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Original Research Article

An Analysis of Theoretical Foundations in Sound and Place Studies From Architectural Acoustics to Auditory Place*

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Abstract

Problem statement: The relation between hearing sounds and architecture is one of the neglected matters in studying the embodied experience of architecture. Accordingly, this paper addresses the relation between hearing sounds and place.

Research objective: To explore the whatness of the ‘auditory experience of place,’ this paper examines the diverse ways of thinking about the relation between sound and place through academic disciplines.

Research method: The paper introduces the intellectual foundations and content of these disciplines in a historical context by referring to diverse texts of the field. Therefore, the paper is based on “inquiry-based” research rather than a “hypothesis-based” one.

Conclusion: The analysis indicates three approaches: physical, psychological, and phenomenological. The paper begins with architectural acoustics, which is the starting point of studying sound and architecture in the field of building physics and indicates a conceptual turn in the studies from ‘sound’ in sciences (like acoustics, architectural acoustics, and psychoacoustics) into ‘hearing’ in human studies. Human-oriented sound studies include two main approaches: psychological approach, in the soundscape and its sub-disciplines like acoustemology and acoustic ecology as well as aural architecture; and phenomenological approach, in auditory place studies. Finally, the analytical comparison and a conclusion of these approaches indicate the movement of thought in these studies from quantity (in architectural acoustics aimed at sound control) toward quality (in the soundscape and aural architecture aimed at sound design) and more toward wholeness (in auditory place aimed at auditory understanding of place.)

Keywords: *Auditory experience, Architectural acoustics, Soundscape, Aural architecture, Auditory place.*

Introduction

Many discussions in the architectural profession and education are about how to design, criticize, and

represent architecture, whereas fewer discussions are about how architecture is experienced and perceived. We “experience” and perceive our world through

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our bodies as well as our senses, memories, associations, and mentalities. Therefore, “place” is experienced as the reality of our world through this “embodiment”, the consequential way “architecture” is experienced.

In this regard, the main focus and assumption of architecture have always been about “seeing” architecture, especially since the modern era. In fact, all efforts have been put into constructing “something to see”, whereas the other aspects of the architecture have been neglected. However, “hearing” has long been an aspect of our embodied relationship with the world, and the relation of this type of world experience, i.e. “auditory experience”, to architecture and place in general can be one of the main questions of architecture: How can a place be experienced through hearing? What are the characteristics of this experience?

Searching through what others have thought about this relationship forms the main question addressed in this paper: “What have been the intellectual foundations and the main contents of studies on the sound–place relationship?” Therefore, like many studies based on the critical review of previous studies, this paper is based on an “inquiry-based” study rather than a “hypothesis-based” one. According to the review of different research texts addressing the sound–place or sound–architecture relationship, there is a wide variety of studies in different areas. These studies have been shaped based on intellectual paradigms of their era, which examine the sound–place relationship from a specific perspective.

There was no specific discipline for studying the sound–architecture relationship until the beginning of the 20th century, and the relationship was probably limited to the practical experiences of architects. The relevant papers on sound published in Iranian and Western cultures before this time are limited to music theory¹, physics, and sometimes auditory sense in philosophy with no references to the relation between sound and architecture, or place. Out of all those references,

we know only two brief papers on this area. The first one is Chapter 5 of The Book of Healing on hearing (Ibn Sina, 1984, 85–93), in which the indoor behavior of sound is discussed briefly. The second one is the fifth book of Vitruvius: The Ten Books on Architecture (Vitruvius, 2009), Chapter 5 of which addresses the sounding vessels in the theatre. Despite the existence of a space like Čīnī-kāna of Ālī Qāpū palace in Iran that was probably used to hear music, there are no written references about this style of design and how to use this space or similar spaces. Hence, this paper is based on the texts from the 20th century and afterward.

Reviewing the literature regarding the research question in this paper, i.e. the “intellectual foundations” of studies on the sound–place relationship in the pivotal sound studies², indicates no explicit answer. As this paper discusses, the philosophical study of sound is a new subject that is being shaped. Within these studies, there are brief indications to intellectual foundations usually based on the philosophy of perception. For instance, Dokic points out “The description and the analysis of what I hear, of what I have the impression of perceiving - independently from what I can learn from non-perceptual information, for instance from a physics book - belongs to the phenomenological component of philosophical research “(Casati & Dokic, 1994, 1), which indicates implicitly two physical and phenomenological approaches in sound studies. The texts putting together different views have not formed their classification based on the intellectual foundations. For example, there is a thematic classification (hearing, space, transduce and record, collectivities, the sonic arts, and voice) in The Sound Studies Reader (Sterne, 2012). However, intellectual foundations have been stated in the studies of “sound–place” relationships are often much less than the studies of “sound”.

