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THE FORMATION OF SACRED SPACE AS ARCHITECTURE OF EXPERIENCE: BETWEEN SYMBOL, LITURGY AND EMBODIED PERCEPTION

KSZTAŁTOWANIE PRZESTRZENI SAKRALNEJ JAKO ARCHITEKTURY DOŚWIADCZENIA: MIĘDZY SYMBOLEM, LITURGIĄ A PERCEPCJĄ UCIELEŚNIONĄ

Abstract

The article substantiates the concept of sacred space as an "architecture of experience" that integrates liturgical practice, spatial form, and embodied perception. It employs phenomenological, morphological, typological, and acoustic analysis of spatial geometry, materiality, choreography of movement, lighting scenarios, and acoustic parameters (reverberation, absorption, diffusion, speech intelligibility). The study proposes a systematic classification of architectural means for shaping sacred experience is proposed, demonstrating that form-making must integrate multisensory and acoustic design at the conceptual stage. It argues that sacred architecture must balance acoustic solemnity with the clarity of the liturgical word and treat sound as an equal material in spatial design alongside light, volume, and symbolism.

Keywords: *architecture of experience, liturgical scenario, phenomenology of perception, sacred symbol, spatial choreography*

Streszczenie

Celem artykułu jest uzasadnienie koncepcji przestrzeni sakralnej jako „architektury doświadczenia", integrującej praktykę liturgiczną, formę przestrzenną oraz percepcję ucieleśnioną. Wykorzystano metody analizy fenomenologicznej, morfologicznej, typologicznej i akustycznej geometrii przestrzeni, materialności, choreografii ruchu, scenariuszy oświetlenia oraz parametrów akustycznych (pogłosu, pochłaniania, rozpraszania i zrozumiałości mowy). Zaproponowano nową, systematyczną klasyfikację środków architektonicznych służących kształtowaniu doświadczenia sacrum, wykazując, że kształtowanie formy powinno już na etapie koncepcji uwzględniać projektowanie multisensoryczne i akustyczne. Na tej podstawie wyciągnięto wnioski, iż architektura sakralna powinna równoważyć podniosłość brzmienia z wyrazistością słowa liturgicznego oraz traktować dźwięk jako równoprawny materiał projektowy, obok światła, kubatury i symboliki.

Słowa kluczowe: *architektura doświadczenia, choreografia przestrzenna, fenomenologia percepcji, scenariusz liturgiczny, symbol sakralny*

1. INTRODUCTION

The architecture of experience in the shaping of sacred space combines the theory of form-making, the phenomenology of architecture, sacred semantics, and contemporary principles of designing religious buildings.

Sacred space is not reduced to a mere collection of walls, volumes, lighting, or decorative elements, but is formed as a complex system of interactions: spatial composition; directions of movement and ritual routes; light, shadow, and color; scale and proportions; acoustics; material tactility; symbolic structure; liturgical action; and individual and collective perception[1].

Sacred space is shaped not only through the organization of architectural volumes but also through the programming of the sequence of human experience – entry, transition, orientation, concentration, participation, and exit. Architectural form emerges as a unique script for experiencing space, one that does not merely delimit or partition the environment but determines the way it is read, physically navigated, and spiritually interpreted. Today, religious buildings function not only as places of worship but also as spaces for communal interaction, silence, remembrance, psychological support, education, and social communication[2].

At the same time, the expansion of a building's functional program should not lead to a loss of its sacred identity. Consequently, the main theoretical question becomes the identification of architectural means that ensure the integrity of the sacred experience amid functional, denominational, and cultural transformations.

It is also important to consider the distinction between physical, architectural, and sacred space. Physical space exists as a material expanse. Architectural space is an organized form of this expanse. Sacred space, on the other hand, arises when the material organization of the environment takes on symbolic, ritual, and existential significance.

Particular attention should be paid to the transition from a static model of a temple to a dynamic model of spatial experience, in which meaning arises not only through the contemplation of form, but through presence, movement, and participation.

Sacredness is not determined solely by the presence of a certain type of building or religious attributes, but is shaped by a particular way of perceiving and using space. That is why the same architectural element – a threshold, axis, dome, altar area, light opening, or vertical accent – can simultaneously have structural, compositional, liturgical, and symbolic significance.

The author's concept of structuring architectural means of shaping experience demonstrates that sacred architecture influences people not through a single artistic image, but through a complex system of spatial stimuli and semantic landmarks (Table 1).

