

Article

Towards an Evolutionary Science of Sacred Architecture: When Atmosphere Meets Narrative

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Abstract

This paper forwards the claim that our early human ancestors had protosacred experiences long before they had languages, architecture, or religions. A mountain may create feelings of awe while a grove in the forest may create feelings of serenity. In some circumstances (and very much dependent on the mental set of the individual), such protosacred experiences may create a sense of ultimacy that may be interpreted by the faithful as a religious experience in terms of their own beliefs. We chart an evolutionary account of the path of human ancestors from experiences of the protosacred to the diversity of religions, with a focus on the emergence of culturally varied architected sacred spaces designed to offer a religious group a sense of shared community and the sacred in the experience of their religion. We argue that the cultural evolution of languages was necessary for this transition. It made our species both *Homo quaerens* (the humans who ask questions) and *Homo narrans* (the humans who tell stories), able to ask existential questions and to offer answers that a group could accept. The answers took the form of narratives and scripts for ritual behaviors that could harmonize the community with the world around and beyond it. We suggest that both affordances and atmospheres relate to the aesthetics of space, stressing the atmospheric flow as the performance of various rituals proceeds. This paper offers examples from diverse religions or cosmologies and closes with suggestions for a range of empirical and experimental investigations to address the hypotheses raised herein.

Keywords: aesthetics; affordances; architecture; atmospheric flow; comparative religion; cultural evolution; *Homo quaerens*; *Homo narrans*; language evolution; sacred architecture; ultimacy



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1. (Experimental) Aesthetics of Sacred Architecture

This paper focuses on *sacred architecture* in terms of designed places and spaces where members of a particular religious community come together to share and experience their faith. We claim that understanding the sacred spaces for a particular religious tradition involves the narratives of that religion and the human capacity for protosacred experiences—our ability for emotional response that include awe, serenity, belonging to a community, and our sense of wonder. We explore the notion that such spaces around us may tap the space within us to open up a space beyond everyday space and time.

This article is part of a Special Issue on *Experimental Theological Aesthetics*. Theology, considered generally, is the study of God or gods, while Theological Aesthetics has developed primarily as a branch of *Christian theology* which seeks to understand the nature of the Christian Trinity and humanity's relationship with the divine. Among the ancients, Saint Augustine emphasized beauty as a reflection of divine order and harmony, while

in the Middle Ages, Thomas Aquinas viewed beauty as a transcendental property of being. Among many 20th century contributors to theological aesthetics are Hans Urs von Balthasar whose *Herrlichkeit (The Glory of the Lord)* (von Balthasar 1961) presents beauty as a theological category rooted in the incarnation of Christ. Given the emphasis of this paper, it is worth noting that David Tracy's (1981) book *The Analogical Imagination* argues that theology must engage in a mutually critical correlation between the Christian tradition and contemporary culture, with the use of *analogy* allowing for both continuity and difference between divine and human realities. Building on such work, Richard Viladesau (1999) has explored the role of aesthetic experience in our perception and understanding of the holy to argue that *God is the absolute and necessary condition for the possibility of beauty*. However, the present paper turns from a theological approach that takes the existence of God (or gods) *as understood within a particular religion* as an axiom and then seeks to understand human aesthetics in relation to this pre-existing divinity. Many religions or cosmologies hold a sense of the sacred that does not include this sense of the divine. We shift focus to ask

How did human cultural evolution gave rise to a sense of the sacred as variously manifested in diverse religions and cosmologies?

and to ask and partially answer

How do the aesthetics of particular places and buildings held to be sacred by a particular community relate to the particularities of their faith?

Our theme may be labeled (*Experimental*) *Aesthetics of Sacred Architecture*, while noting the role of sacred objects and rituals.¹ Some possible experiments will be sketched in §7, but the emphasis is on establishing a framework based on the following notions:

1. Pre-modern "protosacred" experiences of early humans underpin the cultural evolution of sacred architecture and modern experiences of sacred space.
2. Language and the construction of narrative are essential in constructing religious meaning, or cosmologies more generally; and these are complemented by the development of scripts for rituals, symbols, and sacred objects that would otherwise be meaningless.²

We consider three types of space (Arbib, N&SA)³:

- The physical *space around* the people within or around a building. Moreover, the people around them may be as important as the physical space itself in determining the atmospheric flow experienced by a person within that space. (Previously, the term "atmospheric flow" has only been used for patterns of airflow in and around buildings but here we apply it to changes in the atmospheres in the aesthetic sense discussed below.)
- The *space within*, the space of *multisensory imagination* that enriches whatever impact sensory stimuli may have when a person experiences a physical space.
- And, specific to the sacred, the *space beyond*, the notion in many religions that there is something beyond everyday reality as defined within the 4-dimensional spacetime continuum.

2. The Framework

Much of what follows is relevant to other forms of sacred architecture, such as memorials designed to honor the history of heroic events of local or national significance, such as war memorials. There the narratives offer a particular view of those events located in our space and time, whereas the narratives of religions and cosmologies seek to link humans to a transcendent reality. Indeed, history and the sacred are often interlinked. For example, Varela, in his study of the morphogenesis and spatial organization of Tarragona cathedral, stresses that not only was it designed to support liturgical practices but its layout preserved the axes

of an ancient Roman sacred precinct while its immense size reflected the political ambitions of the bishops to make Tarragona the most notable see of the cities of Spain (Boto Varela 2016).

In this paper, aesthetics is not restricted to the creation and appreciation of beauty. We are concerned with the experience of buildings that extends beyond beauty to incorporate atmosphere (§6.2) more broadly as the effect on the person's mood, a notion that we extend to introduce the notion of atmospheric flow. Different people may experience different atmospheres of the same space at different times. The architect is thus trying to offer objective features of a building that may offer subjective experiences to a certain range of inhabitants. For example, a mosque may be admired for its beauty by tourists and yet evoke a deeply sacred atmosphere for the Muslim faithful. Experimental aesthetics then seeks to design experiments that explore these aesthetic experiences of different individuals (§9). Affordances (possibilities for action, §6.1) enter the picture in, for example, the rituals performed by the faithful within their sacred space, and the performance of these rituals may be pleasurable or disorienting, thus affecting the aesthetic flow.

A prime challenge for sacred architecture is to better understand how architecture may contribute to the space around us in such a way that it changes the space within us and connects us to the space beyond. However, the examples (see §7) of the Seder and a storefront church (§8) make clear that a space used by a family or a community for the practice of their faith may be a sacred space, at least temporarily, but need not be an example of sacred architecture.

In what follows, the term “early human” refers to the *Homo sapiens*, Neanderthals and Denisovans that co-existed around 200 thousand of years ago. They had use of fire and some tools but lived in small groups with no agriculture or domestication or buildings and perhaps only simple precursors of what might emerge later as full languages. There was neither the domestication nor the social hierarchy for a group of humans to believe that “The Lord is my shepherd.”

We use the term “protosacred” here to express the feelings—of awe or contemplation for example—that early (and modern) humans may have had in certain places or situations before they had religions or comparable symbolic systems (§3). Note that use of the term “protosacred” does not imply that evolution must have led inevitably to what we now consider sacred practices. Rather, our claim is that cultural evolution was in part stimulated by such protosacred experiences but that it was only as the capacity for language developed that narratives and practices could emerge to structure what we might characterize as early forms of religion. Some might see the diversity of present-day religions as implying that human evolution “created” gods through processes charted below. Others would hold that different religions have glimpsed different aspects of a transcendent Reality but then dressed them in a group's history with elaborations of those glimpses—much like the blind men who described portions of an elephant but never understood the total Elephant. This paper works from the notion that early humans had no (notion of) gods and that notions of “the sacred” became available only once humans had rich enough language to ask existential questions and for a community to become convinced by shared answers.⁴

A crucial emotion here is *the sense of belonging* whereby the mutual dependence of a community in hunting and foraging and child rearing for the group's survival becomes consolidated by the development of a shared belief in myths and historical narratives, and an emerging set of existential answers. Such narratives may have first arisen for groups of people sitting around a campfire whose shared myths expanded to yield a system of interlinked narratives (and, crucially for our later discussion, patterns of behavior [scripts] informed by those narratives) that yielded a cosmology that included nonhuman beings, whether or not these attain the status of gods. The transition from simple patterns of habitation in caves and elsewhere to buildings, in general, and then sacred buildings in

particular is then comparatively recent—perhaps emerging only in the Neolithic for Indo-Europeans. Community matters in religious experience in a particularly architectural way, with buildings acting as the vessels for groups to share common and mutually reinforcing rituals. Those can be words or songs or following a formal ritual sequence that engages the community either by call-and-response or by respectful observation. Architectural spaces shape the potential for experience and so can align, or not align, with the conditions and qualities needed for religious experience.