Therefore, this paper investigates the theoretical foundations and general contents of the studies

on sound and place, or architecture to analyze their “intellectual foundations.” The investigation starts from the beginning of the 20th century when architectural acoustics emerged. The paper also introduces the advent of studies on sound and place, after the physical approach in architectural acoustics, which are the psychological approach (soundscape and aural architecture) and the phenomenological approach (auditory place). The main question, intellectual foundations, and assumptions of each field are addressed in each section with regard to three major concepts of “place”, “sound”, and “human” by reviewing the topics, methods, and their representation methods (e.g., the words used in each area). Finally, these approaches are concluded to present a general analysis of thoughts on place and sound.

• **Physical approach: architectural acoustics**

Considered a subfield of physics, acoustics is the study of sound generation, emission, and reception. It has many branches, among which architectural acoustics is linked to architecture and sound.

- **Origins and contents of architectural acoustics studies: study of sound behavior in architectural physicality**

The serious study of sound and architecture stemmed from empirical sciences and physics with studies conducted by Wallace Clement Sabine, a professor of physics at Harvard University. Sabine started finding a solution to a sound problem in Fogg lecture hall and managed to find the reverberation time formula, which shows the relation between volume and materials within a space and the duration of sound stability in that space (Rossing, 2007, 9-24). This formula contributed to designing different spaces such as concert and lecture halls. Boston Symphony Hall was the first music hall where the acoustic calculations and design were performed by Sabine. In 1922, Sabine published the research findings in *Collected Papers on Acoustics* (Sabine, 1922) that can be considered the first comprehensive book about architectural acoustics.

In the same period (the early 20th century),

studies of sound were affected by behavioral psychology, and psychoacoustics was developed to study the sound-human relationship. In fact, psychoacoustics is the study of a stimulus called a sound and the human response to it by studying the “measurable” subjective effect of hearing sounds in close connection to the physiology of the Ears. The results of these studies are presented on various diagrams and parameters (e.g. hearing threshold or equal-loudness contours), which can also be used in studies and calculations of architectural acoustics³.

The development of electronics, media (e.g., TV and radio), and electroacoustic equipment (e.g., sound recorders and playbacks), which introduced “sound engineering” in the early 20th century, resulted in creating certain spaces such as sound recording studios and acoustic laboratories designed by acousticians. In this period, the growth of mechanical life caused many noises such as the noises of cars, mechanical facilities, factories, and machinery in daily life. As a result, an important subfield of acoustic studies called “building acoustics” was developed for sound insulation (i.e., noise control and noise reduction). These studies mainly address the mutual relation between sound behavior and building materials which are connected to psychoacoustics in practice. Therefore, the purpose of studies in ‘architectural acoustics’ is sound transferring, and in ‘building acoustics’ is sound insulation, both through “calculation and measurement”, so that spaces can have certain properties based on the predefined parameters.

In Iran, there are only a few studies on the sound-place relationship. In fact, most of the existing studies are translated into architectural acoustics. Architectural acoustics was introduced in Iran by Mahdi Barkashli, the first Iranian acoustician with modern education, in the 1950s. He wrote the first papers on architectural acoustics in Persian⁴ (Barkashli, 1956, 1957).

Zia-al-din Esmaeelbeigi and Gholam Ali Liaghati

were the ones who made many efforts to expand architectural acoustics in Iran by translating western works and using electroacoustics in architectural spaces. The first book that they translated in 1971 was called *Fundamentals of Acoustics*. In the early 1980s, Gholam Ali Liaghati and Khausrow Maulana established an acoustic laboratory in the building and housing research center to initiate studies of architectural acoustics in Iran. Their studies were mainly limited to testing building materials for sound insulation or acoustical studies of certain spaces such as halls or schools in Iran. The results, which are all about building physics, are a few authored books such as *National Building Regulations (No.18)*. In recent years, theses and papers written in Iranian universities have often adopted an acoustical approach. They are classified as building physics. Studying Iranian traditional architecture from an acoustical perspective includes a paper was written by Gholam Ali Liaghati who studied *Ālī Qāpū* and its cavity absorbers. The paper was presented at the International Acoustics Conference in Tokyo (Haghdooost, 1998, 337-338). Moreover, Khausrow Maulana conducted an acoustical test on *Ālī Qāpū*; however, the results of the study have not been published officially yet⁵. The rest of the papers only addressed the acoustic wonders of some Iranian architectural spaces (e.g., the dome of the Shah Mosque in Isfahan).

- Main question and intellectual foundations of architectural acoustics

Referring to the content of architectural acoustics⁶ indicates that the main question in this discipline is about “how to change the sound behavior in space physicality”. It is tested by a variety of parameters and factors such as Reverberation Time, Sound Pressure Level, Clarity, Transmission Loss, and Preferred Noise Criterion, all of which have numerical values. The main issue in psychoacoustics is the ‘subjective relation between the physical parameters of heard sounds by human’. The statistical and numerical

results of experiments in this field are presented in various parameters and diagrams such as Speech Transmission Index, Thresholds of Audibility, and Equal-Loudness Contours. In these studies, complicated sounds such as speech are assumed as a collection of simpler sounds and decomposed into meaningless components.

