology, physiology, acoustics, and psychoacoustics—helps explain how sound can foster states of altered consciousness (such as trance and meditation), religious mysticism, and feelings of awe or transcendence. By examining the sounds of religion, we can furthermore understand how sonic ritual fosters cultural identity, creates a sense of community, enables communication with the divine, and elicits a range of emotional experiences.

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Introduction to Sonic Spirituality

Next time you walk into a spiritual place or witness a spiritual event, I want you to think about it as an acoustic event designed to elicit a spiritual response. When you go to Kol Nidre on Yom Kippur or attend the Muslim Call to Prayer, what do you hear? Are many sounds present, or does one dominate? Are the sounds created intentionally, or are they a byproduct of the ritual context? How important are these sounds to the religious experience? If you listen closely and think about the sounds you hear, you will find that, more than you might expect, the sounds of the spiritual event resonate with the deep feelings of spirituality you may experience. In fact, without sound, you may not experience any sense of spirituality at all.

Sound is a regular component of religious rituals, and religious practitioners and sound scholars alike have considered the function of sound in religious rituals. From the immersive experience of the Muslim Call to Prayer to trances stimulated by Mongolian shamanic drum rituals, sound is often a necessary tool for engaging people emotionally and directing religious experience. With sonic tools at their disposal, people and cultures seeking to create spiritual experiences have found that sound is associated with not only feelings of immersion and trance, but also community, awe, emotional richness, meditation, and shared transcendence. Even when religious practitioners do not intentionally manipulate sound, it serves important functions in religious rituals. This thesis explores religious rituals as acoustic events, examining sonic properties and the functions of sounds in a variety of ritual contexts from different religions and cultures.

A comprehensive understanding of religious rituals requires a robust analysis of the function of sound within them. This thesis employs a sound engineer's framework, exploring religions and cultures and explaining rituals by means of their sonic characteristics and acoustics.

By examining the sounds of rituals, we can understand some of the ritual's experiential components, such as fostering cultural identity, engendering a sense of community, or communicating with the divine. Moreover, focusing on sonics can help explain how spiritual experience and aesthetic experience can be very similar—at times, perhaps indistinguishable.

Studying both spiritual and aesthetic experience, the thesis is an effort to explain that interrelationship by investigating how religious rituals might cater to certain types of aesthetic preferences when it comes to sound and how sound and our experience of sound fit within a religious context. We can, and often do, talk about spiritual experience in aesthetic terms. Indeed, we experience aesthetic objects (objects, like artworks, "whose function is to engender aesthetic experiences"[1]) in ways similar to our experience of ritual events. Both types of experience involve a sensory component, a cognitive component, and some sort of appreciation. Both types of experience can give the perceiver a sense of something larger than oneself, as though one is experiencing something deeper than mere surface meaning. It is worth investigating the interrelationship between these types of experiences.

Although sound is a fundamental component of religious rituals, it is not always recognized as driving the spiritual experience. While commentators often discuss the role of music in ritual, the other sounds of religious rituals have been studied less extensively. This thesis highlights the profound connection between sound and spiritual experience. Through discussion of sonic properties and ritual acoustics, it tries to explain ineffable events and (often) transformative, personal experiences. People talk about religion and spirituality as "inexplicable" and "awesome" (in the literal sense), but this thesis suggests that we can, to some extent, understand and explain why certain sounds are associated with feelings of awe or spiritual

[1] Noël Carroll, "Art and Aesthetic Experience," in *Philosophy of Art: A Contemporary Introduction* (Routledge, 1999), 159.

connection. Most people have experienced these feelings, yet we do not normally connect the experience to sound properties. This thesis makes the connection.

Studying sound helps us better understand religious traditions and cultures. By approaching religious ritual through the framework of sound, sound properties, and psychoacoustics, this study opens new possibilities for religious studies, ethnomusicology, and sound studies. It encourages scholars to broaden the discussion of the form and function of ritual practices beyond traditional religious studies, which often focus primarily on words, texts, or ethnographic research. The project's unique frame of study helps explain the "physics" of ritual sounds, why practitioners choose particular instruments (such as the shofar or dungchen), and how ritual techniques (such as the Muslim Call to Prayer or the Buddhist sound bath) are spiritually effective—why they move us in profound ways, fill us with awe or spirit, or connect us to one another or to the beyond. Analyzing sound characteristics and sound patterns within ritual contexts, this thesis contributes to discussions of religious experience, aesthetic experience, cultural traditions, and sound perception.

Methodology and Organization

The thesis adopts an interdisciplinary approach to the study of sound and religious rituals, incorporating research from various disciplines on the topics of sound, acoustics, psychoacoustics, altered (and non-altered) consciousness, and religious mysticism. My research methodology also involved ethnographic work, such as ritual observation, field recordings, and interviews with ritual sound practitioners. The analysis and manipulation of audio from various religious rituals enabled me to deconstruct their sonics. This multifarious interdisciplinary approach allowed me to understand the relationship between sound and spirituality in a complex

way, looking at (or, rather, listening to) ritual sounds as complex physical, psychological, sociological, and spiritual phenomena. I have separated my argument into four chapters.

Chapter One, "Sound and Religious Rituals: An Interdisciplinary Approach," argues that an interdisciplinary approach—including research from acoustics, sound studies, psychoacoustics, and psychology—best explains sound's function within religious rituals and why sound can have a profound impact on spiritual experience. Introducing the thesis' theoretical framework, the chapter lays the groundwork for understanding the arguments of later chapters.

Chapter Two, "Sound Perception in Religious Rituals," examines the ways in which individuals perceive sound in religious rituals and how rituals orchestrate our perceptions to create or enhance spiritual experiences. Including discussions of *spatial perception*, *signaling perception*, and *frequency masking*, this chapter highlights design similarities across religious rituals and searches for patterns in ritual orchestration.

Chapters Three and Four focus on two pervasive and complex spiritual experiences: trance and meditation. Chapter Three, "Altered States of Consciousness: Trance," focuses in particular on Mongolian shamanic drum rituals as a case study of ritual trance. Chapter Four, "Altered States of Consciousness: Meditation," surveys many religious meditative practices and explores sound's ability to create meditative states. Both chapters analyze ritual examples in light of their sonic characteristics (primarily time and frequency).

Sound-Makers and Perceivers

As an introduction to what follows, we must first establish two primary roles in an acoustic event: the *sound-maker* and the *perceiver*. Evaluating the functions of these two ritual roles offers us a consistent standard for considering rituals across religions.

All sounds—both natural and human-made, both intentional and non-intentional—shape spiritual experience, but sound-makers only exist in rituals in which someone purposely creates sound. Although sound has inherent ritual functions, even when no one directs it, the role of the sound-maker requires intention. Hence, the sound-maker employs sound as a spiritual tool. So, when discussing sound-makers, we will consider the intent behind the sonics of rituals as well as considering who is allowed to make sound. In religious rituals, the sound-maker is typically a religious authority figure, such as a shaman, although we also witness sound-makers among non-authority figures in rituals such as choir singing, congregation chanting, or call-and-response reading.

Sound-makers make sounds, and perceivers experience them. Here's where the distinction between sound-makers and perceivers becomes complicated because perceivers often make sounds too. Indeed, the sound-maker may be the only sound perceiver. The sonic landscape of a ritual affects the spiritual experiences of the entire range of participants, individual congregants and the collective ritual assembly, and sound-makers and sound perceivers alike.

Sound is a component of both religious experience and aesthetic experience. To describe either type of experience, we might use terms such as "beauty" and "grace," and we might call either experience "sublime," "moving," "significant," or "awesome." This thesis centers on the area where the two experiences overlap.

Chapter I

Sound and Religious Rituals: An Interdisciplinary Approach

Due to the plurality of ways sound functions in a single religious tradition, it is necessary to acknowledge that any study of religious sound will need to have a very explicit and specific scope. Additionally, no single discipline can fully explain the ways sound functions in religious rituals; therefore, an interdisciplinary approach helps address the multifarious ways in which sound and religious ritual intersect.

This chapter examines the relationship between sound and religious ritual through four key disciplines within two different sections: 1) a*coustics* and *sound studies*, and 2) *psychoacoustics* and *psychology*. To comprehend how sound and acoustics relate to religious rituals, we must engage with research in acoustics and sound studies, including the work of sound engineers. To understand the individual perception of sound and sound's relation to religious experience, we must enlist research in psychology and psychoacoustics.

In this chapter, I shall explain the benefits of this interdisciplinary approach, addressing, in turn, each of these areas. The various disciplines may at times appear at odds, each with its own theories, concepts, considerations, goals, and preferred lexicon; however, to understand the diverse ways in which sound functions within religious rituals, we must address the topic from multiple perspectives.

Acoustics and Sound Studies

"Acoustics" is the branch of physics that focuses on the study of sound.[2] While the study of sound and religion could rely primarily on subjective evaluations, understanding acoustics

[2] Richard E. Berg, "Acoustics," in *Encyclopedia Britannica*, August 20, 2019, https://www.britannica.com/science/acoustics.

offers us objective evidence for assessing complex events like religious rituals. In particular, the study of acoustics examines the sonic characteristics of sounds that include time, frequency, level, and timbre. Establishing domains for these characteristics allows for individual analytic approaches and lets us describe sounds' physical properties with consistent methods. It is the job of sound engineers to examine these specific sonics and assess acoustics. On the other hand, while the study of acoustics provides an understanding of sound's measurable properties, a broader "sound studies" framework enables us to understand the multi-dimensional qualities of sound, emphasizing the study of different historical and cultural contexts to inform sound.[3] Itself an interdisciplinary field, sound studies explores sound through the physical sciences, anthropology, and music, as well as incorporating an understanding of the technology used to produce sound.[4]

Let us begin with a physical definition of sound. "A class of physical kinetic energy called acoustical energy," sound is defined as "fluctuating waves of pressure through a physical medium" (typically air).[5] An audible form of energy, sound waves are measured in terms of frequency (as a rate in Hertz [Hz]) and amplitude (as level strength in decibels [dB]), which correlate with pitch and volume in hearing perception. Frequency and amplitude constitute the most fundamental physical components of sound. High amplitude determines higher volumes, while low amplitude determines low volume. Low frequencies refer to the bass and sub-bass range, whereas higher frequencies occupy the midrange and treble registers. Within our full range of hearing, we often classify sounds by assessing where they "sit" within the low, mid, and

[3] Marie Thompson, "Sound Studies," Oxford Bibliographies, May 7, 2020, https://www.oxfordbibliographies.com/display/document/obo-9780199757824/obo-9780199757824-0280.xml.
[4] Jonathan Sterne, *The Sound Studies Reader*, 1st Edition (Routledge, 2012), 2.
[5] Gary Davis and Ralph Jones, *The Sound Reinforcement Handbook*, Second Edition (Hal Leonard Corporation, 1989), 1.

high ranges of frequency. These frequency ranges also allow us to determine the characteristics of certain sounds. Organizing specific frequency ranges offers us a method to analyze sounds, determine their specific properties, and help us understand how we hear different auditory data.

Humans generally hear frequencies measured between 20Hz to 20kHz (20,000 Hz),[6] although the upper boundary lowers as we age and our hearing deteriorates.[7] The lower limit is also not a concrete figure, and bass frequencies below a certain threshold are felt but not heard. The term "infrasound" refers to sounds at extremely low frequencies (roughly below 20Hz), inaudible to humans but perceivable through physical vibrations within one's body.[8] Hence, sound is an energy force that can affect perceivers through both their ears and their bodies. Even inaudible sound frequencies can affect listeners, as we shall see later in the study when we examine the effects of sound within religious rituals.