It seems dubious that any single experiment could test the claim that “God is the absolute and necessary condition for the possibility of beauty”. An experimental sacred aesthetics must find focused hypotheses to test, exploring how to modify the *pragmatic criterion* of the exact sciences as we move to other forms of knowledge, in our case the study of the aesthetics of sacred spaces. In *The Construction of Reality*, [Arbib and Hesse \(1986\)](#) offered a bridge between my concern with how “schemas in the head” mediate an individual’s construction of their experienced reality and Mary Hesse’s concern for how a group of scientists create new paradigms when the weight of new evidence demands restructuring or replacement of a prior paradigm ([Hesse 1969, 1980](#)).⁵ For example, Newton offered a deterministic worldview for physics that in the end succumbed to a range of new experiments whose results could only be explained within the inherently probabilistic worldview of quantum mechanics—even though, in the large-scale limit of our daily lives, Newton’s approach still helps us understand “how the world works”. We reached agreement on the form of an epistemology that reconciles the personal and the social in terms of linking “schemas in the head” and “social schemas” (such as languages, religions, systems of morality and ideologies), Hesse then assessed how to read the Bible metaphorically to give us a sense of a God-Reality that transcends the limits of four-dimensional space-time, whereas I suggested how we might develop a purely secular view that nonetheless includes morality and a sense of wonder.

But we did not consider sacred architecture. The present paper develops the thesis that early humans developed (proto)languages and thus became able to share increasingly complex narratives. This in turn led different communities to develop their own world views shaped by narratives that sought to explain experiences of living in a world that could include experiences of ultimacy and the protosacred. As the community came much later to develop buildings to meet diverse needs, sacred architecture emerged to develop buildings for the community’s shared expression of their cosmology or religion. There is no unique order in which to present the diverse aspects of this framework to give a sense of the whole, but here is the order chosen for this paper:

§3 introduces the notion of protosacred experiences that early humans may have had even prior to the development of languages.

§4 discusses, all too briefly, how humans may have evolved the capacity for the construction of both their *physical worlds* and their *symbolic worlds* including language. In particular, they developed the ability to ask questions, and to develop and share answers through the construction of both narratives and artifacts—they became both *Homo quaerens* (the human who asks questions) and *Homo narrans* (the human who tell stories). Symbolic worlds are shaped not only by language but also by art, morality, religion, and diverse ideologies.⁶

§5 exemplifies how protosacred experiences, for example, awe, may have set the stage for the development of cosmologies once people had the ability to develop complex narratives.

§6 develops three important concepts from architectural theory: affordances, atmosphere (with a special emphasis on atmospheric flow), and scripts as general plans for a kind of behavior, with the performance of rituals being a particular case. Moreover, we distinguish scripts from narratives.

§7 shows how even the tourist may experience some aspects of the atmosphere of a sacred building and yet that experience may be enriched or even transformed for those who live by the narratives of the faith that makes that place sacred.

§8 overlaps with §7, with further insights into evolution and the resultant diversity of present day religions and cosmologies.

§9 sketches some present and future directions for the empirical and experimental study of the aesthetics of architecture, but with special attention to sacred architecture and the promise of considering this from an evolutionary perspective.

Finally, §10 draws the paper to a conclusion.

3. Protosacred Experiences

Modern humans may have “experiences of ultimacy” that may be in some sense existential and that many religious people may interpret in terms of their religious beliefs. Figure 1 recaptures something of an experience I had at Cape Leeuwen, at the southwest corner of Australia where the Southern Ocean meets the Indian Ocean, but it cannot capture the full multisensory experience. The clouds were brightly illuminated, the wind buffeted but did not topple me, there was the roar and visible surging of the waves, and I had an experience that had nothing to do with religion but let me feel for a few minutes a oneness with nature very different from everyday experience. We call these experiences *protosacred* to emphasize that early humans could experience them—but they were part of the early human capacity for emotion stirred not only by social interaction but by diverse aspects of the natural environment. Note that although I say *my* experience “had nothing to do with religion”, there are many people today, including those who live within a narrative of a Creator God, who have had similar experiences and would say that such experiences are indeed sacred.



Figure 1. An ocean scene akin to one providing a sense of ultimacy. (Photo retrieved from the web, no longer available).

William James (1902) charted the varieties of religious experience. These were revisited by Leslie Brothers and Wesley Wildman whose approach (Wildman and Brothers 1999) suggests that experiences such as the one I had at Cape Leeuwen might be described as *experiences of ultimacy* that need not be part of a religion but nonetheless need to be placed into a semantic network to serve as the source of varied narratives. An experience of ultimacy becomes a religious experience to the extent that it accords with the interiorized social schemas of a religious community, so that the experiences of the Buddhist or the Christian in such a setting as the above might be modified (subconsciously) by the narratives of their religious faith, but in different ways. A key postulate of this paper is that humans had “experiences of ultimacy” long before they had language rich enough to support “narratives of a religion”.

Mohamad Koubeissi (N&SA) expounded the importance of mystic experiences that . . . emerge from attention to “the thing as it is,” the deep understanding of which is inevitably connected with all things. The truth attained through mystic experience tends to be the culmination of some practice. The wisdom of the sages does not come from reading books or cultural narratives, but through removal of erroneous preconceptions about oneself, the other and the world. Experienced practitioners are potentially capable of seeing ultimate beauty in everything from a grain of sand to a cathedral. One may even argue that the aesthetic experience becomes independent of the culturally associated affect itself. . . perhaps a feeling of unity regardless of the salience that a stimulus or a space elicits.

There seems no reason here to distinguish between mystic experiences and experiences of ultimacy, but we emphasize that such experiences may, but need not, be shaped by religious belief. Our concern with sacred architecture in this paper is *not* with people gaining mystic experience in contemplating a grain of sand—for them, the designed space of architecture seems irrelevant—other than to argue that these may correspond to the experiences of the protosacred by early humans long before architecture, or even buildings, existed. Instead, we will focus on sacred architecture as the design of buildings that support a group of believers in coming together to heighten the experience of their religion—even though mystic experiences in Koubeissi’s sense may be rare (though some sects offer exceptions). Mystic experiences served as but one of several sources for the emergence of religions—with emotional experience in due course augmented by narratives that addressed existential questions. I thus reject Koubeissi’s claim that “The wisdom of the sages does not come from reading books or cultural narratives,” at least in the context of sacred architecture as defined here. However, I do agree with his later comment that “the sense of shared community as an adaptive feature in our species likely plays a . . . role in the religious experience that is different from pure mystic experiences. . . . [This] sense is helpful through evolution, whether it is related to a spiritual practice or not.” This sense is mentioned several times in this article, but its analysis—experimental or otherwise—is outside its scope.

4. Cultural Evolution of the Construction-Ready Brain

With this, we consider the path to narrative before we consider how narrative provided a path from the protosacred to the sacred.

Elsewhere (see, for example, Arbib 2021, chap. 8, for an exposition) I have argued that the brains, bodies, and social interactions of our ancestors had evolved to a point where they were *construction-ready*, having the neural capacity to support the cultural evolution and use of both symbolic and physical construction hundreds of thousands of years before cultural evolution led on to languages or architecture. (For a modern example, human brains have been “internet-ready” for tens of millennia, but this capacity could

not be tapped by individuals without the cultural and technological changes during those millennia that provided the “shoulders” upon which the Computer Age innovations of the 20th century stood.) This unified perspective arises from the suggestion that it was manual skill coupled with imitation, demonstration and pantomime that made the brain “construction-ready” in a way that supported tens of millennia of cultural evolution to yield languages and the design of buildings (and drawing and painting as well).

Just as buildings over time gained increasing complexity so too did the narratives that a group of humans would develop and share and come jointly to believe that they made sense of their physical and social world. (Remember that we are on a time scale on which the invention of cities, writing systems and the building of the pyramids and temples of Ancient Egypt are all “recent”.) In *Cognitive architecture: Designing for how we respond to the built environment*, [Sussman and Hollander \(2021\)](#) entitle their Chapter 5 as “Storytelling is key: we’re wired for narrative”. I would rather say that, because we have language-ready brains, children can in a few years rapidly come to appreciate stories, and even make up their own, *if developing in an environment in which story telling is established*. It is cultural evolution that yielded societies in which storytelling is key in our lives in general, and in architecture in particular.

Among other terms for *Homo sapiens* is *Homo faber*, the human who makes (and *Homo erectus* made stone tools long before the emergence of Neanderthals and *Homo sapiens*), but a crucial aspect here is the label of *Homo loquens*, the human who speaks.⁷ This has enabled us to become both *Homo narrans*, the humans who tell stories and *Homo quaerens*, the humans who ask questions⁸—and a crucial undergirding of religion is that we can ask questions like “What is the meaning of life” and “Is there a God?” and “Where do we come from?” and different people can accept radically different answers so long as they are underwritten by the social schemas of a group to which they belong. Note the crucial role here of “belonging” that includes not only sharing a range of social interactions with a group but also accepting (perhaps unconsciously) a range of social schemas of that group and behaving accordingly.