Therefore, “place” in this science is defined as a space physicality consisting of surfaces with specific materials among which there is a volume of air. “Sound” is a wave emitted in the air with measurable physical characteristics such as frequency, intensity, and spectrum. Hence, architectural acoustics studies the emission of these waves and their transformations through absorption, reflection, and diffraction when they hit different surfaces. Finally, the changed sound reaches the “human” ears, and how the sound is heard is a measurable response on the part of a listener based on the physiology of the ears and the function of the brain. Thus, the space physicality–sound and sound–human relationships are separately studied quantitatively to achieve the sound “control” results. Since these studies are rooted in physics, architectural acoustics is categorized under building physics.

Despite a background to the studies of acoustics before the 20th century, this science entered the architectural field when the other fields of physics found their way into this area. It marked the beginning of modern architecture when the procedures of design and construction took a different direction from the past. In fact, the modern paradigm of architecture has paved the way for the introduction of physical concepts such as acoustics into buildings. Furthermore, the attitude and notion that resulted in the separation of structures from buildings, the use of equipment in architecture, and the introduction of technologies to architecture formed architectural acoustics and building acoustics. As long as modern architecture was not criticized seriously (prior to postmodernism), the sound–architecture

relationship was studied with this rational assumption, i.e. the physical point of view.

- A shift of thought from “Sound” to “Hearing”

Along with the criticism of modernism in the 1970s in various areas, Sound knowledge benefited from such notions, and Sound studies became prevalent in different disciplines such as philosophy, psychology, anthropology, musicology, and art. In this regard, the most important change was the formation of new approaches to sound study in which the pivotal concept changed from “sound physics” to the “hearer”. This change occurred in two different intellectual foundations, the first of which is the “psychological” approach introduced in the earliest comprehensive texts like *The Soundscape* by the musician Schafer. The second one is the “phenomenological” approach, the first comprehensive text of which was *Phenomenology of Sound* by philosopher Ihde. In the following section, the expansion of these two types of thinking will be indicated in “the studies in which sound as the matter of hearing is linked to the study of place or architecture”.

• Psychological approach

The psychological study of sound means discussing “hearing” as a human issue and studying the mutual effects between hearing different kinds of sound and human from various cognitive, sensitive, and emotional perspectives. Regarding the place, these studies are introduced as two fields of “soundscape” and “aural architecture”.

- Origins and contents of soundscape and aural architecture studies

- soundscape: harmony of sounds in the environment

In 1977, a book titled “*The Soundscape: Our Sonic Environment and the Tuning of the World*” (Schafer, 1977) was published to have profound effects on how to think about sound and place by introducing the concept of “soundscape” in relation to different disciplines such as anthropology, urban design, and environmental

psychology. In fact, soundscape means all of the sounds that are heard in an environment every day. “A soundscape consists of events heard not objects seen” (Schafer, 1994, 8) According to Schafer, the soundscape resembles a piece of music that cannot be harmonious and can be annoying if the musical instruments are not tuned. The concept of soundscape was introduced in the newly established Simon Fraser University (SFU), in Centre for Studies in Communication and the Arts, in nearly 1965 to first study all sounds (everyday sounds and historical sounds mentioned in books) rather than just noise with an emphasis on the feelings caused by those sounds (e.g., pleasure and annoyance) (Schafer, 2013, 6-8). The World Soundscape Project interpreted the soundscapes of a few urban and rural places by recording their everyday sounds. Schafer’s book is among the early achievements of that project. Concepts such as ‘soundmark’⁷, ‘signal’⁸, or musical concepts such as ‘keynote’⁹ and rhythm indicate the attention to “hearing” rather than “sound” in this area. Following this attitude, other topics such as acoustic communications have been discussed, for example in the book *acoustic communications* (Truax, 1984), with an emphasis on the sound generation and hearing (especially in speech and music).

The main difference between soundscape and architectural acoustics is the willingness to study the relationship between humans and sounds as well as cultural differences in hearing, something which has shifted the study of environmental sound from “empirical sciences” into “humanities”. Using acoustical tools (e.g., a visual recording of sound), the soundscape addressed the relationships between sound and history, culture, myth, literature, communications, etc. The studies of soundscape aim to make sounds harmonious and pleasant in living environments forming various areas such as *acoustemology*¹⁰ (in anthropology and ethnography fields) and *acoustic ecology*¹¹. With this purpose, soundscape

has entered the urban design and environmental psychology more than any other area and resulted in the study of sound in urban outdoor environments through quantitative and qualitative methods by visualizing sound, recording sound, studying texts, sound walking¹², etc. Finally, the main function of these studies is to identify a sonic environment to achieve higher levels of harmony through intervention and design.

Accordingly, the concept of soundscape has not seriously been introduced into architectural discussions. The studies of aural architecture in the early 21st century can probably be considered the architectural aspect of these studies.