The study of acoustics helps us understand how sound moves through space and time. Properties of sound acoustics consider the ways in which sounds interact with spaces and their environment (a subset of acoustics, this field of study is usually described as "room acoustics"[9]). Room acoustics may describe sounds spatially. Reflecting off objects and surfaces, sound interacts with space and other sounds, altering its physical makeup.[10] Sounds and acoustic environments form in an infinite, ever-evolving interplay. A perceiver can recognize a sound's interaction with its environment through the forms of sound reflection, which can manifest as

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[6] Daniel Dixon, "Psychoacoustics: How Perception Influences Music Production," iZotope, March 28, 2019, https://www.izotope.com/en/learn/psychoacoustics-how-perception-influences-music-production.html.
[7] "High Frequency Hearing Loss | Decibel Hearing Services," *Https://Decibelhearing.Com/* (blog), accessed December 14, 2022, https://decibelhearing.com/hearing-loss-overview/high-frequency-hearing-loss/.
[8] H. Moller and C. Pedersen, "Hearing at Low and Infrasonic Frequencies," *Noise & Health* 6, no. 23 (April 2004): 37–57.
[9] Heinrich Kuttruff and Eckard Mommertz, "Room Acoustics," in *Handbook of Engineering Acoustics*, ed. Gerhard Müller and Michael Möser (Berlin, Heidelberg: Springer, 2013), 239–67, https://doi.org/10.1007/978-3-540-69460-1_10.
[10] David Howard and Jamie Angus, *Acoustics and Psychoacoustics*, Fourth Edition (Routledge, 2013), 41, https://doi.org/10.4324/9780080961873.

echo and reverb.[11] Copies of a sonic impulse, acoustic phenomena like echo and reverb demonstrate how physical space can influence a sound's quality and audibility within a physical space. For example, prayer spaces like the Hagia Sophia (an Islamic Mosque originally built as a Christian church) have architectural properties that create iconic acoustic environments.[12] Similarly, after fire damaged the French cathedral of Notre Dame in 2019, reconstruction efforts included a focus on room acoustics and restoring the grand sonic space.[13] Carefully designing these prayer spaces to create sound reflections, the acoustic environments of both the Hagia Sophia and Notre Dame were intended to convey a sacred authority.

The study of acoustics helps explain the physics of sound in these sacred spaces, but the interdisciplinary nature of sound studies allows us to further consider how cultural and human components affect these environments. Media, technology, and cultural studies scholar Jonathan Sterne says in his book *The Sound Studies Reader* that sound studies "redescribes what sound does in the human world, and what humans do in the sonic world" by "analyzing both sonic practices and the discourses and institutions that describe them."[14] Sterne acknowledges that sound studies is an academic field, but he also observes that it is "a response to the changing world." Sound studies allows us to consider the role of ever-evolving cultural factors, thereby facilitating an enhanced understanding of the experience and creative expression of sound.

The concept of "timbre" offers a good example of the usefulness of blending sound studies and acoustics. According to The American National Standards Institute, timbre is referred to as "that attribute of auditory sensation in which a listener can judge that two sounds, similarly

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[11] Davis and Jones, *The Sound Reinforcement Handbook*, 57.
[12] Bissera Pentcheva, *Hagia Sophia: Sound, Space, and Spirit in Byzantium* (Penn State University Press, 2017).
[13] Madeleine Schwartz, "The Quest to Restore Notre Dame's Glorious Sound," The New York Times, March 3, 2023, https://www.nytimes.com/interactive/2023/03/03/magazine/notre-dame-cathedral-acoustics-sound.html.
[14] Sterne, *The Sound Studies Reader*, 2.

presented and having the same loudness and pitch, are different."[15] Beyond technical descriptions, timbre more regularly refers to the character, tone, or quality of a sound.[16] Timbral descriptions might refer to sounds as "bright," "sharp," "rich," "gentle," or "colorful." Although such descriptions may sound entirely subjective, they are generally measured through a combination of subjective and objective analysis. Objective measures may include frequency mapping, amplitude analysis, and tools for measuring harmonic content. Technological devices, such as waveform analyzers and spectrograms, provide details about the qualities of sounds.[17] Subjective analysis relies on the analyst's aesthetic expertise and sensitivity. It is one thing to note that a sound has a low frequency, but a sensitive sound analyst, such as a sound engineer, can also understand when a sound is "booming" or "rumbling." Subjective sound analyses require taste. It is not enough, then, to account for timbre through the lens of either acoustic or sound studies analyses. As subsequent chapters will demonstrate, to best understand sound within religious ritual, one must employ both frameworks simultaneously.

By employing a sound engineer's framework while also drawing upon research from the fields of acoustics and sound studies, we can gain insight into how religious rituals operate as acoustic events. In a religious context, sound can be leveraged to create unique spiritual experiences. For instance, as we will explore in chapter three, drum rituals in Mongolian Shamanism use low-frequency sounds to induce trance. Acoustics and sound studies provide us with a framework for exploring sound's function in religious rituals and allow us to measure and describe individual sounds, as well as identify the sonic elements of different rituals.

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[15] A.J.M. Houtsma, "Pitch and Timbre: Definition, Meaning and Use," *Journal of New Music Research* 26:2 (1997): 105, https://doi.org/10.1080/09298219708570720.
[16] The Editors of Encyclopaedia Britannica, "Timbre," in *Encyclopedia Britannica*, March 30, 2023, https://www.britannica.com/science/timbre.
[17] "Understanding Spectrograms," iZotope, April 3, 2020, https://www.izotope.com/en/learn/understanding-spectrograms.html.

Psychoacoustics and Psychology

Whereas acoustics and sound studies help us understand sound properties, we can also study sound from the perspective of the individual perceiver. The science of psychology helps us understand how sound interacts with human perceptual systems. These disciplines help us to understand emotional and cognitive responses to sound and offer information about individual aesthetic preferences and predispositions. First, through a psychoacoustic approach, we'll consider how individuals perceive time, frequency, level, timbre, and spatial data (each with distinct perceptual systems). Next, psychologically, we'll address how we have been programmed in our perceptions of sounds and how this programming can help determine what we like and don't like. Addressing both disciplines, this information can inform on the many ways people respond to sounds in religious rituals. Later in this thesis, we shall examine how sound functions within specific rituals and affects individual perceptions and aesthetic preferences.

While explaining the individual perception of sound, this section also addresses inaccuracies in how we interpret sounds and suggests how these flawed perceptual systems can serve a function in religious rituals. Human perceptual systems work imperfectly, and our brains do misprocess sound. For instance, we may perceive a sound as coming from "the heavens" when in fact, the sound source is located within a terrestrial space, such as a hidden area within a large, cavernous church. By utilizing sound in different ways, sound makers can exploit our sound processing systems to elicit desired cognitive and emotional responses.

Psychoacoustics, a branch of physiology, refers to how humans perceive sound.[18] Though sound can be felt as well as heard,[19] humans perceive sound mainly through the ears. This sense

[18] Dixon, "Psychoacoustics."
[19] Moller and Pedersen, "Hearing at Low and Infrasonic Frequencies."

is known as “auditory perception” or "audition." Audiology is the study of how humans hear. Our ears receive information from the environment, but auditory perception relies on the brain’s ability to decode and process the frequency, level, spatial data, and other information received through each ear.[20] At a psychoacoustic level, our sound perceptions help us orient ourselves to sound.

Regarding our first psychoacoustic consideration, we have established that frequency can be perceived as pitch, and, as illustrated earlier through the concept of infrasound,[21] we understand that humans can only hear sounds within a specific frequency range. But even within our audible range of hearing, we don't interpret all frequencies identically and are more sensitive in certain areas.[22] Humans are programmed to hear voices, and evidence suggests that babies develop the cognitive ability to recognize the human voice before even learning how to speak.[23] In order to survive, we’re built to focus on human voices. Translated to hearing abilities, our ears focus on the frequency range of the human voice, and we hear sounds in this range with the highest level of clarity.[24] Specifically, our hearing is most sensitive around 2-5kHz,[25] the upper range of where the human voice generally sits.

Regardless of our programming towards the voice, when we hear multiple sounds in similar frequency ranges at the same time, our brains have trouble distinguishing them from each other.[26] Known as “frequency masking,” this term describes a psychoacoustic phenomenon that

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[20] Howard and Angus, *Acoustics and Psychoacoustics*, 73.
[21] Moller and Pedersen, “Hearing at Low and Infrasonic Frequencies.”
[22] Dixon, “Psychoacoustics.”
[23] Jon Hamilton, “Infants Recognize Voices, Emotions By 7 Months,” *NPR*, March 24, 2010, sec. Research News, https://www.npr.org/2010/03/24/125123354/infants-recognize-voices-emotions-by-7-months.
[24] Davis and Jones, *The Sound Reinforcement Handbook*, 15.
[25] “Sound Intensity & Loudness - Teachers (U.S. National Park Service),” accessed December 12, 2022, https://www.nps.gov/teachers/classrooms/sound-intensity-and-loudness.htm.
[26] Davis and Jones, *The Sound Reinforcement Handbook*, 112.

affects how humans process and struggle to perceive multiple sounds presented at once.[27] Frequency masking occurs when multiple sounds occupy the same frequency range and become indistinguishable or when one gets covered up.[28] While masking and the inability to distinguish individual sounds may be problematic in some cases (musically, sound engineers generally try to reduce sounds with clashing or masked frequencies[29]), there are instances in religious practice where this psychoacoustic phenomenon becomes functional and integral to the ritual experience.

Moving to our second psychoacoustic consideration—the quality of sound level—we find an additional instance of inaccuracy in aural perception. What humans hear as loud may not necessarily be high in sound level. According to *The Sound Reinforcement Handbook*, *volume* refers to the subjective loudness of a sound, while *level* is a precise measurement of a sound's intensity, expressed in decibels.[30] "Loudness" refers to our brain's perception of a sound signal's strength, while "level" refers to its measurable amplitude. For example, humans generally perceive their own voice as louder than what's measured.[31] In the context of religious rituals, perceptual loudness is a crucial determiner of the spiritual experience.

Many factors can determine perceived loudness, a complex psychoacoustic phenomenon (influenced by level, frequency, duration, and hearing sensitivity), but sonic contrast tends to impact what we consider subjectively as loud.[32] Loud sounds are generally compared in relation

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[27] Brian C. J. Moore, "Masking in the Human Auditory System," *Journal of the Audio Engineering Society*, May 1996, http://www.aes.org/e-lib/browse.cfm?elib=7136.
[28] Nick Messitte, "What Is Frequency Masking?," iZotope, March 23, 2022, https://www.izotope.com/en/learn/what-is-frequency-masking.html.
[29] Dixon, "Psychoacoustics."
[30] Davis and Jones, *The Sound Reinforcement Handbook*, 28–31.
[31] H. L. Lane, A. C. Catania, and S. S. Stevens, "Voice Level: Autophonic Scale, Perceived Loudness, and Effects of Sidetone," *The Journal of the Acoustical Society of America* 33, no. 2 (February 1961): 160–67, https://doi.org/10.1121/1.1908608.
[32] H. L. Lane, A. C. Catania, and S. S. Stevens, "Voice Level: Autophonic Scale, Perceived Loudness, and Effects of Sidetone," *The Journal of the Acoustical Society of America* 33, no. 2 (July 26, 2005): 160, https://doi.org/10.1121/1.1908608.

to another sound or some baseline; however, this judgment is entirely context-specific and, unlike level, relies on external data. According to sound designer Tasos Frantzolas, "perceiving loud is only possible if we perceive quiet," and sounds "must work together to have an effect."[33] With allotted time intervals, religious rituals make use of perceived loudness and quietness, which can enhance the spiritual experience. Loud sounds, for instance, may (in some cultures) illustrate the strength of a higher power, while quieter moments or silence can offer periods for introspection.[34] The two can be contrasted. Both loudness and quietness can serve a spiritual function, but manifesting these effects requires establishing their difference.

