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**Analytical and Experimental Studies on Geometric Design and Construction of Late-Gothic Vaults**

The vaulted ceilings play a prominent role in late-Gothic architecture. Both in the design of churches and in prominent profane buildings, we can observe a tendency towards increasing complexity and virtuosity in their design and decoration. Many of these structures present a very complex geometry, which is due to the spatial systems of curves described by the groins and ribs that constitute the boundary conditions for the surface of the vault, and the characteristics of the masonry shell that constitutes its main structural feature. The current research presented in this paper attempts to improve our understanding about how these challenging structures were designed and realized, regarding the design principles, geometric concept, structural design, as well as the geometric control during execution and the building process.

Case studies regard on one hand the so-called Cell Vaults, characterized by their folded shell surface, which occur in central and eastern Europe especially in the 15th century. On the other hand, vaults with ribs that describe three-dimensional curves. Our current knowledge on the design principles is mainly based on an interpretation of sources related to late-mediaeval tradition, which turns out to be problematic. Hence, we propose a new approach starting from surveys of vaults as they were actually built, and their geometric analyses. For the masonry shells, the construction principles can be characterized and clarified in detail by combining geometric analyses of the masonry textures, and experimental reconstructions which we carried out in full scale using realistic materials.