- Aural architecture: architectural interpretation of soundscape

Two main branches of studies on sound and place, i.e. architectural acoustics and soundscape, had been the main topics of this area until the early 21st century. In fact, indoor spaces and architecture were studied in the field of architectural acoustics, whereas urban outdoor spaces were studied in the field of soundscape. Published in 2007, *Spaces Speaks, Are you listening? Experiencing Aural Architecture* (Blessner & Salter, 2007) addressed architecture in addition to expanding the studies of soundscape by adopting a soundscape approach, i.e. the pivotal concept of a hearer perception¹³. The main concept of this field is “auditory spatial awareness” which means humans can detect spatial features such as dimensions, shapes, and materials by hearing the reflections of sounds. “When our ability to decode spatial attributes is sufficiently developed using a wide range of acoustic cues, we can readily visualize objects and spatial geometry: we can “see” with our ears” (ibid., 2).

This concept that includes sensory anthropology and building physics is not merely a cognitive phenomenon. It also includes a hearer’s feelings, emotions, and reactions to these sounds. The complicated combination of hearing spaces through auditory spatial awareness leads to “aural

architecture” that is experienced by hearing along with personal, cultural, and social meanings. Accordingly, an aural architect is not a designer of space physicality but forms certain events to develop a specific aural architecture with the help of a designer of space physicality (i.e., an architectural acoustics designer).

Like the soundscape, the content of aural architecture is based on the “hearer”; however, the soundscape addresses outdoor spaces, whereas aural architecture usually studies indoor spaces. Therefore, a “sound source” is important in the soundscape, whereas the “reflection of sound” matters in aural architecture. Using architectural acoustics, aural architecture studies the indoor and architectural soundscape and describes the human behaviors and feelings in reaction to aural architecture throughout history (from prehistoric architecture to contemporary virtual auditory spaces). These studies aim to design aural architecture (sounds and their reflections).

Despite extensive studies on soundscape and aural architecture, these areas are less known than architectural acoustics in Iran. The only Persian texts are the contents from one of Payam-e-UNESCO journals (UNESCO, 1976). This journal consists of a few articles about soundscape, search for historical sounds, and the sound–psychology relationship. A few other theses and papers were also written on the contexts of urbanism and landscape architecture in the soundscape filed¹⁴.

- Main Question and Intellectual Foundations of Soundscape and Aural Architecture

In psychological approaches, the main question that pertains to the sound–place relationship is “the effects of environmental (outdoor space, architecture, etc.) sounds on humans within the context of everyday life”. It also includes physical (health), psychological, aesthetic, communicational, and cultural effects that lead to the emergence of certain behaviors and feelings in humans.

In soundscape and aural architecture, “place”

is a series of natural environments, outdoor urban and rural spaces, and architectural spaces. In this regard, “sound” refers to the everyday sonic environment (nature, humans, noise, and their reflections), and “humans” have emotions and feelings as well as perceptive and cognitive capabilities. As it is evident, in the lexical scope of the psychological approach, this approach is human-based, which has managed to establish close relationships with cultural, historical, social, and psychological issues through acoustic tools¹⁵. Although human emotions to sounds are included in this approach, the interpretation method is scientifically based on neurology and psychology, especially evolutionary psychology. For example, Blesser and Salter have assigned a part of their book to “Auditory Spatial Awareness as Evolutionary Artifact” in which they present such analysis: “our brain evolved specialized auditory substrates that could incorporate spatial attributes into awareness” (Blesser & Salter, 2007, 317). However, other studies of place and sound have studied this issue from the perspective of human experience and interpreted it from a phenomenological point of view.

• Phenomenological approach

Sound as an independent concept is novel in philosophy. Prior to the 1970s, the sound was often considered a “secondary quality” of objects (like color). However, with the expansion of phenomenological studies in the area of perception and the importance of multisensory perception of humans, thinking about sound and hearing (as experienced by humans) has become noteworthy. In 1976, a book was published specifically about hearing sounds in the field of phenomenology for the first time: *Listening and Voice: A Phenomenology of Sound* (Ihde, 1976). This book was authored following the phenomenology of perception, relying on the works of Husserl, Heidegger, and Merleau-Ponty which is mainly about experiencing the world by hearing, i.e. an experience that is not separated from the

other aspects of experience such as sight. This book addresses whatness and various aspects of auditory perception and experience including auditory dimensions, the shapes of sound, auditory horizons, auditory imagination, silence, and inner speech in which the ontological aspects of sound such as meaningfulness (that is disregarded in the physical approach), surround ability, and directionality are interpreted. Apart from a few cases such as perception of shapes, surfaces, and insides of things through hearing, this book did not mention anything directly about the relationship between hearing and architecture. However, it is considered a starting point for the interpretation of auditory experience in place. As the book is based on “auditory experience” rather than “physics of sound”, it is a noteworthy book in the field of place and sound.