Beyond frequency and loudness, our psychoacoustic perceptions rely on our abilities to interpret sound spatially and localize individual sounds.[35] Depending on binaural processing (sounds entering our ears at different distances), our brains determine where sounds come from through minute differences in time, level, and frequency. Despite only minor differences between the data each ear receives, our brains can decode this data and use this information in localizing sounds. [36]

Beyond human physiology, individuals perceive sound as part of our general way of thinking. We rely (in part) on how we are psychologically conditioned, and our associations with sound can inform our sonic aesthetic preferences. But human evolution also plays a role. In order to survive, the human body has evolved to respond to sounds in specific ways. We illustrated this earlier, explaining how humans are programmed to focus on voice as a method for survival.[37] However, we are conditioned to non-human sounds as well. Scientists believe that we view

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[33] Tasos Frantzolas, "The Beautiful Lies of Sound Design," YouTube, March 21, 2016, https://www.youtube.com/watch?v=jDy5j0c6TrU.
[34] *Tasos Frantzolas.*
[35] Howard and Angus, *Acoustics and Psychoacoustics*, 107.
[36] Howard and Angus, 73.
[37] Hamilton, "Infants Recognize Voices, Emotions By 7 Months."

dissonant and distorted sounds as evocative and holding a negative connotation because they are linked to our perceptions of animal distress calls.[38] On that account, sounds may be designed with dissonance for this purpose. Within the context of religious rituals, we may use dissonant sounds for their evocative qualities. Relying on our primal dispositions to respond to certain dissonant sounds, the shofar, dungchen, and didgeridoo are instruments that become signaling tools across religious rituals.

Beyond voice and dissonance, some believe humans are psychologically programmed in our responses to many sounds. Tasos Frantzolas says that birds in Western culture have a positive connotation, and we associate them with normalcy, peace, and a sense that everything is as it should be. Furthermore, he believes thunder can represent divine intervention, church bells can represent time or human morality, and industrial sounds evoke an unsettling feeling.[39] As demonstrated here, our associations with certain sounds may be both positive and negative.

While each of these examples from Frantzolas can occur naturally, they may also be simulated in ritual settings and evoke the same positive or negative responses. However, beyond positive and negative connotations, sounds may also mean something. Jewish, Christian, Islamic, Greek, and Hindu traditions all consider thunder or lighting as symbolizing the power of their deities. Focusing on thunder, we can recognize that many religions view it as representing a divine authority, which suggests it holds layers of psychological connotations. Thunder is powerful, scary, and (at the time most religions were formed) not understood through science; therefore, with people responding to its authority naturally, it makes sense that thunder was incorporated into the sound fabric of many religions.

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[38] Meg Sullivan, University of California, and Los Angeles, "Dissonant Music Brings out the Animal in Listeners: Researchers," accessed December 14, 2022, https://phys.org/news/2012-06-dissonant-music-animal.html.
[39] Tasos Frantzolas, "The Beautiful Lies of Sound Design."

Conclusion

An interdisciplinary approach allows us to study religious rituals from multiple perspectives. As each discipline informs something unique regarding sound and spiritual experience, together they enrich our understanding of religious rituals as complex acoustic events. A sound engineer's framework enhances our understanding of how sound functions across ritual contexts. Exploring acoustics and sound studies has allowed for a technical understanding of sound and a way to assess sound in religious rituals empirically. Moreover, studying the perception of sound through psychoacoustics and psychology has informed some of the diverse ways that sound can function and be manipulated. By integrating multiple fields of study, this chapter underscores the value of interdisciplinary approaches to enhance our understanding of sound and religious experience.

Chapter II

Sound Perception in Religious Rituals

Sound exists in the environment, whether humans perceive it or not, but sounds in religious rituals have been tailored to meet the sonic preferences and predispositions of human beings. In the last chapter, I developed an interdisciplinary framework for analyzing sound in religious rituals. This chapter applies that interdisciplinary framework to specific ritual contexts and reflects on the connection between sound perception and religious practice. The chapter focuses on 1) how individuals perceive sound in religious rituals and 2) how religious rituals orchestrate these perceptions during spiritual experiences. Divided into sections on three types of sound perception—*spatial perception*, *signaling perception*, and *frequency masking*—it explores design similarities across religious rituals, searches for patterns in ritual orchestration, and explains a few of the many experiential objectives of the ritual sound-makers. Spatial perception properties, we shall see, help to establish ritual authority; signaling perception properties enhance communication; and frequency masking encourages community building.

The sophistication of sound perception designs often elicits profound religious experiences. In some cases, sound is used as one of several tools meant to enhance spiritual engagement, and it is recognized as serving that function by those involved in the ritual. In other examples, sound is the centerpiece of the entire spiritual event, intended to convey experiential meaning in itself. The chapter also examines some rituals that rely on sound indirectly, considering how sounds can unintentionally or serendipitously support ritual objectives.

Throughout this chapter, the role of cultural history, ritual traditions, and individuals' personal backgrounds in affecting sound perception in religious rituals is also considered. In

exploring these topics, we hope to uncover patterns in ritual orchestration, ultimately shedding light on the ways in which sound and perception intertwine in the spiritual realm.

Spatial Perception

Sound-makers and ritual leaders recognize the importance of spatial perceptions of sounds, manipulating ritual settings to serve spiritual functions and garner a sense of spiritual authority. Using sound engineering to evaluate religious rituals, this section aims to explore how spatial environments affect human sound perception and serve a religious function. Space perception becomes part of spiritual reverence when it involves (1) *immersive sound* (surrounding the perceiver with a ritual sound), (2) *atmospheric ambience* (the noises of a ritual space), and (3) *localized sound* (sound that comes, or appears to come, from a particular area).

Certain sound practices transcend religions and are commonplace in ritual events from various cultures, achieved through ambience textures, physical orientation, and exposure to abundant (or specific) stimuli. Across religions and cultures, particular settings play important roles in directing spiritual experience. Setting can help create an immersive event in which the perceiver feels surrounded by sound. On the other hand, setting can localize sound, causing the perceiver to sense that the sound is coming from a specific place (for example, from above).

The way sounds exist within a space can divulge ritual objectives and express spiritual meaning. Spatial perceptions often serve specific religious functions, like igniting a sense of spiritual authority and religious reverence. Exercised within sound's spatial domain, spiritual authority is generally produced through exposure to three main phenomena: immersive, atmospheric, and acousmatic sound. In the pages ahead, I will describe examples of these

acoustic phenomena in order to explain how specific sounds can affect spatial perception and perceivers' religious experiences.

Immersive sound creates the feeling of a ubiquitous divine presence, making the religious entity or culture feel authoritative and omnipotent. For example, the Islamic Call to Prayer (*adhan*)[40] in (majority) Muslim cities can create a powerful religious experience by using spatial acoustics and ubiquitous sound to create a sense of spiritual omnipotence. Broadcasted from mosques across cities by the *Muʾadhdhin* (one who delivers the adhan),[41] the adhan is a ubiquitous ritual event that touches perceivers (Muslim or not) five times a day and all across cities. According to Dr. Scott Kugle, a scholar of Middle Eastern and South Asian studies and former resident of Fez, Morocco, the adhan is an "extremely powerful" event that engulfs cities with sound. As converging speaker systems with different transmission times and technological capacities transmit audio, the sound of the adhan resonates through the streets. Bouncing off buildings and surfaces, the natural reverb and delay effects create a complex psychoacoustic experience, immersing individuals through overwhelming exposure to sonic stimuli.[42]

Dr. Kugle says that, while some Muslim cities' adhan is sonically less unified and "aesthetic" (due to a number of Islamic sects, different vocalized sounds, and effort for the Muʾadhdhin to be both first and loud), the experience is a powerful reminder of Islam. Heard by Muslims and non-Muslims alike, the ritual is an unavoidable experience for all individuals present in Muslim cities and demonstrates the profound authority of Islamic culture within these

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[40] Th W. Juynboll, "Adhān," in *Encyclopaedia of Islam, Second Edition* (Brill, April 24, 2012), https://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/adhan-SIM_0302?s.num=0&s.f.s2_parent=s.f.book.encyclopaedia-of-islam-2&s.q=adhan.
[41] P. Bearman, "Muʾadhdhin," in *Encyclopaedia of Islam, Second Edition* (Brill, April 24, 2012), https://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/muadhdhin-DUM_2720?s.num=0&s.f.s2_parent=s.f.book.encyclopaedia-of-islam-2&s.q=Mu%CA%BEad%CC%B2h%CC%B2d%CC%B2h%CC%B2in.
[42] Davis and Jones, *The Sound Reinforcement Handbook*, 57.

spaces. For the Muslim sound-makers creating these immersive experiences, the Call to Prayer expresses the authority and ubiquity of Islam.

Atmospheric ambience is the term used to describe extraneous sound, like random echoes heard within a religious space. The effect is similar to immersive sound in that it envelops the perceiver in sound, but it is less intentional, direct, or overtly meaningful (the sound is a noise, not language). Generally, atmospheric ambiences are not intentionally created and are, rather, the byproduct of the ritual context. Without direction or ritual focusing, the effect of atmospheric ambience is subconscious (perceivers do not know why the noise creates a spiritual feeling). Whereas ritual language (Kol Nidre, Muslim Call to Prayer, etc.) gains some of its spiritual effect from the semantic meaning of the words themselves, atmospheric ambience creates a spiritual effect through the tonal qualities of the sound and the significance of the space in which it is heard.

According to 19th-century French Romantic writer Victor Hugo, the French cathedral of Notre Dame had sounds "fraught with such benediction and majesty, that they soothed this ailing soul."[43] Evident through Hugo's statement, the specific acoustics of Notre Dame can have profound effects on perceivers and are critical to spiritual experience. Providing a comforting atmosphere, grand aura, and acute sacredness, the room acoustics of cathedrals like Notre Dame are designed to create a distinctive experience for worship, though perceivers might not recognize these features. Audible echoes and reverberations through spaces allow perceivers to consider sounds within cathedral spaces as "heavenly" or "ethereal."

Finally, *localized sounds* give the perceiver a feeling that sound is coming from a particular location within the space, which can enhance the spiritual experience by giving the

[43] Schwartz, "The Quest to Restore Notre Dame's Glorious Sound."

impression that sound comes from a divine source (the heavens, the cross, etc.). Sound designer Tasos Frantzolas argues that "separating a voice from its source" can create a sense of "ubiquity and authority."[44] By concealing a sound source, religious rituals employ "acousmatic sound" to manipulate individuals' spatial perceptions of sound and promote a sense of spiritual authority.

Acousmatic sounds refer to sounds heard without being able to identify the sound source. Referencing the ancient Greek philosopher Pythagoras, 20th-century French composer Pierre Schaeffer first used the term in his experimental study of musique concrète.[45] The French word "acousmatique" is derived from the Greek "akousmatikoi," which means "hearers." In a unique teaching approach, Pythagoras would lecture behind a veil or curtain (to his "akousmatikoi") so that his disciples would focus on the sound of his voice words rather than his physical character.[46] Pythagoras believed that meaning should be derived from content, and the veiled method was intended to reduce the educational process to a listening experience. Schaeffer considered Pythagoras's ancient practice in conceptualizing and theorizing listening experiences and originating the term acousmatic sound. Schaeffer believed in the power of reducing sonic experiences to listening, and acousmatic listening experiences are designed to restrict all information that could interfere with one's perception of sound.