Table 1. Architectural Means of Shaping Experience

Architectural Device	Spatial Effect	Type of Experience
Threshold and Foreground	Separation of the Everyday from the Sacred	Experience of Transition
Longitudinal or Radial Axis	Orientation and Hierarchization of Space	Experience of Directionality

[1] L.R. Gnatiuk, *Creating a spiritual atmosphere of sacred space*, "Modern problems of architecture and urban planning" 2021, no. 59, pp. 16–27.

[2] M. Eliade, *The Sacred and the Profane: The Nature of Religion*, trans. W.R. Trask, Harcourt, Brace & World, New York 1959, p. 256.

Architectural Device	Spatial Effect	Type of Experience
Vertical emphasis	Enhancement of the sense of transcendence	Experience of elevation
Light opening or overhead lighting	Creation of an immaterial center	Experience of presence
Compression and expansion of space	Regulation of emotional tension	Experience of anticipation and revelation
Material texture	Enhancement of physical contact with architecture	The experience of touch
Acoustic differentiation	Creation of atmosphere of silence, song, or speech	The experience of auditory immersion
Symbolic center	Concentration of attention and meaning	The experience of focus

When exploring symbolic form and bodily perception, it is important to avoid interpreting a symbol as a purely decorative or sign-based element. In a sacred space, a symbol is realized through the interplay of form, material, light, scale, and movement[3].

Thus, a sacred symbol can be defined as a spatially realized structure of meaning that is revealed through a person's bodily participation.

2. THE INFLUENCE OF A CHURCH'S GEOMETRY AND DECORATIVE MATERIALS ON THE PERCEPTUAL EXPERIENCE

The geometry and materials of a church directly determine how clearly the congregation will perceive the sermon, readings, and prayers. They influence the distance to the sound source, the direction of reflections, the duration of reverberation, and the uniformity of the sound field; large volumes, significant height, and hard surfaces typically increase reverberation and reduce speech intelligibility.

The larger the volume of the church, the longer the sound persists after the speech signal ends. This creates a solemn atmosphere, but at the same time causes one syllable to overlap another, especially when hard surfaces predominate in the space.

For speech, it is important that the sound reaches the listener quickly without an excessive "tail" of reflections. A general acoustic principle is that an increase in volume, with a constant amount of sound absorption, lengthens the reverberation time. Therefore, a high nave, a large dome, or an excessively spacious apse can impair speech intelligibility.

A long, narrow nave increases the distance between the pulpit or altar area and the back rows. Direct sound weakens, while late reflections become relatively stronger. As a result, the listener hears not a clear voice, but a mixture of direct and reflected signals.

Fan-shaped and radial layouts can reduce the distance between the sound source and the congregation and provide more uniform sound coverage. Studies of the geometry of religious spaces link such configurations to better sound propagation and higher speech intelligibility compared to elongated layouts.

[3] L.R. Gnatiuk, *The role of art and symbol in the formation of sacred space*, "SPAM: Cuchasni problemy arkhitektury ta mistobuduvannia [Contemporary problems in architecture and urban planning in Ukraine]" 2020, no. 58, pp. 32–47.

However, a radial shape is not automatically optimal. Concave surfaces, sharp angles, or excessively large smooth surfaces can concentrate sound, creating focal points, echoes, or acoustic "dead zones."

Long parallel walls promote multiple reflections between them. If these reflections occur at short intervals, a metallic timbre or "tremble" in the sound is produced. If, on the other hand, the reflections arrive with a longer delay, they may be perceived as an echo.

When designing worship spaces, it is also important to pay attention to unfavorable length-to-width ratios in the room and to favor designs that prevent parallel sound reflections. Legibility depends not only on the shape of the church, but also on the location of the sound source[4]. The preacher, deacon, reader, or choir must be spatially aligned with the congregation.

Even a church that is well-designed in terms of form may have poor intelligibility if the sound source is located too far away or is obscured by architectural elements[5].

Materials also affect acoustics through three main properties: reflection, absorption, and diffusion.

Hard, reflective surfaces – such as stone, concrete, marble, glass, ceramics, and smooth plaster – primarily reflect sound. In a large church, they contribute to the formation of a reverberation field.

However, complete or excessive absorption is also undesirable. If the space becomes acoustically "dry," the choir and congregational singing lose their support, and the church may resemble a conference hall. Therefore, the challenge lies not in maximizing absorption, but in its precise calibration and placement.

Diffusive surfaces – which scatter sound in various directions and helps prevent the concentration of reflections[6].