The expansion and growing importance of philosophical thinking about sound under the topic of perception can be traced back to the late 20th century with philosophical publications such as *Philosophy of Sound* (Casati & Dokic, 1994) and *Sounds: A Philosophical Theory* (O’Callaghan, 2007). One of the most important matters of this area is detecting the direction of a sound source in auditory perception which is significant in the study of sound–place relationships. In recent years, another branch of these studies has been developed based on the new phenomenology, in which sound is considered an aspect of “atmosphere”. In fact, atmosphere discusses a “wholeness” that emerges as the “character” of an environment in the first human encounter with the world in the form of a “meta-individual wholeness”. This concept has been theorized by Hermann Schmitz, after whom Gernot Bohme discussed the concept of atmosphere from different aspects such as architecture and music (separately¹⁶). The “character” of sound is the main concept, and *Music as Atmosphere: Collective Feelings and Affective Sounds* (Riedel & Torvinen, 2020) is among the latest achievements in this area¹⁷.

In the field of the architectural atmosphere (which has a phenomenological approach to the multisensory experience of architecture), thinkers such as Juhani Pallasmaa partly addressed the relationship between auditory experience and architectural experience: “Sight isolates, whereas sound incorporates; vision is directional, whereas sound is Omni-directional. the sense of sight implies exteriority, but sound creates an experience of interiority... Buildings do not react to our gaze, but they do return our sounds to our ears... It is thought-provoking that the mental loss of the sense of center in the contemporary world could be attributed, at least in part, to the disappearance of the integrity of the audible world.” (Pallasmaa, 2012, 53).

In the very recent studies of the auditory atmosphere, there are no comprehensive resources or theories on the relationship between auditory experience and place or architectural experience. However, this relationship is presented in the studies of “auditory place¹⁸” emerging from the area of cultural geography.

- Origins and contents of auditory place studies: sound as a place maker

Since nearly the 1970s, the phenomenology of place and architecture has been formed with an emphasis on the concepts of *genius loci*, sense of place, and place attachment in the books by different thinkers such as Christian Norberg-Schulz in which there is no emphasis on the effects of sound and hearing on the sense of place. In these studies, place is considered an interwoven series of space physicality, events (activities, motions, etc.), and the meanings provided by them for humans. It is also a spatial-temporal phenomenon considered a framework by which experience is perceived. The discussion of sound in such studies, which mention that an auditory experience can make a place and is a factor of place attachment, is very recent.

These studies have generally approached the matter of sound in the field of cultural geography with a phenomenological approach (as case studies) and their theoretical foundations are now

being formed. The latest relevant book is called *Sounding Places: More-Than-Representational Geographies of Sound and Music* (Doughty, Duffy & Harada, 2019), which has tried to collect a series of scattered studies on the subject. Another series of these studies have been presented in two seminars of *Invisible Places: Sound, Urbanism and Sense of Place* (Invisible Places, 2014, 2017), which have covered certain topics about identity and sense of place through hearing sounds in cities. According to these studies, sounds can make feelings of being-in-the-world or not-being-in-the-world as well as place attachment or alienation. For instance, the silence of a village interconnects all the complicated and various narrations of rural life experience and turns the place of that village into a “home” for people.

The most important point that unifies these scattered studies is “making a place” through hearing sounds. Since sounds are events, they can configure space and place. In other words, since sounds do not occur only at the moment, and an auditory experience is actually connected to all of our memories, imaginations, needs, and behaviors, sounds (including music) are the lived experience comparable and in parallel with life itself. Therefore, these studies “contribute to the ongoing efforts across the interdisciplinary field of sound studies and auditory culture to theorize the role of sound in assembling various forms of social life—in the forming of communities and places of belonging, in habitual bodily practices, in movements and rhythms, in the performance of culture and identity in places, and in the emotions, affects and sensory experiences that weave the sonic into mechanisms of sociality in general” (Doughty et al, 2019, 6).

The main function of these studies, which have not directly addressed the relation between space physicality and making a place through hearing sounds, is the “understanding” of a place through hearing with the help of evident and sensed factors rather than conscious understanding. The

study of this understanding is usually performed through the direct participation of a researcher in the experience of a research subject.

Moreover, the phenomenological approach to the studies of sound and place has also affected some interdisciplinary studies. For instance, LaBelle in *Acoustic Territories* believes that the topics of the book represent a combination of phenomenology (Labelle, 2010, xix) and the physical behavior of sound. He has addressed the matter of place by introducing the concept of 'acoustic space' and has interpreted the auditory experience of these spaces through the acoustic territory, echoes, culture of silence and noise, and sound in different spaces of everyday life.