5. From Protosacred Places to Narratives and Cosmologies or Religions

Before we embark on our quest to understand human sacred architecture, we first consider natural, rather than human-built, places that were themselves protosacred and gave rise to cosmologies that made them sacred. We start with two examples where awe, just one emotion that may contribute to a sense of the protosacred, may have led two different groups of *Homo quaerens* to ask questions that combined with their skill as *Homo narrans* to generate narratives that each came to accept as providing answers that were the basis for elaborate social systems that we might classify as cosmologies rather than religions.

The huge monolith Uluru (once known to Europeans as Ayer’s Rock) in Central Australia (Figure 2) is sacred to the Pitjantjatjara, the Aboriginal people of the area. The area around the formation is home to an abundance of springs, waterholes, rock caves, and ancient paintings.⁹ The sense of the protosacred may arise from awe when seeing this monolith rising from the plain and also the sense of mystery associated with the caves and crannies within. This gave rise to Aboriginal ancestral stories for the origins of Uluru. One such account (as recorded by [Brockman 1997](#)) tells of two tribes of ancestral spirits who were invited to a feast but were distracted by the beautiful Sleepy Lizard Women and did not show up. In response, the angry hosts sang evil into a mud sculpture that came to life as the dingo. There followed a great battle, which ended in the deaths of the leaders of both tribes. The earth itself rose up in grief at the bloodshed, becoming Uluru. Here the question “Where did we come from?” becomes complemented by the question of “Where did features of the landscape come from?” These fundamental questions gave rise to the notion of the Dreamtime and the Songlines that accommodate lengthy narratives that combine practical

and sacred information about places and the paths that connect them (Neale 2017; Chatwin 1987). Tilley (1994) includes a broader perspective on “The social construction of landscape in small-scale societies: structures of meaning, structures of power”. Intriguingly, though, despite their elaborate continent-wide cosmology, Aboriginal Australians did not develop sacred architecture in the sense of permanent buildings; instead, their architecture was based on temporary settlements reflecting practical, social and kinship patterns as they moved along the Songlines (Memmott 2022).



Figure 2. Uluru. (commons.wikimedia.org/wiki/File:ULURU.jpg, accessed on 8 November 2025. This file is licensed under the Creative Commons Attribution-Share Alike 4.0 International license).

In what is now Wyoming, Mata Tipila (Figure 3) lifts our eyes upward to engage a sense of awe and wonder that led to creation stories that the Northern Plains Tribes employ to instill religious and moral beliefs in new generations.¹⁰ One such story tells of a group of Crows camped at “Bear’s House,” a place where many bears and one giant bear lived. Two girls were playing on nearby rocks when the large bear started creeping towards the girls thinking he had found a tasty snack. By the time one of the girls looked up and saw the enormous bear, the only way to escape was climbing up the rocks, but they couldn’t outpace the bear. The Great Spirit, seeing that the bear was about to catch the little girls, caused the rock to grow. The rock grew so high it dwarfed the trees and skyline and put the girls out of reach of the fearsome bear. As the giant bear tried to jump to the top of the tower, it missed and scratched the rock on its way down, resulting in the long, deep groves.

With this we have exemplified how protosacred places may become sacred to a community if that community has not only language but the ability to ask questions they may converge upon (possibly idiosyncratic) answers that the community can share, developing a symbolic world in which the community can live. §4 sketched our hypotheses on how such a capacity for language arose. But our real concern in this paper is with the further transition from sacred places to sacred architecture. By contrast with Uluru and Mato Tipila, Notre Dame de Paris exemplifies the work of humans within an existing religious community to create a building that reflects an extant religious tradition but in part does so by evoking the awe of its inhabitants as they look up and experience the play

of light coming through the stained glass windows. Their eyes ascend into light. This may tap into a primeval sense of awe in looking up to mountains as for Uluru and Mato Tipila while the emotional impact of looking up may rest in part on the young child looking up to father or mother which may elicit emotions of familial love or submission to authority and thus offer another path to narratives about gods.



Figure 3. Mato Tipila (Bear Lodge), also known as the Devil's Tower. (<https://www.facebook.com/USInterior/posts/the-stories-of-devils-tower-national-monument-are-as-varied-as-the-columns-that-/2600913286629003/>, U.S. Department of the Interior's Post, accessed on 8 November 2025).

But before saying more about sacred architecture, we turn in §6 to three notions that have become central in discussion of architecture more generally, *affordances*, *atmosphere*, and *scripts*.

6. Affordances, Atmospheres, and Scripts

Elsewhere (Arbib 2021), I have shown how a scientific framework based on key concepts that include *schemas*, *action-oriented perception*, *drives and emotions*, *affordances and effectivities*, *scripts*, *cognitive graphs*, and *atmospheres* can be linked to neuroscience and to experiments, both psychological and using human brain imaging as well as animal neurophysiology, in probing how humans interact with buildings and may design them. The terms *action-oriented perception* (Arbib 1972) and the *action-perception cycle* (Neisser 1976) remind us that, although perception as an aesthetic activity is an important part of our appreciation of architecture, the key to understanding ourselves in an evolutionary framework is that perception evolved to support actions that could in turn support survival.

Here we focus on *affordances* (the possibilities for action offered by the environment), *atmospheres* (the way a space may affect the mood or emotions of a person—but with a new emphasis on *atmospheric flow*, its changeability), and *scripts* (general patterns of behavior on which individuals may play variations), three concepts that have entered the lexicon of many architects. For early humans, actions and emotions proceeded in an environment with simple tools and no buildings, but these concepts apply to their

behavior and experience, including experiences of the protosacred. This section sets the stage for the development of our evolutionary perspective on sacred experience and the provision of buildings to house them.

6.1. Gibsonian Affordances

Gibson's (1979) term *affordances* for relevant perceptual cues for actions exemplifies the theme of action-oriented perception. When walking down a crowded street, you may *consciously* seek the opportunity for walking faster afforded by a gap in the crowd, but affordances can be nonconscious as when, during that walk, you change course when peripheral vision signals a possible collision—even though you are not consciously aware of the person or object you might otherwise collide with.

Providing affordances for the diverse activities that are to take place in a building is a crucial part of making a building functional. Here is a place to eat; here is a place to rest; here is a place to hide. In a sacred space, affordances may be provided for both the performance of rituals and the experience of emotional states. Note that the use of “affordance” is in some sense ambiguous: it may refer to the physical substrate for people to perform certain actions and the perceptual cues (which need not be visual) that can draw people's attention to that substrate, whether to prompt them to perform that action or to be noticed as and when the need for that action arises.

Stairs provide affordances for getting from one level to another in a building but do not offer an affordance for this action to someone in a wheelchair—affordances depend on the *effectivities* of the user. Crucially, then, the architect designing a multi-floor public building must consider adding ramps or elevators to increase access to upper floors. What may distinguish the human from other creatures is that, even though he knows he cannot climb stairs, the man in the wheelchair recognizes that they provide an affordance *for others*—and this may bring in an emotion, perhaps a *yearning* to be able to walk up the stairs (Arbib 2023). This may have implications for concepts of the sacred, a *yearning for otherness*, where a space around us is designed in such a way that it connects the space within us to the space of non-spatiotemporal Reality beyond us—a transition from embodied to disembodied cognition.

The three staircases of Figure 4 (with that of Michaelangelo's Laurentian Library in Florence at bottom left) bring us to the interlinkage of multisensory perception, action, and aesthetics. They provide not only affordances for physical actions but may also exemplify how (multi-sensory) *aesthetic affordances* may blend with functionality. Moreover, the two staircases at bottom illustrate a different type of affordance—a *viewpoint* that offers a place where one can stand to look (a perceptual action) to have a fine view of the beauty of the stairs (aesthetics).¹¹ Relating this to the design of a church, we might consider the conceptual and religious affordances of short staircases leading up to a raised altar, a long staircase leading up to a pulpit, or a staircase leading down into a baptismal pool. These different types of staircases are built for use by some people on some occasions and meant to invoke various narratives and rituals. Here we see the cultural impact that lets people know not only that “this staircase could be climbed” but understands whether the current occasion is such that it is proper for them to climb it. Such considerations apply to sacred spaces of most religions.