Diffusion allows for the preservation of a lively sound without creating a harsh echo. This is particularly valuable for places of worship, where it is necessary to simultaneously support singing and ensure that speech is intelligible.

For speech, a balance between reverberation time and clarity is essential. Practical guidelines for spaces primarily intended for sermons and readings often suggest a target reverberation time of approximately 1.0–1.5 seconds; musical and choral activities may require a longer reverberation time. This is not a universal standard for every church, but rather a design range that depends on the volume, denominational practices, the sound reinforcement system, and the nature of the worship service[7].

The optimal solution lies not in choosing a "quiet" or "echoey" church, but in creating a differentiated acoustic system – a certain architectural balance.

Geometry and materials cannot be considered in isolation. The same stone surface can be beneficial in the early reflection zone and detrimental on the rear wall, where it reflects sound back toward the speaker and the congregation with a delay (Table 2).

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[4] C. Guillebaud, C. Lavandier (eds.), *Worship Sound Spaces: Architecture, Acoustics and Anthropology*, Routledge, London 2019, p. 224.

[5] P. Zumthor, *Atmospheres: Architectural Environments*, "Surrounding Objects", Birkhäuser, Basel 2006, p. 75.

[6] G. Böhme, *Atmospheric Architectures: The Aesthetics of Felt Spaces*, Bloomsbury Academic, London 2017, p. 192.

[7] C. Guillebaud, C. Lavandier (eds.), *op. cit.*, p. 224.

Table 2. The Relationship Between Acoustic Performance and Architectural Components

Architectural Component	Desired Acoustic Effect
Pulpit or Sermon Area	Early direct reflections and minimal late reverberation
Congregation Area	Uniform sound distribution
Apse or Altar Area	Controlled reflections without focusing
Choir area	Sufficient reverberation and diffusion
Rear wall	Absorption or diffusion to prevent back echoes
Side surfaces	A combination of reflection and diffusion
Floor and seating	Control of acoustic changes with varying occupancy levels in the church
Dome or vault	Prevention of sound concentration and acoustic focal points

In addition to liturgical traditions and architectural style, the size of a church has a significant impact on its acoustic characteristics.

The geometry and materials of a church determine speech intelligibility through the organization of direct and reflected sound. Elongated floor plans, significant height, large volumes, and a predominance of hard surfaces contribute to increased reverberation, which can enhance the atmosphere of solemnity but at the same time impair the perception of spoken speech. More compact spatial configurations, reducing the distance between the sound source and the congregation, diffuse surface treatments, and the strategic use of sound-absorbing materials help create a more uniform and intelligible acoustic field. Thus, the physical and spatial form of a church serves both as a vehicle for symbolic meaning and as a tool for organizing the auditory experience. The interplay between the dimensions of the space, the number of seats, and the nature of worship services becomes a critically important factor in the design process. A successful acoustic strategy must align spatial scales with the behavior of worshippers during services, rather than relying on general performance standards[8].

Thus, a church shapes not only what a person sees, but also how they hear the Word, experience community, and perceive their own presence in the sacred space.

3. SOUND DESIGN IN CONTEMPORARY CHURCH ARCHITECTURE

Modern church construction often overlooks acoustic design not because sound is unimportant to worship, but because it is mistakenly viewed as a technical issue that can be addressed after the architectural design is complete. In reality, the church's geometry, volume, materials, lighting, and liturgical scenarios all simultaneously shape its acoustic experience.

Contemporary architectural culture is largely image-oriented: silhouette, facade, photogenic quality, formal innovation, and a recognizable compositional concept. These characteristics are easy to present in drawings, competition boards, and digital visualizations.

Acoustic space is less obvious; it cannot be fully conveyed through perspective images, and its quality is revealed only over time during speech, singing, prayer, a pause, or as a person moves through the church. In this sense, it is essential to recognize the limitations

[8] D. Zhang et al., *Soundscape in religious historical buildings: a review*, "Heritage Science" 2024, no. 12(1), art. 45.

of architecture, which designs what will be seen but pays insufficient attention to what will be heard and physically experienced[9].

A church must simultaneously ensure the intelligibility of sermons and readings, support congregational singing, and create musical richness. However, these goals do not always align.

Excessive reverberation enhances solemnity and musical richness but can "blur" syllables and make it difficult to understand the words. A room that is too dry promotes speech clarity but robs the singing of its spatial depth. Studies of liturgical acoustics describe this spectrum as a tension between *clarity* and *mystery* – between the clarity of the message and a sense of acoustic mystery[10].

