

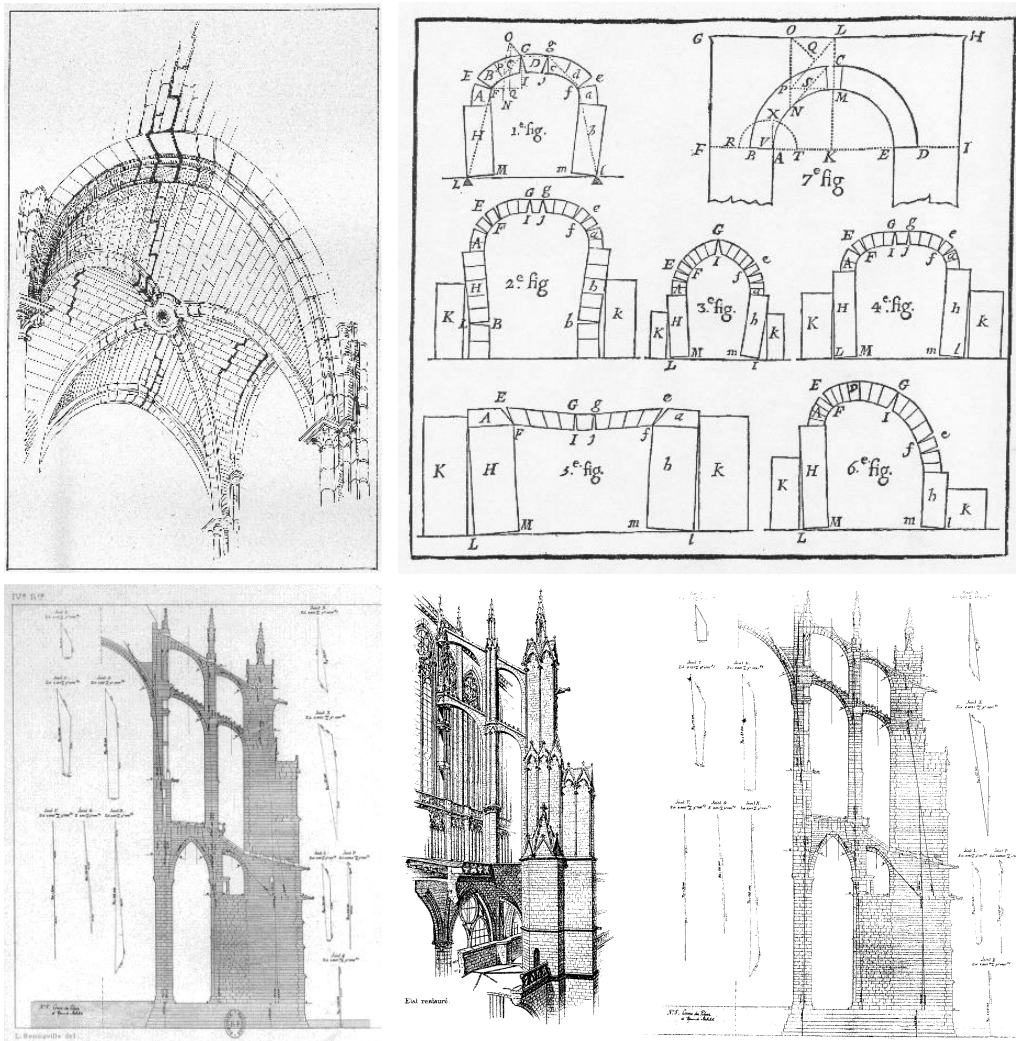
# MECHANICS OF MASONRY STRUCTURES: HEYMAN'S APPROACH OF EQUILIBRIUM

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## Abstract

Masonry construction was dominant in building and civil engineering until the 19th century. Throughout the 19th century, iron, steel and reinforced concrete gradually displaced the masonry. Consequently, the calculation theories and tools taught today in schools of architecture and engineering refer to the new materials, to structures composed of bars. This theory is inapplicable to a material such as the masonry made of an essentially discontinuous, heterogeneous and anisotropic material which, moreover, can only withstand compression (one-sided material). Professor Heyman has developed modern masonry theory by translating the principles of limit analysis to this structural type. If masonry fulfills certain conditions, the Fundamental Theorems of Limit Analysis are verified. Crucially, the Safe Theorem leads to the “equilibrium approach”: that is, we can do safe analysis using only the equations of equilibrium and the material masonry. No assertions need to be made about the boundary conditions, essentially ephemeral and unknowable. The lecture will review the fundamental concepts of Heyman’s theory and its application to the analysis of masonry arches and vaults.



## **About the Author**

Architect 1981. Some work as a free architect. 1983-85. Collaboration with a Software Company in documentation. 1985 begin of Doctor Studies in the Polytechnic University of Madrid. 1989 Assistant in the School of Architecture in Madrid. PhD in 1990. Since 1992 Professor of Structural design in the School of Architecture Polytechnic University of Madrid. 1997-2003 Secretary of the Spanish Society of Construction History (SEdHC), founded in 1997. Since 2003, President of the SEdHC. Teaching on Structural Design, Construction History and Historic Structures. 2010-13, Head of the Master on Building Structures of the UPM. In the last twenty-seven years work as structural consulter of Historical Constructions (35 expertises on buildings and bridges, among them, San Juan de los Reyes, Cathedrals of Tudela, Palma de Mallorca, and Santiago de Compostela, bridge of Navea, etc.). Most of the publications and technical reports can be downloaded freely from the Digital Library of the Polytechnic University of Madrid ([www.ad.upm.es](http://www.ad.upm.es)).