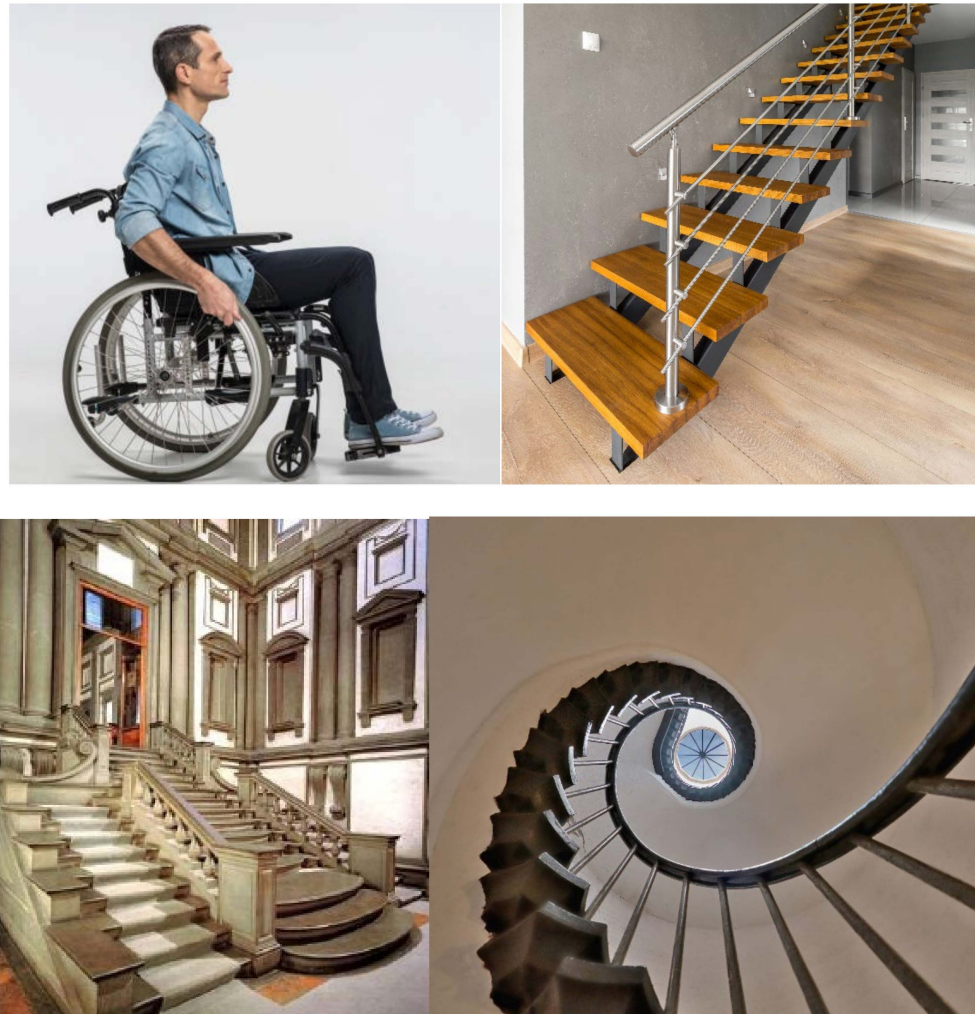


Figure 4. Three staircases and a man who cannot use them (top left: iStock, Vlacheslav Yakobchuck; top right, iStock, in4mal; bottom left: from *Biografías y Vidas. La enciclopedia biográfica en línea*, www.biografiasyvidas.com, accessed on 8 November 2025, with Permission; bottom right, iStock, Jörg Keller).

6.2. From Atmospheres to Atmospheric Flow

The use of the term *atmosphere* for the effect of built spaces on moods and emotions has been increasingly adopted in discussions of architecture, whether sacred or profane (Tidwell 2014; Canepa 2022). However, we reject the notion of a static relationship with a building and its atmosphere in favor of considering the changing sense of atmosphere as a person inhabits a space. We call this *atmospheric flow* and stress that it may vary with the current mood and needs of the inhabitant as well as their cultural background (consider the discussion of statues of Christ crucified to be offered in §7). We shift attention from first impressions of a generic atmosphere of a space (serene, awesome, scary, depressing) to the state experienced within that space of a dynamic atmospheric flow that a space supports, and seek to understand how—for example, during the performance of rituals within a sacred space—that flow may be experienced differently by different people, and even the same person depending on the mood they bring to the occasion. Not only the affordances of a building but also its range of atmospheric flows must be considered in a design that will serve varied groups of people.

Tonino Griffero (2014) has suggested that we complement the Gibsonian notion of an affordance for actions by considering atmosphere as a kind of architectural affordance for mood/emotion but there is no sharp boundary between them. Gernot Böhme (2014)

offers an integrated view of “atmospheric affordances”—the stage setting and the shifting mood—and the physical affordances for the range of actions the user will take within the action-perception cycle within the space:

The architect . . . is . . . primarily concerned with . . . the structure and articulation of spaces. These spaces may be open or closed, narrow or wide, pressing or uplifting. . . . [T]he architect at the same time sets “suggestions for movement”, actual movement as when the visitor steps around the space or virtual movement as when he follows lines and surfaces with his eyes. All these considerations mean that the architect when designing anticipates what sort of lived place he is constructing and how the future visitor or dweller will feel [and not just feel!] there. (Böhme 2014, p.13)

Our wheelchair example (Figure 4) suggested how physical effectivities may relate to giving a space different atmospheres and that even a practical affordance may evoke emotions. This reinforces the notion that the architect must be able to imagine the moods and emotions of others in seeking to make a building that sets the atmosphere of its inhabitants, while understanding that each of us brings both prior experience and current mood to a building and thus can experience it differently. The true measure is how people use the space and how they live—or worship—in it.

The garden of the Reiun-in sub-temple of Tofuku-ji Temple (Figure 5) offers an atmosphere of serenity, but for many of us our experience will lack a crucial religious dimension that would be an essential aspect of the experience of a devout Buddhist. Nonetheless, we experience this serenity as being special in some way, infused perhaps with an awareness that it is part of an ancient Japanese tradition. Moreover, as we sit in contemplation, more and more details become part of our experience of that serenity—the circles in the sand, the artfully selected rocks, the rounded topiary and the balance between these elements, and more. The whole shapes our experience of the details that inform the whole.



Figure 5. The garden of the Reiun-in subtemple in Kyoto. (Author’s photo).

As the experience of a service or celebration in a church or other sacred space makes clear, people are part of “the space around” the person experiencing the space. To understand the impact of the other people—the music the incense, the rituals—we must begin to understand the social cognitive neuroscience of how behaving as part of a group can transform one’s emotional state, whether in the joint performance of prayer or in the communal singing of hymns. Juhani Pallasmaa (2018) speaks of “Architecture as Experience” where the experience brings together perception and action into integrated wholes. However, bio-

cultural evolution has taken us “beyond” action-oriented perception by building a capacity for language, aesthetics and more. Symbolism and shared community are key components to how a sacred space can elicit what is interpreted as the religious experience (much less intense, generally, than a mystic experience) as a harmonized alignment of acquired and accepted cultural and religious constructs. Certainly, the communal experience of singing hymns together in certain religious traditions may create a feeling for the sacred that may rarely rise to the mystical (§6.2) but yet may, for a while, remove one from rootedness in the self. Such a performance can—if only for a while—transform even a store-front church into a sacred space. The linkage of music and dance in building a sense of community (Lewis 2013), and the linked evolution of music, language and culture (Cross et al. 2013) are also relevant here.

6.3. From Scripts to the Challenges of Architecture

Cognitive scientists use the term *script* for a general framework for a variety of related behaviors (Schank and Abelson 1977) but with far more flexibility than the script of a play.¹² Consider, for example, the “birthday party script” with a cake, candles and presents choreographing the behavior of the guests and the person whose birthday it is, but with diverse variations on the theme. *Scripts are not narratives*: indeed, a narrative about aspects of a memorable birthday party may gain part of its power from departures from the script. When we link narratives to a particular faith, we tend to emphasize narratives that have become canonical and are studied by all members of the faith (though even the Christian Bible offers four different Gospels). In sacred architecture, what makes objects sacred and structures the religious rituals will be strongly expressive of certain portions of those canonical narratives.

My suggestion is that part of the work of the architect is to examine scripts for the behaviors of people for whom the building is being designed (and these scripts may vary for different people using the same building: contrast the scripts for congregants, pastor, organist, choir, and even cleaners in a church) and decide what affordances (whether, practical, aesthetic, atmospheric or two or more in combination) are required and thus what places are needed to provide these affordances. Moreover, those places must be connected by paths and the order and way in which these paths are traversed may be an important part of the ritual. Thus, architects should contrive places that support various scripts that invite certain behaviors and so be aware of how to create readily perceptible (often nonconscious) affordances and yet do so with a sense of how the atmosphere of a space that brings together the affordances may create an overall affect for the expected inhabitants.