Thus, the problem lies not simply in "poor acoustics," but in the absence of a concept that would define what type of sound is appropriate for a specific theological and liturgical context.

In modern worship spaces, the technical system sometimes effectively replaces the acoustic design. As a result, the church functions as a hall with loudspeakers rather than as a space where the architecture itself fosters communal listening[11].

Acoustic solutions are often considered a secondary expense, especially when they lack obvious decorative value. Absorptive panels, diffusers, acoustic suspended elements, double-layered structures, and special finishing materials may be perceived as complicating the church's aesthetic or increasing the budget.

It is telling that in some modern places of worship, measured reverberation can exceed three seconds, while speech intelligibility remains low. At the same time, modeling that incorporates acoustic absorption and zoned loudspeaker systems can significantly improve the situation[12.]

Some modern churches mechanically replicate historical forms – domes, high naves, solid stone surfaces, and large smooth vaults without understanding that historical acoustics were tied to a different type of worship, a different congregation size, different sound practices, and the absence of modern electronic amplification.

Scientific studies of religious buildings indicate that large historic churches often have high reverberation and low speech intelligibility. This means that their acoustic value and functional convenience do not always align[13]. As the modern church strives to be open, multifunctional, and communicative, the more important it becomes to differentiate the space acoustically.

A single acoustic regime for all these functions is impossible. Therefore, a modern sacred space requires either variable acoustics or a differentiated spatial structure: a large liturgical space, intimate chapels, acoustically controlled spaces for teaching, and areas with varying degrees of acoustic openness[14].

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[9] A. Jelić, A. Staničić, *Embodiment and meaning-making: interdisciplinary perspectives on architectural experience*, "Journal of Architecture" 2022, no. 27(4), pp. 473–484.

[10] R. Lucas, *Designing a notation for the senses*, "Architectural Theory Review" 2009, no. 14(2), pp. 173–192.

[11] J. Pallasmaa, *Space, place and atmosphere: emotion and peripheral perception in architectural experience*, "Lebenswelt: Aesthetic & Philosophy" 2014, no. 4, p. 230.

[12] D.M. Howard, J. Angus, *Acoustics and Psychoacoustics* (5th ed.), Routledge, London 2017, p. 480.

[13] S. Girón et al., *Church acoustics: a state-of-the-art review after several decades of research*, "Journal of Sound and Vibration" 2017, no. 411, pp. 378–408.

[14] J. Pallasmaa, *The Eyes of the Skin: Architecture and the Senses* (4th ed.), Wiley, Hoboken 2024, p. 230.

The space of a church is revealed through the voice, singing, reverberation, silence, and the sonic presence of the congregation[15]. Therefore, its architectural quality is determined not only by the visible parameters of form but also by its ability to organize the auditory experience in accordance with the liturgical action. Overcoming visual reductionism requires the integration of architecture, acoustics, and a theological understanding of worship at an early stage of design.

In this concept, the visual elements serve as evidence: they demonstrate that the form of the temple simultaneously organizes light, movement, a sense of materiality, and sound.

3. CONCLUSIONS

Architecture is not an autonomous visual object, but only acquires its full meaning in interaction with a person who enters the space, moves through it, touches the materials, hears its acoustics, and perceives its smells, temperature, scale, and lighting atmosphere. The architectural experience is shaped by a person's entire physical presence, not merely by the act of visual contemplation.

Sacred space is not merely a form that represents the transcendent but an environment in which the transcendent is experienced through bodily, sensory, and temporal means.

It is important to overcome visual reductionism – architectural culture often evaluates a building primarily by its appearance, facade, photographic expressiveness, or geometric concept, which leads to a neglect of other dimensions of space – tactile, auditory, olfactory, kinesthetic, and atmospheric.

Thus, the phenomenological approach broadens the concept of the formation of sacred space. Form is not merely a contour, volume, or compositional scheme, but a synthesis of all the parameters through which a person experiences architecture.

Therefore, the spatial composition of the church can be analyzed as a choreography of bodily participation. In this sense, architecture does not merely provide a functional arrangement for the faithful but organizes their presence in time and space.

The architectural experience is linked to the concepts of atmosphere, mood, memory, and imagination, with atmosphere serving as a means of conveying sacredness. People perceive space not as neutral geometry, but as an environment with a specific emotional tone. Architecture can create an atmosphere of calm, anxiety, concentration, openness, security, or elation. For a sacred space, this means that its design must take into account not only objective characteristics but also atmospheric integrity.

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