Building on Schaeffer's concept in his book *Sound Unseen: Acousmatic Sound in Theory and Practice,* music and sound studies scholar Brian Kane says that by shifting attention away from physical causes of "auditory perception toward the content of this perception," sounds are reduced "to the field of pure listening." Kane argues that "although the acousmatic experience of sound still allows for the possibility of speculating upon or inferring casual sources, it bars direct

[44] Tasos Frantzolas, "The Beautiful Lies of Sound Design."
[45] The Editors of Encyclopaedia Britannica, "Musique Concrète," in *Encyclopedia Britannica*, April 27, 2018, https://www-britannica-com.proxy.library.emory.edu/art/musique-concrete.
[46] Brian Kane, *Sound Unseen: Acousmatic Sound in Theory and Practice* (Oxford University Press, 2014), chap. 2.

access to visible, tactile, and physically quantifiable assessments as a means to this end." [47] Therefore, without an ability to identify the sound sources, listeners may create their own associations with unsourced sounds, and acousmatic experiences can create several emotional responses from listeners.

In a discussion of acousmatic sounds, Frantzolas notes several situations in which separating a sound from its source has created unique performances and listening experiences. Richard Wagner's invention of the orchestral pit illustrates one application for acousmatic sound. Frantzolas believes hiding the orchestra from theatre audiences gave a sense of ubiquity to the orchestral sounds and elevated the theatrical experience. Aphex Twin, according to Frantzolas, famously DJ'd and performed music from the darkest corners of clubs. Like Pythagoras, Aphex Twin would "veil" himself from his audience, which he believed would generate a purer listening experience for his audience and bring a more significant impact to his work. Aphex Twin cared greatly and wanted listeners to create their own meaning from their music. Finally, and most pertinent to our discussion of religious ritual, Frantzolas cites nuns in Rome and Venice performing their own version of acousmatic music. Singing from the highest rooms of monasteries, nuns would project their voices down below. Creating the illusion that sound was being sung from angels up in the heavens, these sounds were given divine authority.

Using the mystery of sounds to garner a sense of religious authority, many religious rituals employ acousmatic sound to direct religious experiences. Through ascribing spiritual meaning to sound, acousmatic experiences demonstrate how our spatial perceptions of sound may be manipulated to enhance ritual meaning and direct spiritual experience.

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[47] Brian Kane, *Sound Unseen: Acousmatic Sound in Theory and Practice* (Oxford University Press, 2014)Kane, 24.

Signaling Perception

Countless sound-makers in religious rituals use horns, trumpets, or other instruments with broad psychological associations. Their goal is to create a "signaling perception," which either indicates a significant moment in the religious ritual or communicates the need, among religious adherents, to perform a specific action. Signaling perception illustrates sounds' deep connotations and capacity to evoke specific responses in listeners during religious rituals. Signaling instruments often have similar designs and serve specific ritual functions. They are prevalent and used in religious rituals across cultures.

For example, in Judaism, the *shofar* is blown during Rosh Hashanah to signal the start of the Jewish New Year.[48] Made from a ram's horn, this wind instrument emits dissonant tones and is used to call perceivers' attention and foment religious experiences. Discussed in the previous chapter, this instrument may be linked to our perceptions of animal distress calls.[49] With primal associations to its sound, one may argue that the shofar elicits its emotional response by tapping into our deep psychological programming. However, this is only part of the way the shofar develops meaning. Through consistent exposure to its specific sound through rituals and over time, repetition contributes to its perceptual connotation and signaling function.

Used as a signaling tool, horn-like instruments are one of humanity's oldest musical inventions, existent across cultures and prevalent in countless religious rituals. Despite being developed independently in far corners of the world, many horn-like instruments have strikingly similar designs and functions and are similarly used as powerful tools for signaling in religious rituals. For example, in ancient aboriginal culture, the *didgeridoo* is a "sacred prayer-tool" with

[48] The Editors of Encyclopaedia Britannica, "Shofar," in *Encyclopedia Britannica*, July 30, 2020, https://www-britannica-com.proxy.library.emory.edu/art/shofar.
[49] Sullivan, California, and Angeles, "Dissonant Music Brings out the Animal in Listeners."

spiritual healing functions.[50] Similarly, the *dungchen* (also called the Tibetan long horn or trumpet) has a comparable design and, played by Buddhist monks in Tibetan temples, also functions in religious contexts.[51] Both used for religious signaling, one may note in figures 2.1 and 2.2 the similar instrument designs of instruments conceived and used in entirely different parts of the world.

FIGURE 2.1. Photograph of Yirrganydji Aboriginal men by Rafael Ben-Ari.

[50] Karl Neuenfeldt, "The Quest for a 'Magical Island': The Convergence of the Didjeridu, Aboriginal Culture, Healing and Cultural Politics in New Age Discourse," *Social Analysis: The International Journal of Social and Cultural Practice* 42, no. 2 (1998): 73.
[51] Peter Tracy, "The Sounding of Trumpets: Ritual, Signal, Warfare, and the Hunt in the Music of Early Brass Instruments," Early Music Seattle, July 19, 2022, https://earlymusicseattle.org/the-sounding-of-trumpets-ritual-signal-warfare-and-the-hunt-in-the-music-of-early-brass-instruments/.

FIGURE 2.2. Photograph of Tibetan monks from a 1938 German expedition.[52]

Used to call attention across cultures, the shofar, didgeridoo, dungchen, and prevalence of other horn-like instruments demonstrates the power of sound to trigger deep psychological associations and elicit emotional responses. Though they are used in different places and different contexts, there is remarkable similarity in the ways in which sound makers use them as powerful tools of spiritual and religious purpose.

Frequency Masking

[52] Tracy.

Referring to humans perceiving multiple sounds at once, frequency masking is the psychoacoustic phenomenon in which one sound masks another sound because the two occupy the same frequency range.[53] In music and sound engineering, frequency masking is generally considered a problematic occurrence,[54] but in ritual settings, frequency masking can fulfill certain religious goals. It can foster a spiritual experience, for example, by encouraging collective singing, and by increasing the sound force and harmonizing multiple sounds into one collective sound. In both cases, frequency masking is used to promote a sense of community and shared experience.

In attempting to explain social healing, collective participation, and notions of shared transcendence in ritual, neuroscientist and biologist Walter J. Freeman illustrated the role of sound in shared experience and social bonding. In his article "A Neurobiological Role of Music in Social Bonding," Freeman discusses the benefits of singing and dancing in achieving social unity.[55] Despite noting that the "pleasurable states" of social unity and aesthetic engagement result in neurotransmitters like "dopamine and…endorphins" being released,[56] he says that "[neither] conventional neuroscience nor aesthetics can explain the deep emotional power of music to move humans to action."[57]

Relying on the social unity properties described by Freeman, frequency masking encourages collective singing, helping to bond a spiritual community and encouraging participation in choirs, singing from the pulpit, or other collective ritual sounds. During group or collective singing, frequency masking can encourage individuals to be more confident and

[53] Moore, "Masking in the Human Auditory System."
[54] Davis and Jones, *The Sound Reinforcement Handbook*, 112.
[55] Walter J. Freeman, "A Neurobiological Role of Music in Social Bonding," May 20, 1998, https://escholarship.org/uc/item/9025x8rt.
[56] Freeman, 7.
[57] Freeman, 1.

expressive in their vocalizations. At similar volumes, when singers believe that their individual voices can't be made out, they are more likely to sing more freely and devote themselves to the experience. Evident in group Zikr rituals practiced in Islamic Sufism, collective vocalizations can be meditative and spiritual experiences in which individuals connect with themselves, their groups, and God.[58] Through phrases and repetitively reciting religious scriptures, Sufi Zikr rituals demonstrate "remembrance" of God while also providing an opportunity for personal reflection and thought.[59] As meditative and cathartic experiences, the ritual experience relies on individuals vocalizing and expressing themselves freely. As frequency masking may encourage ritual participants to be more expressive, this perceptual phenomenon appears to benefit certain ritual events. Altogether, this function of frequency masking helps us see how sound-makers are themselves sound perceivers. Frequency masking provides positive feedback to the singer and thereby encourages singing.

Frequency masking helps to harmonize various sounds into one collective sound, creating the feeling among listeners of a spiritual whole and multiplying the overall sonic force. Sound-makers and listeners alike thereby experience the sounds of individuals as one forceful, collective sound, thereby enhancing the feeling of a strong spiritual community. Frequency masking can make multiple sounds work together. When multiple voices or instruments combine, this can result in a shared force that can be more than just the sum of all the parts. An ancient spiritual practice across multiple religions, gamelan is an Indonesian music style rooted in Hindu, Buddhist, and Muslim traditions. Incorporating gongs, flutes, xylophones, drums, and

[58] The Editors of Encyclopaedia Britannica, "Dhikr," in *Encyclopedia Britannica*, May 27, 2021, https://www-britannica-com.proxy.library.emory.edu/topic/dhikr.
[59] Gerhard Böwering and Moojan Momen, "ḎEKR," in *Encyclopaedia Iranica Online* (Brill, August 30, 2020), https://referenceworks.brillonline.com/entries/encyclopaedia-iranica-online/dekr-COM_8261?s.num=0&s.f.s2_parent=s.f.book.encyclopaedia-iranica-online&s.q=DHIKR.

singing, gamelan is performed in ensembles and is remarkable for its layers of sound.[60] With sometimes more than 50 instruments, sounds work together during gamelan, and the experience is designed to create a unified, powerful, and immersive sonic aesthetic. While individual instruments can often not be made out, their tones and discrete frequencies combine to form an expansive sound rich with texture and harmonic content. With each instrument "tuned to match the ensemble… rather than to an external standard of pitch,"[61] sounds build off each other in frequency and create a profound ritual experience for listeners. If only one sound were played at a time, or if brains didn't engage in frequency masking, this ritual would not create the same spiritual experience for listeners.

[60] The Editors of Encyclopaedia Britannica, "Gamelan," in *Encyclopedia Britannica*, August 19, 2011, https://www.britannica.com/art/gamelan.
[61] Britannica.

Chapter III

Altered States of Consciousness: Trance

While the previous chapter considered the many ways that individuals can perceive sound in religious rituals, and the diverse ways in which rituals enhance spiritual experiences, each of the following two chapters focus on one particular function of sound within specific ritual contexts. Framed through chapters, first, on trance and, second, on meditation, each will explore how sonic characteristics, primarily of time and frequency, exist across religious rituals, and the various ways they elicit Altered States of Consciousness (ASC) and affect individuals' spiritual experiences. This chapter examines religion through the lens of sound and altered consciousness in religious rituals, looking at how sound can alter perceivers' conscious states and affect the spiritual experience. But before we look at sound's relationship to altered consciousness, we must first discuss some of the research on ASC.

Background on Altered Consciousness

As a tool to direct human experiences, sound's ability to transform listeners' mental states is perhaps its most extraordinary function. Beyond mood changes, humans can have perceptions and conscious experiences temporarily altered into various (but psychologically consistent) states,[62] which sometimes result from exogenous triggers like a sound. Including a range of mental conditions like trance, meditation, hallucination, hypnosis, and psychosis, the term "Altered States of Consciousness" describes categories of consciousness that occur beyond normal states of consciousness (NSC).[63] NSC refers to individuals' standard states of being—the

[62] Sarah Williams, "Study identifies brain areas altered during hypnotic trances," News Center, July 27, 2016, http://med.stanford.edu/news/all-news/2016/07/study-identifies-brain-areas-altered-during-hypnotic-trances.html.
[63] Antti Revonsuo, Sakari Kallio, and Pilleriin Sikka, "What Is an Altered State of Consciousness?," *Philosophical Psychology* 22, no. 2 (April 1, 2009): 187–204, https://doi.org/10.1080/09515080902802850.

consistent version of oneself in terms of behavior, environmental or situational awareness, and coherent cognitive thought. Despite the fact that humans mostly exist in NSC, people also seek out ASC, often in specifically religious contexts.[64] Considered as examples of ASC, spiritual experiences can refer to transcendent moments between individuals and the divine. Sound is one of the most effective and commonly used devices to help one enter ASC.