A challenge for sacred architecture is to better understand the relation between atmosphere and symbolism in developing sacred spaces, whether or not that sacredness is rooted in the history of events that occurred at the site, the natural properties of the site, or the decision of a community to found a new sacred space there. All this opens a whole range of questions for the architect—or even a community without involving an architect—trying to design a sacred space. What sort of script is a ritual? How does a script bring in “affordances” of the religion? What are these? How does this affect the design of the physical structures of a building that may open up the faithful to experiences that extend beyond quotidian space and time? How can all this enhance the atmospheric flow?

To see what this means for the result to be a work of architecture, rather “just” a building, consider the comments of two architects who say little about the special case of sacred architecture but certainly illuminate our discussion.¹³

Harrison Fraker (N&SA) asked “What makes a place meaningful?” and then asserted that “The desire for meaning in our lives is primal and fundamental. In some cases, for those folks who have the least in material resources, meaning is all they have. This desire to

try to understand what makes something meaningful is really important.” Amos Rapoport (1990) titles his book “The meaning of the built environment: A nonverbal communication approach.” In perhaps the same spirit, Julio Bermudez (N&SA) opposed my emphasis on verbal narrative, observing that “Part of embodied experience is to some extent translatable into language, but the immediate experience, even conscious experience and not just unconscious, is nonverbal.” Some religions do make explicit use of texts in their sacred spaces (excerpts from the Koran in Muslim mosques; hieroglyphs on the walls and columns of the temples of Ancient Egypt) but my point here is that a crucial aspect of what makes a space feel sacred may require us to appreciate what that space mean within a particular religious tradition. However, once one has assimilated the basic narratives, one does not have to revisit them to experience the emotional or ritual impact of those symbols within the context of a Christian church. Moreover, the soaring heights and play of light from the stained glass windows in Notre Dame de Paris can stir the emotions and sense of beauty of a visitor who has no knowledge of the Biblical narratives, in some sense evoking those underlying human emotions that gave rise to the protosacred. Nonetheless, the space may exert its full effect on the congregant only when the congregation is present and the rituals of the religion are being shared. In short, our experience of a space may involve both the nonverbal knowledge of its affordances and atmosphere and our knowledge of narratives, whether recalled consciously or providing a subconscious modulation, that affect what we attend to and how we perceive.

Suchi Reddy (N&SA) questioned the importance of affordances, stating that “It is interesting to think about myself trying to reframe my work in the lens of a designer of affordances. And to me that just felt really reductive—that in some ways offering affordances is not at all what I’m trying to do. I might look at designing a staircase in a million different ways from an affordance to get to another floor to allowing somebody to understand how they use a space or a building or a city. But that’s not really what I’m doing as an architect.” In partial response, Fraker (N&SA) observed: “I think affordances could be described as the kind of base program [but] being able to have a stair that gets you from one floor to the other is only the beginning. [Thus] the importance of showing Michelangelo’s stairs to the Laurentian Library [Figure 4] which kind of explodes in the space and gives you multiple ways to ascend when you could have just had a pragmatic stair. . . . And at the same time, you can’t help but project other ways of ascending. So this idea of an affordance as an . . . invitation to an activity is . . . just the beginning, but an essential one.”

Despite the diversity of ways that one can design a staircase it still remains crucial that a way be afforded to get from one floor to another (with perhaps a ramp or elevator for the man in the wheelchair). But what of scripts? For Reddy, “the script is actually the more difficult part. What I’m trying to understand as an architect is how to write the scripts for how people of all kinds, all different ranges of experience, will use and experience the space in different ways. . . . But I’m not thinking of myself necessarily as somebody who designs the aesthetic appearance of affordances. That’s not the important part of architecture for me. What is really important for me is the holistic script that runs through everything in the space. That’s not just what allows me to use it, but also what it makes me think of and realize.”

For me (Arbib, not Reddy), the challenge in many enterprises is to go back and forth between ideas of the whole and ideas for the parts, with the understanding that decisions about the parts may shape the whole while rethinking the whole may force redesigning some of the parts, and so the cycle continues—and may be greatly affected by discussing the design with others. In architecture, computing the costs of construction may also catalyze drastic rethinking of a design. The space supports diverse “atmospheric flows”, whereas affordances (such as doors for entry or exit, windows for light and view, and so on) may

often be localized features of the overall space. Yet objects providing affordances may be portable, as in the case of certain ritual objects used in the performance of rituals. Moreover, a church as an overall space that encloses the congregation must create a holistic sense of being within the overall “space” of Christianity, “the space beyond”, even as people sing the particular hymns and hear a sermon based on a particular passage of the Bible.

Reddy continued that “The script for me in the Laurentian library, which is just one of the most amazing spaces I’ve ever been in, involves experiencing the ceiling, the patterns, the way that the patterns talk to each other . . . There are discoveries within this space, such as the width of the stair and how it allows me to move up there and raise my head instead of feeling like I need to hold the handrail in order to not fall over.”

And then comes her turn to the sacred: “As an Indian, I come from a culture that believes that enlightenment is a body–mind state and [so I think about] whether that’s actually the purpose of my life here on this planet. What influences my body and mind in underwriting my experience? What are these experiences around me that can actually lead me on that path maybe in this lifetime or more? This is actually part of why I look to architecture—architecture connects the space within with the space beyond, and that truly is what we try to do, and we’re always trying to connect the unconscious to the conscious as well. As we experience space, there is this threshold through which we take in this information, we process it, and through this we come to understand ourselves and not just our world.”

This subsection has advanced the importance of distinguishing rituals as scripts, more or less flexible patterns of behavior, from narratives that address existential questions. Together, these may constitute a religion that develops objects and buildings and institutions that construct a new symbolic and physical reality. This sets the stage for the considerations of §§7&8.

7. Narratives Transform the Experience of Sacred Architecture

Our emphasis is on buildings that support the bringing together of a community. Given this, we view *sacred architecture* as providing buildings that, in addition to providing a space around people that may satisfy certain aspects of their space within, allow them to experience something of the space beyond as understood by the community for which the building is designed. Our claim is that a full understanding of sacred spaces for a particular religious tradition requires an understanding of both the narratives of that religion and the human capacity for protosacred experiences—our ability for emotional response, our sense of wonder. This section focuses on Christian churches, but readers can readily assess examples of this same phenomenon in other sacred spaces, whether sacred to a religion or to national memory. Other religions have their own specific paths to religious experiences and the places that support them. Indeed, §5 considered the importance of cosmologies in Australia or North America that are not god-centered, and where spirits are not divine in the Abrahamic sense.

In the Abbey of St Peter in Assisi, we see an exceptional depiction of the crucifixion and its placement within a church (Figure 6). To one innocent visitor, this may appear to be a truly ghastly depiction of a man slowly dying in agony with nails driven through his hands and feet. Is he suspended there to add to his agony? But a devout Christian will see a crucial symbol of a deeply felt core of their being, representing Christ’s ultimate sacrifice to atone for the sins of humanity, a reminder of divine love expressed through suffering. Moreover, knowing that the crucifixion was followed by Christ’s resurrection, she will see a symbol of hope in the face of suffering. Other non-Christian visitors may know that Christ on the Cross is an expected aspect of Church design that will raise no emotional response beyond, perhaps, an aesthetic appreciation of the ways the Christ figure is sculpted here or

how it is displayed in relation to other architectural features of the abbey. This example exemplifies how the narrative may inform one's emotional response to an object or space without being a conscious element of what shaped a particular experience—in this case the inability of the Christian to see horrific torture rather than God's love.



Figure 6. At the Abbey of St Peter in Assisi. (Photo by Bob Condia, with his permission).

Another feature of many churches is the placement of the Stations of the Cross (Figure 7), offering a pictorial narrative of the crucifixion that may well have instructed earlier Catholic congregations that had not or could not read the Bible. But there are many other narratives that are part of the Christian canon, including stories of the virgin birth and of Mary's love for Jesus, as well as stories of the lives of the saints that illustrate and

extend the basic Biblical narrative. These are beautifully brought together in the Cathedral of Our Lady of the Angels (Catedral de Nuestra Señora de los Ángeles).

There, the Stations of the cross are almost hidden, placed along the back wall and around the corner in a side corridor. The tapestry of Mary as a benevolent figure dominates over the crucifixion at the front of the cathedral while the tapestry on the side walls has the saints gazing in adoration at the figure of the virgin mother. Here it is the sense of maternal love and family that provides the dominant atmosphere for the congregation (Figure 8).



Figure 7. The Stations of the Cross displayed on the walls of the Mission Basilica San Diego de Alcalá. (Author's photo).

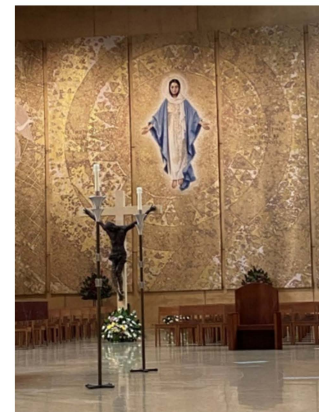


Figure 8. The adoration of Mary at the Cathedral of Our Lady of the Angels in Los Angeles. (Author's photos).