- Main question and intellectual foundations of auditory place

The main question of auditory place studies is the "whatness and howness of participation of auditory experience in the place experience" or the "how human experiences a place through its auditory aspect". Therefore, the auditory experience is considered an aspect of the wholeness of lived experience, and its presence is investigated at the formation of the sense of place and place attachment. The difference between these studies and psychological studies is the idea of the connection between human to the lifeworld. In other words, like scientific studies, psychological studies consider the human psyche an object for study; however, human is not the object of study in phenomenological studies but is the center of experience that can be received and interpreted. Hence, these studies are often characterized by cultural and existential aspects.

As discussed in the previous section, "place" is the context of human experience in the studies of auditory place and is not merely considered a space physicality but includes all events and meanings. Experienced through embodiment with a multisensory perception, the place is the realm for the occurrence of all past and present experiences of individuals and society. In fact, it

is a historical, cultural, environmental (physical), and natural phenomenon. In this area, "sound" and "human" are not considered two separate categories but are both discussed in the concept of "hearing". Thus, sound is not just a wave that flows through the air, is involved with space physicality, and is heard by humans. In fact, hearing sounds is an experience that brings cultural, historical, social, and emotional concepts resulting in a bond to nature, the emergence of various feelings, people's connection to the past and their identities, and also the sense of a place.

Conclusion and analysis

As discussed in previous sections, the proposed approaches differ in their considerations of "human". In a physical approach, "human" is assumed a passive creature resembling a hearing sensor machine, the reactions, and responses of which to sonic stimuli are measurable and predictable. However, auditory perception, auditory experience, and their association with the other human embodiment experiences are considered the main topic in human-oriented approaches (i.e., psychological or phenomenological approaches). Therefore, human is studied with all cognitive, emotional, and philosophical complications. Nevertheless, the psychological approach still considers the human psyche a research object, whereas human is at the center of experience in the phenomenological approach.

According to what was discussed, the concept of "sound" is discussed differently in two physical and human approaches. "Being a wave", the physical feature of sound, is the main issue in acoustic studies, something which is also considered an important and searchable fact in the soundscape and aural architecture studies. It is also an aspect of human experience in the scope of 'auditory place' studies. Whereas meaningfulness, which belongs to humans, is considered one of the most important foundations of thought in human-

oriented studies of sound, it is not considered in acoustics. Hence, sound can be considered a meaningful phenomenon of the world in human approaches in a psychological, historical, cultural, and even communicational aspect (especially in speech topics) rather than being considered only physically. The study of sound in place and architecture can also be performed beyond physical boundaries.

The physical and humanistic approaches consider the concept of “place” differently. In acoustics, a place is merely considered a space physicality. In soundscape and aural architecture, space physicality creates an understandable and evaluable (cognitive and emotional) environment in combination with sounds. In phenomenological studies, the place includes not only the space physicality but also the life events and meanings, which is a fundamental context of human experiences. Therefore, since the concept of place is entangled with everyday life, emotions, feelings, and all aspects of life in general, it cannot merely be studied through quantitative or qualitative methods and has its specific research methods.

In brief, the physical approach has been formed in the studies of sound–place relationship to “control” sound in space physicality, whereas

the psychological approach seeks to “design” a harmonious sonic environment, and the phenomenological approach focuses on the “understanding” of place through auditory experience. Thus, comparing the subjects and methods from architectural acoustics to ‘auditory place’ generally indicates a shift from quantity (in architectural acoustics) to quality (in the soundscape and aural architecture) and from quality to wholeness (in auditory place)¹⁹. Fig. 1 demonstrates the study model of these approaches based on the pivotal concepts of human, sound, and place as well as how to consider their relationship in relevant studies of each specific approach. Table 1 presents an overview of the three intellectual foundations discussed in this paper²⁰.

Conclusion

• Expansion of Results in Architectural Field: Auditory Experience of Place

According to the Introduction, this paper aims to explain the intellectual foundations of an aspect of architectural experience (auditory aspect) to address how to think about the auditory aspect of architectural experience. A glance at the history of architecture indicates that the dominance of vision over the world of architecture is more prominent