These two chapters examine trance and meditation as separate entities, but not all religions or scholars make such distinctions. Culturally, there are often not even different words for the two experiences, and, of course, "Altered States of Consciousness" is an academic/scientific, not cultural, term. Despite the difficulty in distinguishing trance and meditation, any attempt to describe the role of sound in each practice must rely on the work of scholars, like ethnomusicologists Judith Becker and Gilbert Rouget, who have framed the two altered states mostly through intensity of experience and sometimes through their collective or individual nature.[65]

Potentially transforming one's "conscious mode of awareness" in order to enter unfamiliar "domains of self-experience," ASC can dissociate people from their "autobiographical sense of self,"[66] allowing multiple narrations through a single event. Dissociation or detaching from one's "autobiographical narrative" may offer individuals personal insight and connective growth. Though medical risks exist, depending on the intent and context of the practice, altered states can be profoundly beneficial experiences if practiced with certain purpose. ASC is often positively associated with acts of healing, catharsis, reflection, connection, ego death, and

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[64] Gilbert Rouget, *Music and Trance: A Theory of the Relations Between Music and Possession* (University of Chicago Press, 1985).
[65] Judith Becker, *Deep Listeners: Music, Emotion, and Trancing* (Indiana University Press, 2004); Rouget, *Music and Trance: A Theory of the Relations Between Music and Possession*.
[66] Pierre Flor-Henry, Yakov Shapiro, and Corine Sombrun, "Brain Changes during a Shamanic Trance: Altered Modes of Consciousness, Hemispheric Laterality, and Systemic Psychobiology," ed. Peter Walla, *Cogent Psychology* 4, no. 1 (December 31, 2017): 1313522, https://doi.org/10.1080/23311908.2017.1313522.

honoring spirits. Flor-Henry, Shapiro, and Sombrun argue that "Contrary to the prevalent Western belief, ASCs are extremely common: anthropological studies show that of the 488 societies studied worldwide, over 90% were found to have an institutionalized form of ASCs."[67] Despite varying practices, ASC have become popular therapy methods across cultures, and scientific evidence suggests they have healing properties.[68]

Though "there have been a number of electrophysiological and neuroimaging studies," according to a 2017 examination of brain changes during trance, "the nature and clinical significance" of ASC "remain[s] elusive."[69] Nevertheless, while more research and technological developments are required to understand the neurocognitive processes involved in ASC, humans have always been aware that altered states exist, and, as with ritual healing trances, cultures have utilized ASC in countless and idiosyncratic ways. ASC can occur naturally through events (like yoga or childbirth), from stimuli (like psychedelic compounds or sounds), or through a combination of factors.[70] One can enter ASC for a variety of different reasons (stimuli, contexts), but similar ritual practices do exist, and certain tools are frequently used to elicit spiritual experiences.

Sound is a highly effective stimulus for inducing ASC.[71] As discussed earlier with regard to infrasound,[72] humans perceive sound both auditorily (through our ears) and tangibly (through vibrations processed within our bodies). Due to these quick and efficient sensory reception

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[67] Flor-Henry, Shapiro, and Sombrun.
[68] Lyz Cooper, "Sound Affects: Sound Therapy, Altered States of Consciousness and Improved Health and Wellbeing," *The British Academy of Sound Therapy*, January 1, 2016, 5.
[69] Flor-Henry, Shapiro, and Sombrun, "Brain Changes during a Shamanic Trance."
[70] Christa Smith, "Altered States of Consciousness," Psychology Today, August 24, 2015, https://www.psychologytoday.com/us/blog/shift/201508/altered-states-consciousness.
[71] Asa Young, "Altered States of Consciousness Induced by Exogenous Audio Signals: Toward a Better Understanding of the Oscillatory Correlates of Consciousness," *Resonance* 3, no. 1 (March 1, 2022): 28–40, https://doi.org/10.1525/res.2022.3.1.28.
[72] Moller and Pedersen, "Hearing at Low and Infrasonic Frequencies."

systems, sound serves countless functions and elicits a wide range of emotional responses. Research suggests that, when listening to sounds, humans can see "colors pulsing behind closed eyes," lose their "sense of time," and endure "spiritual or mystical experiences."[73] Moreover, spectral analysis studies have indicated that altered consciousness has the ability to shift individuals' brain wave patterns.[74] Empirical studies and consistent qualitative experiential descriptions suggest that, even when sound is the sole stimulus, it can alter consciousness.

Across cultures, certain sonic characteristics (primarily within the time and frequency domains) can play powerful roles in the promotion of trance. Despite differing methods and theoretical frameworks of sound and ASC, many cultural groups employ sound as a catalyst for the experience. Though religion is not inherent to ASC, these practices are often connected to religious traditions.

Much about the relationship between sound and ASC is unknown, but countless religious groups (within the cultural traditions of Buddhism, Hinduism, Islamic Sufism, and Mongolian shamanism, to name a few) involve sound in ritual and employ it to elicit desired emotional responses. A sufficient neurological explanation of ASC does not exist, but many cultures have found solace and meaning from these experiences and attribute mystical properties to divine intervention. Though the medical community may try to explain ASC, some cultures find comfort in the unknown properties of ASC on the human condition. For example, according to religion scholar William Wainwright, "the concept of mystery is central to Christian reflection and Christian worship."[75] But beyond Christianity, many religious groups view God (or some

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[73] Cooper, "Sound Affects: Sound Therapy, Altered States of Consciousness and Improved Health and Wellbeing."
[74] Bhavna P. Harne and A. S. Hiwale, "EEG Spectral Analysis on OM Mantra Meditation: A Pilot Study," *Applied Psychophysiology and Biofeedback* 43, no. 2 (June 1, 2018): 123–29, https://doi.org/10.1007/s10484-018-9391-7.
[75] William J. Wainwright, "Theology and Mystery," in *The Oxford Handbook of Philosophical Theology*, ed. Thomas P. Flint and Michael C. Rea (Oxford University Press, 2011), 0, https://doi.org/10.1093/oxfordhb/9780199596539.013.0005.

spiritual entity) as working in mysterious ways and consider faith an essential component of piety. Finding a framework for understanding has traditionally been attempted through the study and practice of religion.

Questions of mysticism, consciousness, and the origins of religion are highly debated subjects within academia. In his book *Mysticism and Philosophical Analysis*, philosopher and religion scholar Steven T. Katz argues the significance of cultural traditions and norms in creating individuals' religious experiences. Claiming that academic attempts to study religious experiences often reduce complexity and fit within existing theoretical frameworks, Katz has critiqued many "explanations" as reductionist.[76] In an opposing view, Robert K. C. Forman, another scholar of religion, argues that "pure consciousness" exists as a pervasive phenomenon, and that humans have innate dispositions that affect spiritual experience.[77] Unlike Katz, Forman believes nature (rather than religion or culture) is the paramount determiner of peoples' "thoughts, emotions, sensations,…[and] awareness" during mystical experiences.[78] To simplify the debate, we can say that Katz takes a cultural position, and Forman takes a nature position. While both Katz and Forman acknowledge the significance of stimuli like sound in creating spiritual experiences, their explanations of ASC focus on different things.

Nevertheless, in the most beautiful way, sound has been a common denominator in the genesis of religion. Sometimes the primary (or sole) tool used to help one enter an ASC, sound has extraordinary spiritual functions and is often inseparable from religious practice. Whether developed independently or transmitted between religious groups *vis-à-vis* shared practices, sound has been remarkably present in the history of individuals pursuing ASC. Furthermore,

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[76] Steven Katz, *Mysticism and Philosophical Analysis* (Oxford University Press, 1978).
[77] Robert K. C. Forman, "Pure Consciousness Events and Mysticism," *Sophia* 25, no. 1 (April 1, 1986): 49–58, https://doi.org/10.1007/BF02789849.
[78] Forman, 49.

sound's effect on listeners is perhaps as complicated as the cognitive conditions described as ASC. With sound, ASC, and religion so inherently interrelated, it's no surprise that countless religions consider sound and instruments as holy. Gamelan, for example, is not just a musical orchestra.[79] Despite being practiced by numerous religious groups like Hindus, Buddhists, and Muslims, instruments in gamelan are considered to have souls, and the sonics of these traditions are inherently linked to the "sense of the 'spiritual.'"[80] While we won't discuss gamelan for its specific relationship to ASC, gamelan's unique understanding of instruments highlights how sound, religion, and ASC are, beyond connected, fundamentally inseparable. Revisiting the idea that the inexplainable nature of ASC may have sparked individuals' inspirations for religion, underlining an inseparable link, humans' innate appreciation of sound may also have informed the values and conceptual frameworks of religions.

As an experience of altered consciousness, some scholars view trance states as exclusive and potentially unattainable depending on perceivers' cultural backgrounds. The major spokesperson and first proponent of this school of thought, French ethnomusicologist Gilbert Rouget emphasized the importance of cultural context in ASC. Researching the prevalence of music within trance rituals, he developed a strict theory of who can achieve trance and ASC. Arguing that trance applies only to people within the culture, in his 1985 book *Music and Trance: A Theory of the Relations Between Music and Possession,* Rouget supports the belief that psychology is culturally influenced, "forcefully rejecting pseudo-science…[,] reductionism,…[and] the so-called theory of neurophysiological effects of drumming on

[79] Britannica, "Gamelan."
[80] Susan Pratt Walton, "Aesthetic and Spiritual Correlations in Javanese Gamelan Music," *The Journal of Aesthetics and Art Criticism* 65, no. 1 (September 22, 2007): 39, https://doi.org/10.1111/j.1540-594X.2007.00235.x.

trance."[81] While Rouget's work was highly criticized, he did concur with other scholars in concluding that trance differs from other ASC by degree of intensity.

Building on the work of Rouget, nineteen years after *Music and Trance*, American ethnomusicologist Judith Becker released her book *Deep Listeners: Music, Emotion, and Trancing,* which, while also emphasizing the importance of cultural background in experiencing ASC, presents a less strict and exclusive view of who can experience ASC.[82] In her book, Becker argues that Westerners and other cultures that don't practice trance rituals can still experience something similar, referring to "*deep listeners"* as a "term for persons who are profoundly moved…by simply listening."[83] Considering *deep listening* as less consuming than trance states but still, to some degree, a spiritual experience, we will consider both Becker's and Rouget's perspectives in assessing less intense ASC.

Altered States of Consciousness and Trance

In her book *Deep Listeners: Music, Emotion, and Trancing*, ethnomusicologist Judith Becker discusses the "sensual richness of trancing within the context of religious ceremonies," arguing that "religious institutionalized trancing ranks as the most aesthetic, most widely practiced, and the most highly valued of all trances."[84] With powerful ties between religion and trance, she notes the "many firsthand accounts of experienced and skillful trancers" who attest to the "catalytic role of music in the transition into trancing, in the sustaining of trancing, and the transition back to normal consciousness."[85] But while, as an ethnomusicologist, Becker feels

[81] Rouget, *Music and Trance: A Theory of the Relations Between Music and Possession*.
[82] Becker, *Deep Listeners: Music, Emotion, and Trancing*.
[83] Becker, 2.
[84] Becker, 1.
[85] Becker, 3.

comfortable outlining the fundamental relationship between religion, trance, and music, sound alone (even without evident *musicality*) can evoke the profound effects of trance.