8. From the Protosacred to Religions via the Evolution of Narrative

We have already emphasized that scripts are not narratives. Moreover, nonhuman animals have scripts and thus early humans that did not have language also had scripts. §4 sketched how our ancestors come to develop languages, and §5 introduced two examples

of how places that were “naturally” protosacred evoked narratives that coalesced into religions or cosmologies. The claim is that words when combined with questions and narratives became important in two ways: as the device for groups in social settings to coalesce their beliefs as community, including sacred experience rooted in both the sense of the sacred and reflection about certain deep existential questions. As in the loop between social and individual schemas, language serves as a tool for thought and for social interaction, but thought is not restricted to what can be expressed in language (consider explaining why *this* sunset is exceptionally beautiful).

Turning from awe as one component of the protosacred, consider (Figure 9) the sense of serenity we experience as we walk through the Arashiyama Bamboo Grove in Kyoto (if we can avoid the crowds) with a light wind rhythmically swaying the bamboo. This experience is protosacred, with no necessary connection to any religious beliefs.

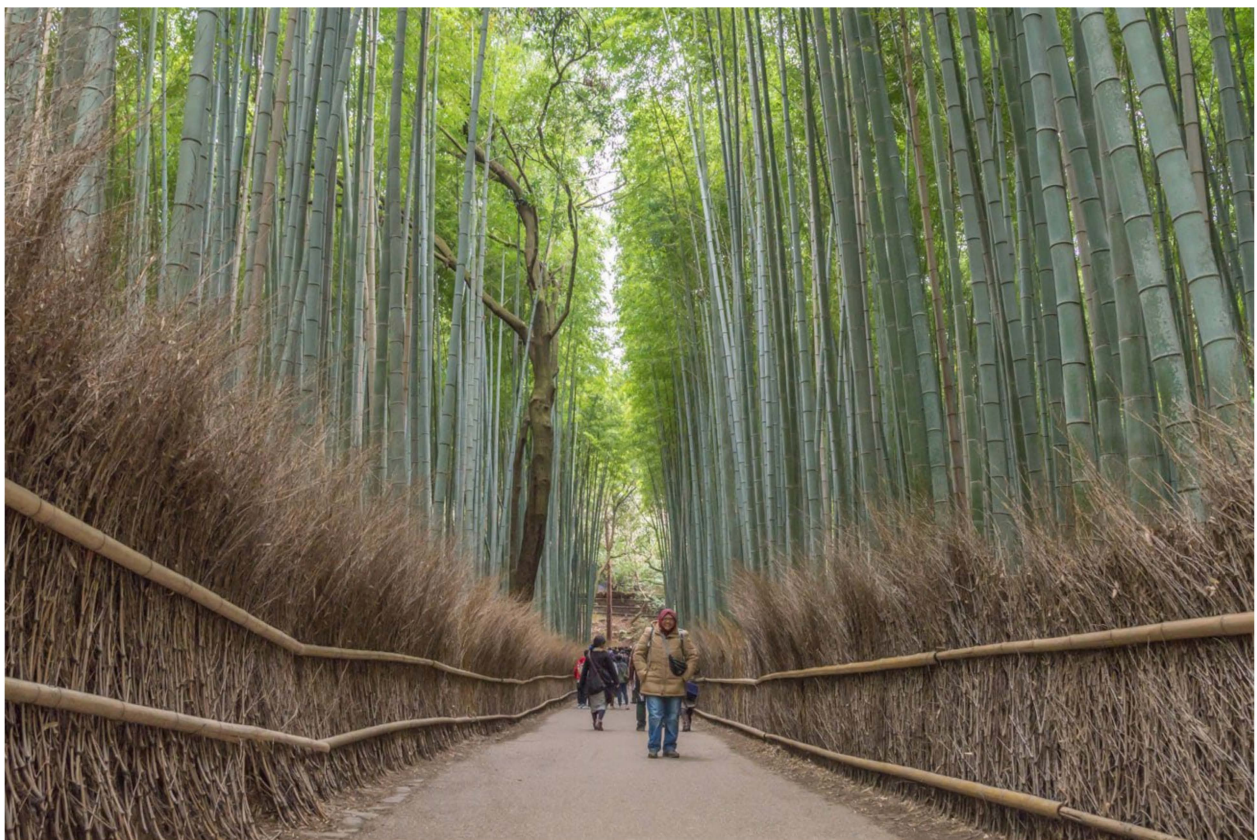


Figure 9. The Arashiyama Bamboo Grove in Kyoto. (<https://www.sprayedout.com/bamboo-grove-in-arashiyama-kyoto/>, licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. Accessed on 8 November 2025).

Now consider the Anthony Chapel designed by Fay Jones (Figure 10). Whatever the appeal to the symbols and purposes that accompanied its consecration to Christianity, the church captures the spirit of the grove, where I use the word “spirit” not in the sense of the Holy Spirit of the Christian Trinity but rather the notion of atmosphere—the effect of built spaces on moods and emotions (see §6.2). Here we have the back and forth between something that is, as it were, naturally inspiring, and architecture that captures and maybe distills the essence of that inspiration within a religious framework.

Some animals express a form of curiosity when confronted with a novel object, inspecting it through multiple senses to determine whether it is, for example, a possible source of food. But this seems to me very different from the human search for meaning, and I argue that this only emerges when *Homo quaerens* can ask why certain things exist in the world

and set off on the path to speculation about deeper meanings and patterns in the world, both tangible and imagined. The meanings of places and paths extend their meaning from assessing “practical” (survival-related) affordances for satisfying the needs of survival to aesthetic emotions. These may then extend to culturally extendable account of goals worth pursuing in terms of a religion adopted by a certain community. Indeed, Stephen Kaplan (1987) brings together aesthetics, affect, and cognition in an evolutionary account that supports the hypothesis that a rapid, unconscious type of cognition may precede certain affective judgments. Kaplan and Kaplan (1989) extended this framework in linking the *experience of nature* to the nature of restorative environments—but the analysis could be further extended to the analysis of sacred spaces as in our discussion of the bamboo grove.



Figure 10. The Anthony Chapel, Arkansas, designed by Arkansas architect Euine Fay Jones. (Martha T, Flickr, <https://www.flickr.com/photos/roswellsgirl/7762734222/>, CC BY-NC-ND 2.0. Accessed on 8 November 2025).

The Ganges is a sacred space for Hindus that accommodates many sacred places. As in sites of pilgrimage, a place or space may first become sacred for historical reasons that become the stuff of myth, and then buildings may or may not come after and further define sacred places—in this example, places that are sacred because the river is made sacred by Hindu scriptures.

In Islam, each mosque contains a niche, the mihrab, which is holy because it indicates the direction to be used for prayers. It *points to* the sacred site of Mecca rather than being itself a site that was sacred beforehand. Moreover, in contrast to the use of sculptures and paintings and stained-glass images in Christian churches, here such images are forbidden and instead holiness is conveyed by the combination of elaborately scripted extracts from the Koran together with beautiful tile work.

In many traditions, a place may be holy because the community is meeting there, not because of anything intrinsic or extrinsic about the place itself. For the Seder feast, the Jewish celebration of the Passover, the escape from Egypt, the only space that is sacred is the space around the dining room table, and it is only sacred for the time that the family is

joined in the Seder meal and the accompanying reading and singing structured around the sharing of a particular narrative that helps introduce children to the religion of their family.

As a related example of ritual making a place sacred, consider a storefront church, a space that—apart from a lectern, the chairs facing it, and perhaps a picture on one wall bearing a Christian symbol—is just a nondescript box. But it becomes sacred when it is inhabited by a congregation and its priest who gather to perform the rituals and explore the narratives of their faith.

On the other hand, Calatrava's Oculus at the World Trade Center in New York City evokes some of the shared perceptual experiences of awe of Notre Dame, but it is part of a transportation hub. Unsurprisingly, then, awe may support experience of the sacred but can be dissociated from it. It is the association of Notre Dame with sacred symbols and the narratives that support them, its consecration as a place where Christian rituals are performed, that make it sacred. Yet the echoes of the protosacred provide an atmosphere that enhances the performance of those rituals (and yet also holds appeal to the non-believer, just as the Kyoto shrine conveys serenity even to non-Buddhists). Conversely, a place may be sacred yet not be awesome or particularly serene because it resonates with the teachings of a particular religion. For example, a household Shinto shrine is central to the spirituality of the Japanese family because it is dense with objects that obtain symbolic significance through the tenets of their religion. The point here is to emphasize that dimensions of protosacred experience can exist apart from the sacred and then suggest how they may be developed within architecture, whether in or out of sacred architecture. It then suggests that relation to narratives and scripts of a religion transforms how we may, if both faith and our current state move us, experience the place as being sacred—or not.

