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Length

ACADEMIC DIVISION:

Applying Neuroscience to Architecture

Architectural practice and neuroscience research use our brains and minds in much the same way. However, the link between neuroscience knowledge and architectural design—with rare exceptions—has yet to be made. The concept of linking these two fields is a challenge worth considering.

The design of places and spaces that provide a context for human experiences—architecture—has a long and often distinguished history. The conscious, frontal lobe processes of shaping this context are only partially understood by architects and have yet to surface on the roiling waters of neuroscience studies. Even less well understood is the role of architecture in shaping human experiences. Social and behavioral scientists have explored this terrain over the past 50 years, but the results of their work are shallow knowledge. They enable us to observe the fact that children in classrooms lit with natural daylight achieve higher test scores, but not why this happens.

More than 2000 years ago, a Roman architect, Marcus Vitruvius Pollio, was the author of De architectura, known today as The Ten Books on Architecture, a treatise written in Latin and Greek on architecture, dedicated to the emperor Augustus. This work is the only surviving major book on architecture from classical antiquity. Vitruvius is famous for asserting in this book that a structure must exhibit the three qualities of firmitas, utilitas, venustas—that is, it must be strong or durable, useful, and beautiful. It seems strange that 2000 years later this three-part requirement is still so little understood.

Most neuroscientists think of architecture as a profession concerned with aesthetic beauty—designs that please the observer through visual perception of the harmony, symmetry, and good proportions crafted by the designer. But, architecture is more than aesthetics. Well-designed buildings need to respond to the functional needs of the occupants, and users need to be provided with adequate lighting, well-modulated heating and cooling systems, structural soundness, and public safety provisions (i.e., entrances and exists, stairways, etc.).

All of these attributes are now evaluated in physical science terms. If we expand the horizon for neuroscience, it would eventually result in a new knowledge base for architecture. We would then know how the design of classrooms can support the cognitive activities of students, how the design of hospital rooms can enhance the recovery of patients, and how the design of offices and laboratories can facilitate interdisciplinary activities of neuroscientists, and so forth.

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Length

ACADEMIC DIVISION:

A Case History of How Design Impacts the Brain:Thorn crown Chapel

The chapel's history begins in 1971, when Jim Reed, a native of Pine Bluff, Arkansas, purchased land in Eureka Springs, Arkansas, to build his retirement home. Other people admired his location and would often stop at his property to gain a better view of the beautiful Ozark hills. One day while walking up the hill to his house, the idea came to him that he and his wife should build a glass chapel in the woods to give wayfarers aplace to rest, reflect, and refresh themselves. He asked his architect friend Fay Jones to design the chapel. Fay says, I saw an opportunity here to create Architecture—with a capital "A." The distinction I am making is that all building isn't Architecture, just as all writing isn't literature or poetry, even though the spelling, grammar, and syntax might be correct. There is something in Architecture that touches people in a special way,and I hoped to do that with this chapel.

If you walk into this small chapel nestled in the Ozark mountains, you are likely struck with awe. It's only 24 feet wide, 60 feet long, and 45 feet tall. It would easily fit within one of the transepts of the National Cathedral in Washington, and yet it is larger than life. The American Institute of Architects chose it as the fourth most impressive design of the 20th century. Since July 10, 1980, when Thorn crown Chapel opened, over five million people have visited this little chapel on the hillside. Thorncrown has won numerous architectural awards.

The chapel is made with all organic materials to fit its natural setting. The building materials are primarily pressure-treated pine 2×4s, 2×6s, and 2×12s. The larger elements of the building, such as the trusses, were assembled on the floor and raised into place. Light, shadows, and reflections play a major role in Thorn crown's ambience. Because of the chapel's elaborate trusses and the surrounding trees, constantly changing patterns of

light and shadows appear during the day. At night, reflections of the crosses in the lights appear to surround the entire building.

Our available knowledge of the brain and mind can provide some plausible hypotheses about the cognitive and emotional experiences associated with the Thorn crown Chapel: Our sense of awe is influenced, in part, by having space above our head that is not visible until we move our eyes (and probably our head) upward. Semir Zeki once suggested that raising our eyes upward to see a spire on a cathedral was transformative—it stirs some primal notions of something ethereal.

The sensitivity of our suprachiasmatic nuclei (SCN) to light—driving the circadian rhythms—influences our alertness. The play of light and shadow may trigger the SCN to "play with alertness" in a way that we find stimulating. The hush of nature deep in the woods provides a "quiet" experience for our auditory cortex that could be soothing, which suggests that the sense of "quiet" experienced by urban dwellers may be more soothing (because of the ambient noise where they live) than the experience of rural dwellers.

Vocabulary:

Applying Neuroscience to Architecture

Soundness: solvencia

Shallow: poco profunda

Stairways: escaleras

Enhance: mejorar

Wayfarers: caminantes

Soothing: calmante

Concerned: dedicado a

Nestled: anidado