Stripped down to time and frequency domains, this section explores how sound-makers in religious rituals direct specific characteristics of sound (specifically time and frequency), affecting perceivers' physiological states and triggering intense spiritual experiences through exposure to overwhelming stimuli. Assessing religious trance rituals as acoustic events, sound functions in rituals to engage perceivers at an emotional level and to benefit them religiously. As a case study on sound and trance, this section focuses specifically on Mongolian shamanism, exploring ritual drumming, ceremonial trance, and diverse functions of sound in religious healing. While many sounds and instruments are used in religious rituals, exploring shamanic trance, drumming is vital to the ritual experience. Moreover, as many rituals utilize sound as a necessary tool to direct experience, countless religious groups view trance ceremonies as essential healing traditions.

An essential tool within ceremonies for healing and connecting with spirits, the shaman's drum holds both physical and spiritual value. As a physical tool, according to Mongolian shaman Sarangerel, "the beating of the shaman drum is the most powerful way to induce trance."[86] In ritual pursuit of an ASC, the drum is recognized as immensely powerful, and—through time and frequency—its repetitive sound directs shamans to trance. Moreover, as undergoing the process of becoming a shaman, they will often "retreat into the woods to drum alone,"[87] it is evident how spiritually important the drum and act of drumming is to Mongolian shamans. Altogether, exploring Mongolian shamanism and trance rituals, we will assess drumming for its both physical and spiritual functions.

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[86] Sarangerel, *Riding Windhorses: A Journey into the Heart of Mongolian Shamanism* (Destiny Books, 2000), 90.
[87] Sarangerel, 74.

Demonstrating spiritual importance, in her book *Riding Windhorses: A Journey into the Heart of Mongolian Shamanism*, author and trained shaman Sarangerel explains that the drum is the "most important tool" to the shaman.[88] Representing their heartbeat, traditionally, in becoming a shaman, the drum is constructed and offered to them by their community.[89] The shaman's drum is crucial to their state of harmony and balance of souls, known as *tegsh*.[90] In a state of illness and soul imbalance, reviving tegsh may require a shamanistic ceremony, and entering trance and connecting with the spirit world is part of the shaman's journey. In Mongolian culture, these ceremonies have great religious significance, and the shaman is respected and depended on for his ability to enter trance and make connections with spirits.

While, from an outside perspective, our understanding of these rituals and the function of the drum makes distinctions between physical and spiritual properties, in Mongolian shamanism, these properties are conceptually connected. Beyond shamanism, many cultures and religious groups do not adhere to conceptual distinctions between physical and spiritual worlds, the mind and body, and do not divorce physical and spiritual health.[91] Adhering to a more holistic view of sound, trance, and spiritual action, Mongolian shamanistic healing rituals demonstrate this framework, and these rituals benefit individuals beyond shamans. For example, the shaman's drum is powerful for its ability to direct numerous forms of energy, and they service their drum to heal others in their community. Aware that some sounds are felt and not heard, and that bass frequencies transfer through vibration, the shaman service their drum to transfer energy between persons. Rubbing the drum on their chest to absorb *windhorse* (energy) and then placing it on the

[88] Sarangerel, 85.
[89] Sarangerel, 74.
[90] Sarangerel, 9.
[91] Harold G. Koenig, "Religion, Spirituality, and Health: The Research and Clinical Implications," *ISRN Psychiatry* 2012 (December 16, 2012): 278730, https://doi.org/10.5402/2012/278730.

patient,[92] you could argue that this act is both physically and symbolically valuable, used to transfer energy, heal, and induce trance.

According to a study conducted by Stanford's School of Medicine, "little is known about how [hypnosis] works at the physiological level," but trance states illustrate "the brain's ability to heal medical and psychiatric conditions."[93] According to Russian psychologist Ivan Pavlov's theory of Transmarginal Inhibition, organisms respond intensely when subject to overwhelming stimuli, which could account for the beneficial properties of trance. Through abundant sensory exposure or deprivation, perceivers may endure massive cognitive redevelopment, periods of brain malleability, and potentially "dramatic change[s]" in "beliefs and/or convictions."[94]

Though instances of stimuli deprivation are less common, translated to ritual trance, spiritual experiences are often elicited through testing individuals' perceptual tolerances to overwhelming stimuli, such as drum hits.[95] These experiences can be physically and psychologically valuable. While extremely intense experiences, "trance and altered states are not necessarily associated with psychopathology," and these periods of cognitive redevelopment "may in fact be therapeutic."[96] As a vehicle for individual healing, trance can reduce shamans' mental and physical pain, and shaman study and practice achieving these effects. While sensory overload may occur from sheer quantity of stimuli exposure, few but complex stimuli can also overwhelm perceivers' sensory systems. Even the solitary sound of a drum, if struck hard and repetitively, can operate complexly and provide sufficient stimulus to evoke trance.[97]

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[92] Sarangerel, *Riding Windhorses: A Journey into the Heart of Mongolian Shamanism*, 86.
[93] Williams, "Study identifies brain areas altered during hypnotic trances."
[94] Laura Knight-Jadczyk, "Transmarginal Inhibition," July 8, 2007, 5.
[95] Sarangerel, *Riding Windhorses: A Journey into the Heart of Mongolian Shamanism*, 86.
[96] Flor-Henry, Shapiro, and Sombrun, "Brain Changes during a Shamanic Trance."
[97] Andrew Neher, "A Physiological Explanation of Unusual Behavior in Ceremonies Involving Drums," *Human Biology* 34, no. 2 (1962): 151–60.

Within the auditory domain, several acoustic stimuli "are capable of 'driving' the brain's alpha rhythms and thereby triggering convulsions," and certain sonic characteristics involved with drumming can elicit trance.[98] Andrew Neher's 1962 article, "A Physiological Explanation of Unusual Behavior in Ceremonies Involving Drums," conducted an anthropological study of drumming and trance and developed several scientific assertions.[99] A scholar of psychology with interest in consciousness, Neher researched the physiological components involved in listening to drumming. Defining "particular [sound] characteristics" involved in trance, in his book *Music and Trance: A Theory of the Relations Between Music and Possession*, ethnomusicologist Gilbert Rouget references Neher's article and reports the following conclusions on drumming and trance:

> These particular characteristics are: (1) with respect to intermittency, a bass frequency corresponding more or less to the frequency of the alpha rhythm, which can vary from eight to thirteen cycles per second, according to the individual; and (2) with respect to the acoustical spectrum, a predominance of bass frequencies (musical frequencies in this case) since they are capable of transmitting more energy to the brain than higher frequencies without doing damage to the ear.[100]

According to this report, certain sonic and acoustical "characteristics" influence trance. Referenced as *intermittency* (similar to rhythm) and *acoustical spectrum*, this research indicates that drumming can elicit trance through sonic properties within the time and frequency domains. Moreover, these conclusions seem to suggest that, within each domain, there is a spectrum of effectiveness. The drum's striking times matter. The drum's bass frequencies matter. Evaluating

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[98] Rouget, *Music and Trance: A Theory of the Relations Between Music and Possession*, 173.
[99] Neher, "A Physiological Explanation of Unusual Behavior in Ceremonies Involving Drums."
[100] Rouget, *Music and Trance: A Theory of the Relations Between Music and Possession*, 173.

the sounds produced by drums, it is important to note that drum hits are transient and not sustained sounds. Moreover, though they also emit higher sounds and tones across the frequency spectrum, the drum sound emits mostly low, bass frequencies. Assessing for effectiveness in inducing trance, this report suggests that transient, intermittently struck sounds and bass drums are most successful in inducing trance.

These findings are relevant within the context of the drumming ritual, and Neher's conclusions are applicable to the study of Mongolian shamanic trance. Beginning with intermittency, it is first necessary to understand how drum hits direct spiritual experiences. Reporting perceptual phenomena within the time domain, Mongolian shamanic rituals can induce trance states in part by providing tempo and by indicating points and phases of the ritual.

According to Sarangerel, while drum hits occur with relative consistency, in Mongolian shamanic rituals, the striking of the drum does not attempt to follow the regularity of a metronome, instead slowing down or speeding up according to the shaman's mental state.[101] As the drum represents the shaman's heartbeat, it is clear how the striking speed can affect the shaman's emotion, energy, and cognitive state. Outside of this shamanic ritual or any religious context, tempos in music are used to direct listeners' emotional states. Similar to shamanic drumming, even the musical genre "Trance" (a noteworthy reference even just for its name) is driven by a bass drum and uses tempo and repetition to alter listeners' emotional and conscious states.[102] Considering intermittency in shamanic ritual drumming, we can discern from this information that slower tempos (fewer frequent hits) could be more calming, whereas faster tempos (more frequent hits) could be more energizing. Accounting for repetition and the number

[101] Sarangerel, *Riding Windhorses: A Journey into the Heart of Mongolian Shamanism*, 90.
[102] "The History of Trance Music (1988 - 2006)," *Give Trance A Chance* (blog), n.d., https://givetranceachance.net/the-history-of-trance/.

of drum hits within a time period, depending on use, the nature of the drum hits affects the shaman's trance state and spiritual experience.

Not just through tempo, but also considering intermittency, drum hits emit powerful sounds that can mark points in rituals and thus also direct the shaman into trance. Indicators of how the instrument is played, sometimes regarding count and other times with speed and strength of the strike, mark different points in the ritual and different phases in the shaman's altered consciousness. For example, in the description of how the shaman conducts the Ritual of the Four Directions, Sarangerel says it is necessary to involve a drum, rattle, or bell as a time indicator.[103] Transient (rather than sustained) triggers, the shaman's drum can work for experiential cue points. Indicating phases of the ritual, she explains how the drum can offer directions, like instructing at different points to "hit the drum three times" and "walk around the circle...all the time drumming."[104] In this ceremony, the instrument is struck at specific points, providing cadence, indicating crucial moments, and experientially directing the shaman through the ritual and into trance.

Considering Neher's second characteristic, *acoustical spectrum*, several perceptual phenomena seem to suggest how bass frequencies elicit trance in ritual drumming, and here we can elaborate on Neher's conclusions. Critically assessing Mongolian shamanic drumming with regard to frequency, our case study suggests four perceptual phenomena could contribute to trance. We will report each of the four here in turn:

1. As the drum's deep, resonating cavity emits mainly low frequencies (which may sit below the 20Hz range of hearing and in the range we call "infrasonic"[105]), the bass and sub-bass

[103] Sarangerel, *Riding Windhorses: A Journey into the Heart of Mongolian Shamanism*, 17.
[104] Sarangerel, 19.
[105] Moller and Pedersen, "Hearing at Low and Infrasonic Frequencies."

resonances may create a physical sensation in the shaman's body powerful enough to alter their consciousness. Possibly the most straightforward phenomena, bass frequencies may physically vibrate through perceivers' bodies and cause emotional responses.

2. Given that "perceptions of time are much more acute at lower registers,"[106] perceptions of the acoustical spectrum may also contribute to perceptions of intermittency because the bass frequencies emitted from ritual drumming help shamanic perceivers determine tempo, thus affecting their emotional states. According to a 2015 study on the neuroscience of bass, while humans' "ability to distinguish changes in pitch" improves in the "upper ranges" of our audible hearing, the "physics of sound waves" and low-frequency sounds aid our capacity to discern rhythm.[107]
3. "Without doing damage to the ear,"[108] the low frequencies of drum sounds may transmit more energy and thus be more emotionally impactful to the shaman perceiving. While, especially over long distances, a sound may appear to lose high-frequency information and be perceivably quieter, acoustically, it can still exist with high signal strength and transmit energy effectively across distance.[109]
4. By feeling rather than hearing sounds as physical vibrations, it is possible that shamans may attribute a religious connotation and authority to the drum sound, responding neurocognitively and predisposing themselves to ASC. Considering spiritual forces as

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[106] Josh Jones, "The Neuroscience of Bass: New Study Explains Why Bass Instruments Are Fundamental to Music," *Open Culture* (blog), October 23, 2015, https://www.openculture.com/2015/10/the-neuroscience-of-bass-new-study-explains-why-bass-instruments-are-fundamental-to-music.html.
[107] Jones.
[108] Rouget, *Music and Trance: A Theory of the Relations Between Music and Possession*, 173.
[109] Richard Collman, "Distance Attenuation: How Sound Reduces with Distance," *Acoustical Control* (blog), February 23, 2015, https://www.acoustical.co.uk/distance-attenuation/how-sound-reduces-with-distance-from-a-point-source/.

transcendent beings, the sound from the drum could also present itself as transcendent, therefore spiritually affecting shamans and eliciting hypnotic states.