9. Notes for an Experimental Aesthetics of Sacred Architecture

Homo quaerens asks questions, but the questions asked depend not only on the language used but also on a whole background of beliefs. This article has turned from the question "Who (God, gods, or other sacred beings) created mankind?" to "how did mankind evolve both biologically and culturally?"; and from "God exists. How did He give mankind a sense of beauty?" to "How can we understand the emergence of diverse religions and the related aesthetics in evolutionary terms?" Clearly, such different questions demand the different "facts" to support the answers. The purpose of this section is to sketch a number of ways to gather and assess such facts.

One way to test answers to "How can we understand the emergence of diverse religions and the related aesthetics of sacred architecture in evolutionary terms?" involves empirical studies in archeology required to trace what aspects of human material culture were established at different places at different times in our prehistory.¹⁴ Detailed review is outside the scope of this paper, but for examples see [Watkins \(2004\)](#) on "Architecture and 'theatres of memory' in the Neolithic of southwest Asia", and [Hodder et al. \(2001\)](#) critiquing Jacques [Cauvin's \(2000\)](#) "The birth of the gods and the origins of agriculture". We note that (a) the breadth of the present paper spawns a huge variety of subhypotheses to be tested and (b) the archeological data are sparse and the room for interpretation is large, but that we can make progress if we ask the right questions, marshal facts, and then test our hypotheses accordingly.

Another empirical, rather than experimental, approach involves anthropology and comparative religion to analyze diverse belief systems along with associated narratives and rituals and their relation to everyday behavior and social interaction. There are many such studies, but the challenge posed here is to mine these studies to develop and probe key hypotheses. Here is one example:

Data point: Modern humans can on occasion have mystic experiences or experiences of ultimacy aroused by natural phenomena rather than by specific disciplines or religious practices—or even the use of language, which may only follow afterwards to try and capture a shadow of the experience.

Hypothesis: Early humans had such experience before they had languages, buildings, or religion. We call them *protosacred* and hypothesize that they provided one of the drives for the cultural evolution of religions.

Challenge: Archeological study yields no direct information about the cognition or emotion of these early humans but does yield traces of the results of behavior, such as making fire, or making and using tools. Cognitive archeology seeks to infer from such data what behaviors were required to produce these material traces, and what cognitive and even social processes were required to support such behaviors. Going further, experimental cognitive archeologists assess what neural and mental resources are used by modern humans to perform behavior's posited for different stages of human cultural evolution. For example, the archeological record distinguishes the earlier Oldowan tool making tradition from the later Acheulean tool making tradition. [Morgan et al. \(2015\)](#) observed modern humans attempting to master stone knapping under varying conditions from observation to teaching with gesture to teaching with language. They concluded that “low-fidelity social transmission, such as imitation/emulation, may have contributed to the ~700,000 year stasis of the Oldowan technocomplex, [but] teaching or proto-language may have been pre-requisites for the appearance of Acheulean technology.” Others have attempted to understand what parts of the brain or connections between them are differentially exercised for different levels of culturally evolved skill ([Hecht et al. 2015](#); [Putt et al. 2019](#)).

Another body of indirect evidence for human capabilities before language comes from *ethology*, the study of animal behavior. Since the great apes are the closest to us on the evolutionary scale, diverging from our last common ancestors 5 to 7 million years ago, there has been particular interest in their capability for vocal and gestural communication and for manual skill and imitation. However, ape “architecture” goes no further than bending branches in a tree into temporary nests to sleep in ([Fruth et al. 2018](#)). Contrast this with the impressive but species-specific construction abilities of birds ([Tello-Ramos et al. 2024](#)). Other studies seek insights from the brains of songbirds for the evolution of human language and music ([Fitch and Jarvis 2013](#))—the implications of ethology for understanding human evolution go well beyond study of apes and monkeys. The classic example of this is Charles Darwin's (1872) study of *The expression of the emotions in man and animals*.

The examples from Aboriginal Australians and the Northern Plains Tribes suggest two (very general) questions for experiment: “What makes a place awesome outside of a religious framework?” and “How can questioning the power of such a place on human emotions lead to the development of narratives that then enrich and inform understanding of that place and the accompanying rituals for a group of people?” We focus on the former.

Awe is just one component of atmospheres that may be components of the aesthetic reaction to a particular sacred space. Relevant experiments have begun to study what spaces elicits sense of awe ([Negami and Ellard 2021](#)). We see awe as an abiding element in much religious experience, as is serenity. However, these can take place in non-sacred venues (otherwise there would be no sense of the *protosacred*); and we have insisted that supporting a sense of community is a strong contributor to the types of religious architecture that we have been considering (otherwise narratives would not be shared and become the core of the community's beliefs and behavior). All this requires new empirical and experimental studies that probe of the ways in which people respond to the architectural religious spaces of different religions differently, including whether they are alone or in a group. We look to the historical study of comparative religion that seeks to assess the

diversity of the cultural coevolution of narratives, rituals, and buildings—and look for common threads and for patterns of social change. Many people may accept overall themes of the narratives of their religion yet still have their individual doubts. If enough people share the same doubts, then they may break away and form their own variation on the prior narratives and develop new sacred spaces that may indeed reflect what has changed. For example, Mark Hargreaves (2023) analyzed how the layout of churches in San Diego designed by Irving Gill reflected differing views on the relation of priest and congregation.

Each social system, ideology or even science accepts at any time its own paradigm for both how questions may be formulated and the methods that can constitute acceptable answers. The most significant science is guided by mysteries and the statement of bold hypotheses that seek to explain or explore them, but the scientific method suggests ways to put these hypotheses to the test, always understanding that even the most powerful hypotheses may (will) have to be revised—the pragmatic criterion. The beliefs of a religion (and not only religion) may be tested more by “it works for me” or “those around me believe it, and I will too.” Sociology and psychology have much to say about this. We turn to an example from psychology.

Keltner and Haidt (2003) relate experiences of awe both to vastness—encountering something physically large or conceptually profound—and to challenges to existing mental frameworks. They then offer a taxonomy of six varieties of awe. But what is worth stressing here is that they already conflate vastness in physical size and in conceptual depth, thus blurring our attempt to understand the emotions that may have been in place before the evolution of language and the type of conceptual systems that language can support. It is also interesting that their challenge-based criterion for awe runs counter to our concern for sacred architecture that can support a community in finding strength from their shared beliefs and rituals rather than supporting challenges to the community’s beliefs.

A key problem for our experimental study is the divergence between the architect’s marshaling of a multitude of factors in a harmonious design and the scientist’s focus on designing an experiment to test a few key variables. Below, we note developments in machine learning supporting studies that seek to isolate a multitude of key variables across a large population. Keltner et al. (2023) used data-driven methods for constructing semantic spaces, employing machine-learning models to process a large body of data on emotion-related experience, expression, and physiology, transforming the data points into a high dimensional space defined by blends of more than 20 distinct kinds of emotions. They emphasized that this space was not reducible to lower-dimensional structures and conceptual processes.

In the same spirit, Coburn et al. (2020) had participants rate 200 images of architectural interiors on 16 aesthetic response measures. They identified three principal components that explained 90% of the variance in ratings: *coherence* (ease with which one organizes and comprehends a scene), *fascination* (a scene’s informational richness and generated interest), and *hominess* (extent to which a scene reflects a personal space). A further, smaller study reanalyzed data from an fMRI study in which participants made beauty judgments and approach-avoidance decisions when viewing the same images to assess brain areas whose activity best correlated with the three dimensions. Chatterjee et al. (2021) placed this study within a broader review of experimental neuroaesthetics. Gregorians et al. (2022) addressed the shortcomings of still images by developing a dataset of valenced videos of first-person-view travel through built environments. They clarified the relationship between emotional valence and fascination and coherence and found that arousal is significantly correlated only with fascination. Both are related to spatial complexity and unusualness, factors that may run counter to hominess. These results demonstrate the utility of a video dataset of affect-laden spaces for probing architectural experience. Nonetheless, a key further

step would be to move beyond the use of videos to monitor brain activity and behavioral responses of people as they go through such a space.

To further challenge the design of studies of humans, we note that the impact of architectural space relies on more than spatial form. For many religions music and the sound of the human voice are vital to the atmospheric flow. Further study can bring the sense of touch and the smell of incense into play, with the latter merging the two senses are atmosphere.

Almost a century ago, [Corbusier \(1927, p.181\)](#) wrote:

In Broussa in Asia Minor, at the Green Mosque, you enter by a little doorway of normal human height; a quite small vestibule produces in you the necessary change of scale so that you may appreciate, as against the dimensions of the street and the spot you come from, the dimensions with which [the mosque's interior] is intended to impress you. Then you can feel the noble size of the Mosque and your eyes can take its measure.