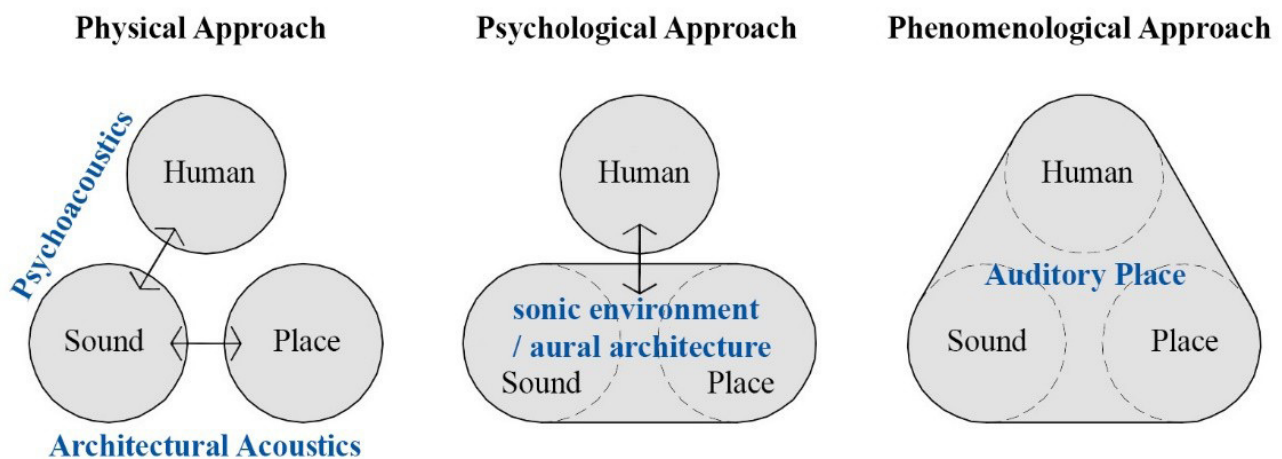


Fig. 1. The models of study in three approaches to sound and place studies. Source: Authors.

Table 1. An overview of theoretical foundations of three approaches to sound and place studies. Source: Authors.

Approach	Physical Architectural Acoustics	Psychological Soundscape and Aural Architecture	Phenomenological Auditory Place
Origins	Physics	Music, Psychology, Acoustics	Phenomenology (philosophy), Cultural geography
Intellectual Foundations	Mathematics	Musical aesthetics, Psychology	Phenomenology of place, Phenomenology of perception Collaboration of auditory experience to wholeness of place experience
Main Question (of)	Sound behavior in space physicality	Effect of environmental sounds (natural and human-made) on humans	Auditory experience is one of the aspects of the embodied experience of the lived world; Sounds can make places and sense of place
Assumptions	Changes in sound properties in the space are measurable	Environmental sounds should be in harmony as a musical piece; The environment is perceptible by hearing	
Key Concepts	Reverberation time, Frequency, Sound level, etc.	Keynote, Soundmark, ..., Auditory spatial awareness	Place, Auditory experience
Place	Space physicality	Natural environment and urban spaces, architectural physicality	Spatial-temporal matter, the context of lived experience, the union of space physicality, events, and meanings in a place
Thinking on	Sound	Perceptible, emotional, and meaningful wave	Something which is experienced in the auditory experience
Human	Hearing sensor machine	A person with cognition, perception, emotion, and feeling	The embodied person with perception and multisensory experience, the perceiver of atmosphere, effective and affective

in the modern era than in any other period. At the same time, technological developments of the modern era have gradually made “architecture” be considered an equivalent of “building” in most cases. Hence, solving technical problems with an emphasis on visual aesthetics, usually based on what is seen on paper, has been the main concern of architectural profession and education. However, in recent decades, different architects such as Pallasmaa and Zumthor have adopted an approach based on a holistic and multisensory experience in architecture, something which indicates a return to the “genuine experience of architecture”. In this approach, the focus of attention in designing is “human experience”, and architecture is the place and context of this experience, but not a machine for living or a statue for seeing.

The “auditory experience of place” is an aspect of the experience-oriented approach to architecture that focuses on the auditory dimension of experiences of architectural spaces. According to all the studies reviewed in this paper, the design tools used by architects are still materials and geometry; however, an architectural designer now

faces an important question that affects the fate of a design: Are spaces merely perceived through the eyes? Is it sufficient to address the visual aspect of architecture to reach the desirable quality? What role does hearing sounds have in perceiving the quality of a place consequently designing spaces? The last question is probably answered by architects giving an architectural acoustic response. However, this results from the same dominant building and physical approach to architecture. The ‘Auditory experience of place’ expresses an auditory character and quality in architecture, the experience of which creates friendly, familiar, and strange places, even “home” for us: the concepts not presented in building physics.

The study of “position of hearing sounds in the qualitative experience of place” or “whatness of auditory experience of place” is a topic that can open up new opportunities for how to design. It can also introduce some forgotten components into design and help understand how to make better decisions with the knowledge about the effect of space physicality, events, and their

meanings on the auditory qualities of spaces while designing spaces, dimensions, and geometry and selecting the materials, which create a richer experience in architecture. A little attention can properly indicate the presence of this concept in the spaces of everyday life. Inattention to hearing in design can eliminate the feeling of attachment to a house, turn the enormous lobby of a library into a frightening space, deprive a musical performance of its amicability, make a teacher shout in a classroom, and eliminate the spirituality of a religious space. Other cases can be heard and perceived in our surrounding environment with little attention.

As human life is complicated and multifaceted, the study of life in a human-made place (architecture) and the creation of such a place would be as multifaceted. Reviewing different studies on the sound–place relationship indicated that those studies leading to design results in some cases (e.g., aural architecture) included a wide spectrum from empirical sciences to art, design, and philosophy which phenomenology of perception and embodiment helped to a great extent.