While Neher's conclusions help to explain how drumming can elicit trance states, it is important to note that other characteristics besides intermittency and acoustical spectrum seem to be left out or aren't explicitly stated. Sound level also has an integral role in ritual drumming and trance. Considering signal strength and frequency, the volume of drum hits, of course, affects the shamanic ritual experience. It is important to consider and contrast the empirical level of a sound from its perceptual loudness, as environmental context and sonic contrast indicate our perceptions of what's quiet and what's loud. Altogether, however, Neher seems to adequately address the auditory perception of drumming and used evidence to support trancing effects of sound.

Though the shaman's drum is most effective in inducing the hypnotic condition, Mongolian shamans also use alcohol, tobacco, and chanting to enter trance states.[110] If the shaman has reached a trance, their own vocal sounds can indicate an altered mental state. After the shaman claims to have made contact with the spirit world, they demonstrate success by singing *hoomei* (overtone throat singing). While this act demonstrates the shaman's induced trance, according to Sarangerel, "the resonance of the overtones in the head is also hypnotic and promotes trance."[111] As both an act of expression and perception, the physical experience stimulates the shaman's altered state. While intermittency and frequency affect the shaman's altered state in drumming, evident through hoomei, the timbral quality of sounds can also elicit trance. On that account, sound directs the shaman into an ASC, sound indicates their arrival in the upper world, and sound further stimulates their altered state.

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[110] Sarangerel, *Riding Windhorses: A Journey into the Heart of Mongolian Shamanism*, 90.
[111] Sarangerel, 92.

While Mongolian shamanic trance rituals are vivid illustrations of the fundamental interplay between religion, sound, and ASC, religious trance rituals are not exclusively a Mongolian tradition, and many other religious groups and cultures incorporate sound in trance rituals in diverse ways. Though there are many similarities and crossovers between cultures, each tradition has its own specific ritual customs, subscribes to idiosyncratic ideological views, and maintains individualized spiritual objectives. For example, in Islamic Sufism, mystical trance rituals emphasize *sama* (Arabic for "listening"[112]) as an essential religious component and direct certain practices for how to listen.[113] Moreover, the !Kung, an ethnic group native to Namibia and Botswana, engage in sacred, community healing rituals that involve spiritual energy and inducing a form of trance called *kia*, their name for "that altered state of consciousness which is the key to healing."[114] While eliciting *kia* requires that !Kung healers perceive many sounds and stimuli from sound-sound makers of their community, their ritual "is a uniquely nonverbal phenomenon" that, unlike many other religious practices, is a spiritual experience "beyond words."[115]

Across religious trance rituals, sound is commonly used, physiologically, as a perceptual stimulus and, spiritually, as an effective tool directing spiritual experience. As seen through the case study of Mongolian shamanism, in drumming rituals, specific sonic characteristics of time and frequency have specific functions eliciting trance. Intense altered states of consciousness, Mongolian shamanic trance rituals illustrate some of the benefits of trancing, like healing. As we have discussed, some of the benefits of trance and philosophical perceptions of healing rituals

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[112] J. During and R. Sellheim, "Samāʿ," in *Encyclopaedia of Islam, Second Edition* (Brill, April 24, 2012), https://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/sama-COM_0992.
[113] Kenneth S. Avery, *A Psychology of Early Sufi Samâ`: Listening and Altered States* (London: Routledge, 2004), https://doi.org/10.4324/9780203458297.
[114] Richard Katz, *Boiling Energy: Community Healing Among the Kalahari Kung* (Harvard University Press, 1982), 8, 9.
[115] Katz, 8.

don’t necessarily translate cross-culturally, and our understandings of these spiritual experiences is limited to our own backgrounds and perceptual frameworks. Nevertheless, evident through widespread use and cultural consistencies, sound serves distinct functions in religious trance rituals and is vital in achieving desired spiritual objectives. Altogether exploring religious trance rituals as acoustic events, sound fundamentally directs human perception, elicits ASC, emotionally engages individuals, and directs specific spiritual experiences.

Chapter IV

Altered States of Consciousness: Meditation

According to scholars Judith Becker and Gilbert Rouget, compared to trance, meditative practices tend to be more intentional, less intense, and less likely to involve big groups or rely on stimuli from other individuals.[116] While trance may be described as a generally high-energy experience, meditation, in contrast, is more often used for relaxation or to increase focus. As with trance, meditation rituals rely primarily on characteristic articulations of *time* and *frequency* to elicit ASC. Though timbre and level of sounds can also affect these ritual experiences, time and frequency are the greatest determiners of ASC, and this chapter will focus primarily on those characteristics. The goal of this chapter will be to demonstrate a fundamental connection between sound, religion, and ASC. To that end, chapter sections will focus on sonic characteristics, time, and frequency in hopes of better understanding the individual and cultural experience of meditation, its spiritual and physiological effects, and the various functions of sound within religious meditative rituals.

While silent meditations do exist,[117] many religious groups rely on sound's functions to elicit meditative mental states. Employing sound as a tool to direct experience, practitioners harness sound in various ways across rituals; however, there are several ideological consistencies in religious meditative practice. Thus, we have determined that, in no particular order, the three main objectives of religious meditation are: 1) communicating with the divine, 2) individual healing, and 3) fostering identity.

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[116] Becker, *Deep Listeners: Music, Emotion, and Trancing*; Rouget, *Music and Trance: A Theory of the Relations Between Music and Possession*.
[117] Karin Matko and Peter Sedlmeier, "What Is Meditation? Proposing an Empirically Derived Classification System," *Frontiers in Psychology* 10 (October 15, 2019): 2276, https://doi.org/10.3389/fpsyg.2019.02276.

This chapter focuses on meditation as a common practice of certain religious groups, utilizing sound study to understand religious rituals as acoustic events and better understand religious groups' various perceptions of sound, sonic functionings, and cultural aesthetics. Applying a sound engineering framework to religious meditation, this chapter also discusses ritual use of instrumentation versus vocalization, establishes roles for perceivers and sound-makers, and considers the intent of sound-makers. Unlike, in the previous chapter, with trance, there will not be one religious case study for assessing meditation and religious functions of sound; instead, given meditation's widespread prevalence, diverse ritual traditions, and conceptual idiosyncrasies across cultures, this section will serve more as a survey of religious groups' meditative practices involving functions of sound.

Meditation and Time

Within the time domain, repetitive vocalization (often in a rhythmical manner) is a powerful way to induce meditative states. Through periods of chanting or reciting mantras and sutras, these repetitive, meditative acts have the capacity to alter individuals' conscious states.[118] Hindu, Buddhist, Christian, Jewish, and many other faiths practice repetitive vocalization in their meditation rituals.

The act of repeating words or phrases (sometimes called "mantras") can have dramatic effects on individuals' conscious states. While meditation may be practiced alone or in groups, this form of repetitive vocalization only requires one sound-maker and one perceiver. Often a solitary ritual, an individual meditator can play both roles. Because these participants direct their

[118] Matko and Sedlmeier.

own spiritual experiences, they are more likely to understand, appreciate, and know how to employ sound for its specific functions.

Used within the domain of time, repetitive vocalization involves certain cadences or rhythms, which may cause individuals to develop a sense of tempo to ritual acts. The rhythms of these rituals can affect perceivers' heart rates,[119] breathing patterns,[120] and also elicit altered states. As acts of repetitive vocalization develop rhythm over time, the loudness and strength of expressions also guide perceivers through the meditative experience. The contrast in volume becomes apparent as the ritual progresses and, together with rhythm, may guide individuals through the meditative experience. Repetitive vocalization can have varied effects, including elevating the emotional connection to the ritual and indicating moments of spiritual climax. Often, these simple changes in level, perceived as loud or quiet, can be the primary catalyst in creating the depth of these experiences.

Religious groups recognize diverse benefits of repetitive vocalization, and even as "mantra meditation is easy to practice,"[121] research suggests it has numerous benefits, addressing our three main objectives of religious medication: communicating with the divine, individual healing, and fostering identity**.** In Hinduism, "OM mantra meditation" is generally considered a personal practice that involves chanting "OM" out loud and over a period of about 30 minutes.[122] A method to communicate with the divine, this ritual helps individuals feel connected to spirits, thus illustrating the first objective of religious meditation. Next, while the

[119] Bhavna P. Harne et al., "Survey on Om Meditation: Its Effects on the Human Body and Om Meditation as a Tool for Stress Management," *Psychological Thought* 12, no. 1 (April 30, 2019), https://www.psycharchives.org/en/item/be838e6a-cac6-49e5-b57e-c29993b6637a.
[120] Russill Paul, *The Yoga of Sound: Tapping the Hidden Power of Music and Chant*, 1st edition (New World Library, 2006), 134.
[121] Harne and Hiwale, "EEG Spectral Analysis on OM Mantra Meditation."
[122] Harne and Hiwale.

‘“OM” mantra is the highest sacred symbol in Hinduism,”[123] and “is also considered as the very name of the absolute,”[124] as a ritual practice, its value goes beyond spirituality. Affecting “various parts of the brain” as well as “heart rate and respiratory rate,” medically it’s seen “as a tool for stress management,”[125] and research indicates its abilities to promote relaxation, decrease mental arousal, and increase mental calmness.[126] Therefore, as a ritual act, “OM” mantra meditation also has objectives for individual healing. Finally, if those practicing “OM” mantra meditation belong to the Hindu faith, this ritual achieves the objective of fostering identity. By consistently practicing “OM” mantra meditation, individuals reinforce the traditions and values of their religion.

While these ritual descriptions and cognitive explanations might differ from those of Hindus who practice “OM” mantra meditation, we can assume that they are aware of each of these described benefits. In regard to the objectives of religious meditation, there is intentionality behind each ritual decision, and, as discussed earlier, many religious groups employ similar ideologies. As a ritual custom, many religious groups (both Eastern and Western) use similar forms of repetitive vocalization to direct spiritual experiences. For example, Buddhist, Jewish, and Christian religions may all be aware of the “physiological effects of repetitive prayer, chanting, and meditation” and engage in similar rituals,[127] whether through individual meditation or in groups.

One example of Western-religious meditative practice is Gregorian chanting. This Christian-Catholic tradition is a form of collective meditation that can affect individuals’

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[123] Harne and Hiwale.
[124] Harne et al., “Survey on Om Meditation.”
[125] Harne et al.
[126] Harne and Hiwale, “EEG Spectral Analysis on OM Mantra Meditation.”
[127] Jerome Groopman, “God on the Brain,” The New Yorker, September 9, 2001, https://www.newyorker.com/magazine/2001/09/17/god-on-the-brain.

"[deepest] existential feelings and thoughts."[128] Vocalizing sacred phrases in a repetitive manner, Gregorian chants can elicit meditative states through their slow "pulse."[129] As the ritual conveys a sense of tempo, like with OM mantra meditation,[130] the sounds of Gregorian chanting, over time, can cause individuals to relax and alter conscious states. Though all religious meditation rituals involve a spiritual component, through size and scale, Gregorian chants are extremely powerful in fostering Catholic identity and facilitating divine connection. These large-group practices create a sacred space for religious connection, increase relaxation in perceivers, and unify entire religious assemblies. Ticking off all the boxes of religious meditative objectives, Gregorian chanting illustrates the fundamental connections between sound, religion, and ASC.