This observation about a mosque raises general questions about how properties of one space may affect the experience of another. The experimental study of such effects as well as the impact of varied affordances has already begun, with people being monitored by EEG or other biomarkers in actual or virtual environments—though in laboratory environments in which only one key variable could be adjusted to better quantify the resultant effects. [Canepa et al. \(2025\)](#) studied the impact of the lighting of a corridor—dark, blue, amber and bright—on the perceived atmosphere of a contemplative space after walking through the corridor. Participants walked through virtual-reality environments wearing sensors collecting blood volume pulse and skin conductance data. The study found stronger skin conductance responses while moving through darker corridors, which correlated with altered perceptions of the ending room. Moreover, older participants were more likely to report altered perceptions. [Djebbara et al. \(2021\)](#) related a predictive coding approach to architectural affordances that support or suppress specific kinds of actions for an individual using source-level time–frequency analysis of brain data recorded from a Mobile Brain/Body Interface.

We envisage future studies in which people are tested as they move through a sacred space, or as they look at particular objects within that space. The general prediction is that judgments and their neural correlates will differ greatly between devotees of the particular religion associated with that sacred space, those who have a general knowledge about that religion but no specific experience of its detailed narratives and rituals, and those who know almost nothing about the religion. On the other hand, we may expect that certain dimensions of emotion will be shared between all participants, and these would begin to give us clues about what might constitute the emotional range of early humans, including dimensions that may contribute to the protosacred.

For the aesthetics of sacred architecture, we might try to design experiments to probe questions like “How does the religious faith of a person affect the atmosphere they experience in sacred spaces of their own and other faiths?” but such a question is too general for focused study. Whereas [Coburn et al. \(2020\)](#) analyzed ratings of 200 images of diverse architectural interiors to find that coherence, fascination and hominess explained 90% of the variance in ratings we might predict that different principal components would emerge when the stimuli are based on walking through a sacred space, and also that our three groups of participants might well exhibit different principal components. This would be the basis for coming up with a larger list of components that let us distinguish what is shared between the groups from what is distinctive to each group. Results for “How does a Jew experience Notre Dame de Paris” may be very different from those for “How does a Catholic experience a specific storefront church in Los Angeles?” and the results from

these studies will force the development of more specific classifications of both the beliefs of the observer and the features of the space to which they attend. Each such experiment demands rigorous descriptions of the results being discussed and the explanation being offered, including suitable controls, to meet the pragmatic criterion of having a theory that explains the facts.

More detailed experiments on people moving through sacred spaces could focus on atmospheric flow. Experiments could assess the extent to which religious practitioners would perceive the affordances for rituals or other forms of observance that particular objects to which they attended would provide, whereas most of these would be missed by the other groups. A possible technique would be to use a head mounted camera to record the visual stimuli to which the subject attended and later quiz the subject for their account of what it was about the object that drew their attention. Note the challenge of extending the repertoire of an experiment to involve a range of different religions. Their rituals, narratives, and conventions for each religion studied would have to be analyzed as the basis for the design of experiments and methods to analyze the results. And all this before we turn from visual experience during locomotion to multi-sensory experiences during the performance by believers of the rituals of their religion.

10. Conclusions

This paper is a contribution to a Special Issue on *experimental theological aesthetics*. We have shifted the focus in five ways:

1. There is a diversity of religions and cosmologies, only some of which include belief in God or gods. This changes the emphasis from theology to a more general concern with varieties of the sacred.
2. Modern humans evolved from early humans who had neither languages nor architecture. These emerged through a process of cultural evolution that yielded the great diversity we know today.
3. This shifts attention from questions like “How did God give us the sense of beauty” to “What emotions might early humans have had (we called them protosacred) that provided the substrate for the cultural evolution that endows modern humans to experience the sacred in different ways?”
4. This raises the question of what other aspects of cultural evolution were crucial to the emergence of religions and other cosmologies. Our hypothesis was that a crucial aspect was the ability to use language to ask existential questions and answer them with narratives that could engage the shared beliefs of the members of a community and affect their behaviors accordingly.
5. To narrow this broad quest, we focused the article on the particular challenges of understanding how the affordances, atmospheric flow, and scripts of buildings can come together in approaching the aesthetics of sacred architecture.

We thus transformed the stated theme of *experimental theological aesthetics* into *experimental aesthetics of sacred architecture* as considered in an evolutionary perspective that addresses the diversity of current-day religions. We explored the challenge of relating the physical *space around* the people within or around a building, the *space within* that affects how a person experiences this physical space, and the *space beyond* everyday reality.

We found that the prefix “experimental” had to be broadened to include “empirical” as well. Our quest raises an immense range of questions for further investigation. Although we cited a few well focused studies that manipulate a limited number of key variables to chart people’s emotional or aesthetic reaction, our primary aim has been to set the stage for a wide range of interlocking studies, both empirical and experimental, to refine our stated

theme while noting its broader implications for a deeper understanding of how humans construct their physical and symbolic worlds.

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Notes

- ¹ In what follows, more examples will be drawn from Christian churches than from sacred spaces of any other type. This in no way suggests a claim for the truth of Christianity as compared to other religions or cosmologies. Examples are included from Australian Aboriginal and Native American cosmologies, as well as Judaism, Islam, and Buddhism.
- ² For an evolutionary view of narrative, though not related to our concern with the sacred, see Ferretti (2025) and the commentaries thereon, to which Ferretti (Forthcoming) responds.
- ³ The quotes with N&SA citations here and below are extracted from the transcript of discussions of the talk I gave at the conference on “Neurophenomenology & Sacred Architecture: Toward an Experimental Theological Aesthetics”. See the Acknowledgements for further details on the conference.
- ⁴ Many religious believers deny the notion that humans are the product of biological evolution. However, there are many attempts to reconcile evolution and faith in God. For example, Ellis (1999) argued that God set the evolutionary process in motion in such a way that it would eventually yield creatures capable of worshipping Him. See more generally the collection of essays on “Evolutionary and Molecular Biology: Scientific Perspectives on Divine Action” (Russell et al. 1998).
- ⁵ Schemas, all too briefly: Our actions, perceptions, memories and more are only made possible because our bodies are integrated with brains whose circuitry developed to support them. Schemas are then units in a psychological analysis of the patterns of interaction of “schemas in the head” including perceptual and motor schemas and coordinating schemas that can mediate abstract concepts and language. Properties of some of the schemas suggested by psychological data can be tested through neurophysiology or brain imaging. These schemas are shaped not only by the practical demands of interaction with the physical environment but also through “social schemas” such as the circumambient language, ideology, religion and/or moral system shape the development of the child as a member of the social groups of which it is part. Thus, social schemas may be partly in terms of narratives but also (and in some cases predominantly) in terms of constraints on, and encouragement of, patterns of behavior. For more in an architectural context, see (Arbib 2021), especially chap. 2 and 3.
- ⁶ CARTA’s October 2024 symposium, “How Humans Came to Construct Their Worlds” explored this interplay. Abstracts and videos of the talks, with speaker bios, are available at <https://carta.anthropogeny.org/events/how-humans-came-construct-their-worlds>, accessed on 8 November 2025.
- ⁷ Milton Shinberg (personal communication) has suggested that I add a tag for “the human who solves problems”. However, problem-solving is a challenge for all animals, as suggested by Pribram’s (1960) 4Fs (Feeding, Fighting, Fleeing, Reproduction) to which I add the fifth F of Family inspired by Koelsch et al. (2015, §2.3.3) who note that “a brain system for attachment-related affect that does not satiate is evolutionarily adaptive, because feeling attached to a child, loving a child and feeling the joy of being together with the child are emotions that serve the continuous protection, and nurturing of the offspring”. This fifth F resonates with the Marian atmosphere of the Cathedral of Our Lady of the Angels (§7).
- ⁸ There is now a website at www.homoquaerens.info/en/.
- ⁹ What follows is based on the Wikipedia article, “Uluru.”
- ¹⁰ For what follows, see <https://www.nps.gov/deto/learn/historyculture/first-stories.htm>, accessed on 8 November 2025.
- ¹¹ Note that affordances may be large-scale features of a space (consider, e.g., a swimming pool or what makes a space “awesome”) as well as more localized features (like a door handle). A staircase falls somewhere in between.

- 12 The behavior of nonhuman animals is often described by ethograms—these offer one representation of scripts for different types of behavior.
- 13 Harrison Fraker is the author of *Minding the City: Field Notes on Neuroscience and the Poetics of Sustainable Public Space*, (Fraker et al. 2021), while Suchi Reddy wrote *Form Follows Feeling* (Reddy 2022).
- 14 A two-part multi-disciplinary study of human origins and language origins surveys a vast body of archeological data to support “a polycentric scenario for biocultural niche expansion” (d’Errico et al. 2025) and then explores the transition “from symbols via pantomime to language and narrative”.

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