Addressing the relationship between ‘sound and hearing’ and ‘place and architecture’ from the perspective of building physics — as architectural profession and education in Iran have been convinced by a brief content of it — is only one aspect of study and design. In fact, there are many artistic, psychological, and philosophical capabilities in this area. Currently, certain areas are emerging in the soundscape, sense of place, and atmosphere in relation to sound which also include cultural, social, and historical contexts. Thus, sound and hearing can be discussed in the technical aspect of architecture in acoustics as well as the meaningfulness and aesthetics of architecture in other areas such as aural architecture, soundscape, and auditory place. Each of these areas can help recognize, interpret, experience, and develop architectural spaces from specific perspectives. Naturally, a wider variety

of these areas and their conscious relationships (e.g., the conscious use of technical concepts of acoustics as tools for studying auditory experience) can enrich studies and design. Indeed, training architects should be considered the prerequisite to all cases: architects should activate all of their senses including sensing and hearing sounds in addition to seeing to communicate with an environment. Therefore, they can learn from their personal experiences and use them in designs in the first steps.

Endnotes

1. The remaining texts from Ibn Sina, Farabi, Safi-al-din Ormavi, and Abd-al-ghader Maraghi indicate a rich history of sound study in Iran.
2. The diversity of these books is beyond the studies of sound-place relationships and includes fields of philosophy, anthropology, history, music, psychology of perception, sound arts, audio-visual systems, and etc.
3. For instance, refer to architectural acoustics books (e.g. Long, 2006).
4. Indeed, the first Iranian who wrote a semi-modern acoustical book was Mehdi Gholi Hedayat whose book “Majma-ol-Advar” was written in 1938. This book was published in lithographic format and there is one copy of it in the National Library of Iran, in which there is no content about the sound-place relationship.
5. Refer to (Sabeti, 2005, 216-235): Interview with Dr. Maulana.
6. Which can be followed in such books: (Beranek, 2004), (Long, 2006), (Egan, 2007), (Kuttruff, 2009) and (Everest & Pohlmann, 2014).
7. The sounds which have a specific meaning for a community, like church bells.
8. The sounds which have informing roles, like sirens.
9. In the musical area, keynotes are the tones which are heard permanently. They are the main anchor. In soundscape field, keynotes are the environmental sounds which are heard unconsciously and have a pivot role in forming the character of sonic environment, such as sea waves sounds in a coastal city.
10. Steven Feld, the founder of the word ‘acoustemology’, is an anthropologist and musicologist who has made the word conjoined by ‘acoustic’ and ‘epistemology’ “to theorize sound as a way of knowing. In doing so, it inquires into what is knowable, and how it becomes known, through sounding and listening” (Novak & Sakakeeny, 2015, 12). Acoustemology addresses the auditory culture of various communities to understand how they live with hearing sounds. One of Feld’s well-known books is *Sound and Sentiment* (Feld, 2012).
11. Acoustic Ecology is a part of soundscape ecology which studies environmental sounds and their destructive effects to eliminate them from everyday life. One of the books from this field is *soundscape ecology* (Farina, 2014) in which the topics like fundamentals of soundscape, types of environmental sounds and their patterns, and methods of study in this field are addressed.
12. The way of recording sonic environment through walking to use for interpreting the soundscape.
13. The authors note soundscape includes sonic events and aural architecture, or aural architecture as a part of soundscape (Blessner & Salter, 2007, 15).
14. For example see (Ghaffari, Ghalenoei & Mohsen Haghghi, 2017), (Semiar, Esmailzade Seilabi & Pasban Hazrat, 2020).
15. It is indicated in the pivotal texts of this approach like *Acoustic Communications* (Truax, 1984) in which, for example, it is addressed the effects of electroacoustics on human communications. For more

information, refer to case studies of two conference proceedings on invisible places (Invisible Places, 2014; 2017). These studies include the soundscape of cities and their relation to cultures, rituals (like Sama), exploring soundscapes in travelers' memories, understanding place identity by hearing sounds, cultures of using recorded sounds, sound arts, and etc., in which they have used acoustical foundations.

16. Bohme has assigned a chapter of his book (Bohme, 2017) to architecture, and another chapter to Light and sound.

17. Even though, there are important studies in the field of musicology in Iran, like the works of Dr. Mohammad Taghi Masoudieh and Mohammad Reza Darvishi, the relation between place and sound or music hasn't been formed based on such human studies in Iran.

18. The term 'Auditory Place' is made by authors from their consideration for the field of study.

19. As these studies are mostly interdisciplinary, they benefit results of other disciplines and approaches.

20. For instance, these three approaches are indicated in these studies of sound-place relationship in Hagia Sophia: (Weitze, Rindel, Christensen & Gade, 2002) in physical approach, (Woszczyk, 2014) in psychological approach, and (Pentcheva, 2011) in the phenomenological approach. Moreover, these two videos are produced based on the the phenomenological study of Hagia Sophia : <https://vimeo.com/58309259> and <https://cerma.stanford.edu/groups/iconsofsound/film>.

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