Fierce spiritual exercises, Gregorian chanting rituals are exemplary demonstrations of how meditative rituals can, using great sounds over extended periods of time, be strong gestures of communication. While, in religious trance rituals (like in Mongolian shamanism), altered states are a means of communicating with spiritual entities; in religious meditation rituals (evident in large-scale Gregorian chanting rituals), altered states can also be acts or gestures honoring spiritual entities. Divine communication in religious meditation does not have to mean "interacting" with spirits. Instead, as with meditative rituals, they can serve as acts of faith and devotion.

As Gregorian chanting indicates how religious meditative acts can be used for communicating with the divine, each religious group manifests their spiritual objectives differently, and numerous religious faiths practice repetitive vocalization in groups. Beyond Christian ritual, Tibetan Buddhist chanting, for example, is often practiced in groups and

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[128] Bernard Sawicki, "Gregorian Chant as a Practical School of Meditation," *The International Journal of Arts Education* 9 (January 1, 2015): 15–23, https://doi.org/10.18848/2326-9944/CGP/v09i02/36182.
[129] Richard L. Crocker, *An Introduction to Gregorian Chant* (Yale University Press, 2000), 107.
[130] Paul, *The Yoga of Sound: Tapping the Hidden Power of Music and Chant*, 134.

involves reciting mantras like the *om mani padme hum*, a ritual tradition to increase the "wisdom and compassion" of the Buddhist practitioners.[131] Though not only practiced as a collective, in Islamic Sufism, Zikr rituals are another example of religious meditative rituals that also involve acts of repetitive vocalization.[132]

Noting religious meditative rituals like those discussed in Hinduism, Christianity, Buddhism, and Islamic Sufism, the widespread prevalence of repetitive vocalization practices makes evident how time as a sonic characteristic can powerfully determine ritual experiences. Considering the functions of sound in religious meditative rituals, there are both physiological and spiritual effects. At a physiological level, acts of repeating words or phrases (like mantras) can affect individuals by altering heart rate, breathing, and eliciting ASC. In contrast to trance, meditation is a less-intense version of ASC,[133] but, nonetheless, meditation rituals can engage perceivers at a deeply religious level, leaving room for unknown cognitive properties and indescribable cultural benefits of these altered states. The next section of this chapter moves beyond the time domain to explore frequency as an additional function of sound in religious ritual.

Meditation and Frequency

According to sound practitioner Noni Keyton, it is important to hydrate before participating in sound baths. Originally a spiritual meditation practice of Tibetan Buddhist monks, sound baths use singing bowls (also called "Himalayan bowls," "sound bowls," or

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[131] John Powers, "Understanding Tibetan Buddhism," PBS, 1995, https://www.pbs.org/wgbh/pages/frontline/shows/tibet/understand/intro.html.
[132] Britannica, "Dhikr."
[133] Becker, *Deep Listeners: Music, Emotion, and Trancing*; Rouget, *Music and Trance: A Theory of the Relations Between Music and Possession*.

"bells"), literally, as instruments of meditation.[134] The instruments are sonically sophisticated and have transparent effects on perceivers' conscious states. Vibrating and emitting "a rich, deep tone when played," singing bowls "are said to promote relaxation and offer powerful healing properties."[135] Sound practitioners (also called "sound therapists"), like Keyton, use sound and instruments to transfer energy through people and space,[136] which, as she says, happens most effectively when individuals fill their bodies with water.

Though Keyton doesn't explicitly refer to her sound baths as religious rituals, her technique is one she developed studying sound therapy in the Himalayas. Originating from ancient Buddhist tradition, there's an inherent spiritual component to sound baths, either from a religious context, as a function that alters consciousness, or from the ritual's sheer sonic authority. Involving singing bowls of different sizes and made from different materials, the sounds Keyton produces layer on top of one another, resonating in unison and presenting a vibrant, warm soundscape. The frequencies and tones of her practice are low and sonically vivid. Even if one had forgotten to follow her ritual hydration advice, the sound bath experience is potent, mystical, and effectively personal.

Perhaps the most iconic function of sound in religious ritual is the way that religious practitioners use sound to transfer energy. Similar to how Mongolian shamans use the drum to transfer energy between persons, heal, and promote trance,[137] sounds' low frequencies (with powerful energy) are physically and symbolically integral in many meditative traditions. In many

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[134] Kendra Cherry, "Tibetan Singing Bowls for Healing," Verywell Mind, November 14, 2022, https://www.verywellmind.com/tibetan-singing-bowls-for-healing-89828.
[135] Cherry.
[136] Sara Auster, *Sound Bath: Meditate, Heal and Connect through Listening* (Simon and Schuster, 2019), 152.
[137] Sarangerel, *Riding Windhorses: A Journey into the Heart of Mongolian Shamanism*, 86.

religious groups' meditation rituals, sound functions as a means of relaxation, healing, and spiritual engagement.

Moreover, given that sounds' makeup within the acoustical spectrum informs how they interact with physical objects, other sounds, and their space and environment, the sonic characteristic of frequency is a complex phenomenon because of its vast spiritual and physical properties. However, with its great application in and influence over this ASC, the effects of frequency in eliciting mediation have been widely studied.

The work of scholars Judith Becker and Gilbert Rouget[138] supports the notion that (compared to trance rituals) meditation is a less-intense version of ASC, but a more intentional and directed experience. While in other sections, we have considered certain ASC as generally either collective or individualistic practices, religious meditation rituals involving sound frequency can be practiced either independently or in groups. With either option viable, we can consider these religious meditations to be highly functional sound rituals.

The widespread use of low-frequency instruments, like *gongs*,[139] across religious traditions seems to support this fact. Despite diverse uses, the function of sounds' frequencies for meditation relies on individuals' aesthetic preferences, and while religious meditation rituals are complex acoustic phenomena, humans' perceptual responses tend to be relatively straightforward, relying on certain qualitative properties for effect. Low-frequency sounds with sustained qualities and rich timbres, for example, are effective tools to elicit meditative states of consciousness and direct perceivers' spiritual responses.

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[138] Becker, *Deep Listeners: Music, Emotion, and Trancing*; Rouget, *Music and Trance: A Theory of the Relations Between Music and Possession*.
[139] The Editors of Encyclopaedia Britannica, "Gong," in *Encyclopedia Britannica*, March 2, 2017, https://www.britannica.com/art/gong-musical-instrument.

High-frequency sounds can stimulate the brain and promote alertness and concentration, while low frequencies are associated with states of relaxation, lucidness, and peacefulness, and sounds in these ranges "may alter…subject's brain waves and may be measured via EEG."[140] Through empirical study of sound frequency and neurocognition, it is apparent that low-frequency sound meditations can affect individuals' brain functioning, promote helpful processes like mindfulness, and spark overall improvements in their health and well-being.[141] By temporarily altering individuals' conscious states, evident through "thousands of case studies," research suggests that low-frequency sounds can help treat "life-limiting health issues such as anxiety dis-orders, chronic pain, arthritis, [and] irritable bowel syndrome."[142] Through extensive study of sound baths, and the effects of physical vibrations on individuals afflicted with mental health issues, research has indicated that low-frequency sound stimulation can greatly reduce symptoms of anxiety and depression.[143] While low-frequency sound meditations can affect individuals' brain functioning and elicit temporary states of altered consciousness, this second point illustrates significant long-term benefits of sound treatment.

In the previous chapter focusing on Mongolian shamanic drumming rituals and trance, we explored how drumming rituals can induce trance through sonic characteristics of *intermittency* and *frequency*. Evaluating the specific sounds produced by ritual drums, we noted how drum sounds in trance rituals are transient rather than sustained. Drum hits in trance rituals

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[140] Tamara L. Goldsby and Michael E. Goldsby, "Eastern Integrative Medicine and Ancient Sound Healing Treatments for Stress: Recent Research Advances," *Integrative Medicine: A Clinician's Journal* 19, no. 6 (December 2020): 24–30.
[141] Tamara L. Goldsby et al., "Effects of Singing Bowl Sound Meditation on Mood, Tension, and Well-Being: An Observational Study," *Journal of Evidence-Based Complementary & Alternative Medicine* 22, no. 3 (July 1, 2017): 401–6, https://doi.org/10.1177/2156587216668109.
[142] Cooper, "Sound Affects: Sound Therapy, Altered States of Consciousness and Improved Health and Wellbeing," 1.
[143] Sarah Hourston and Rachel Atchley, "Autism and Mind–Body Therapies: A Systematic Review," *The Journal of Alternative and Complementary Medicine* 23, no. 5 (May 2017): 331–39, https://doi.org/10.1089/acm.2016.0336.

are triggers. They can be experiential cue points indicating phases of ritual, and they can also serve as the tempo or shamanic heartbeat, directing the shaman's mental state by slowing down or speeding up the drum hits at a triggering rate.[144] While sounds in religious trance rituals are meant to stimulate and excite perceivers, in meditation rituals, sound serves an opposite function, relaxing individuals and comforting them through their altered states.

Eliciting ASC and directing spiritual experiences, sounds in trance rituals tend to be transient hits, while in meditation rituals they are sustained, droning, and often ambient soundscapes. For example, though singing bowls are (like shamanic drums) technically percussive instruments, they tend not to be employed in a rhythmic manner. Tools for religious meditation rituals, their low-frequency vibrations resonate at length, create rich timbres, and radiate energy. One could strike singing bowls and use them as metronomic instruments, in sound bath rituals, however, sound practitioners seek sustained sonics, exciting and vibrating singing bowls with mallets and layering sounds and textures of multiple instruments. By creating an ambient, perpetual soundscape, low-frequency sounds, sustained and with rich timbres, can have the effect of comforting and immersing perceivers in meditation rituals, becoming an integral component of the spiritual experience.

[144] Sarangerel, *Riding Windhorses: A Journey into the Heart of Mongolian Shamanism*, 90.

Conclusion

This thesis offers a new approach to studying religious events as acoustic events. Identifying the roles of *perceivers* and *sound-makers* in a spiritual context, this research has demonstrated how religious groups harness sound for spiritual functions. But we have also seen how even undirected sounds, such as the ambient sound in many ritual spaces, can create or enhance a religious experience. By combining subjective information on sonic perception and religious experience with objective study and hard science, we better understand the ways in which religious rituals elicit emotional responses and direct spiritual experience.

Looking at examples across religious practices, the thesis has underscored the importance and cross-cultural prevalence of sound in religious rituals and sound's critical function in creating or enhancing religious experience. By examining sound in religious ritual, this thesis explored a wide array of religious groups, cultural traditions, and aesthetic preferences. In addition to examining sonic characteristics and acoustic phenomena in specific instances of ritual practice, the thesis has also looked at similarities across cultures in order to highlight particular similarities in the appreciation of sound. Ultimately, I hope this effort helps us to better understand spiritual and aesthetic experience in general.

This research has identified various ways that sound helps achieve religious objectives, like fostering cultural identity, creating a sense of community, establishing religious authority, and communicating with the divine. Moreover, the many benefits of sound, including its therapeutic benefits, have been revealed through an examination of religious healing rituals. The act of orchestrating certain sonic functions and manipulating complex sound perception processes, we have seen, can also lead to altered states such as trance and meditation. I also have successfully explained the benefits of sound exposure on individuals and large communities.

The thesis has established some of the fundamental connections between sound, religion, and religious experience. The findings of this research may help us better understand why devotees practice ritual in certain culturally specific ways and why some sounds are consistently employed across cultures to direct religious experience. By expanding our knowledge of religious rituals and functions of sound, I hope that this thesis will allow us to develop more complete and accurate conceptual frameworks for studying religious rituals and that *sonic spirituality* becomes an effective approach to understanding sound, religion, and experience.

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