PHYSICAL MATHEMATICS SEMINAR

UNSOLVED PROBLEMS IN ANCIENT ARCHITECTURE

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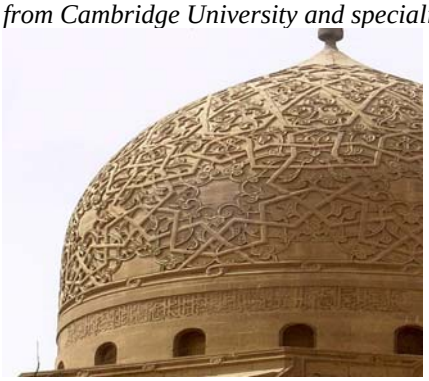
ABSTRACT:

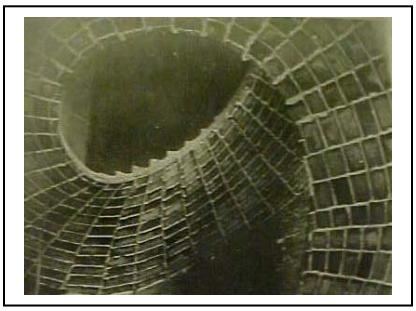
In 1675, English scientist Robert Hooke discovered "the true manner of building arches," which he summarized: "As hangs the flexible chain, so stands the rigid arch." Though Hooke failed to derive the equation for a catenary, his simple idea has been used to understand and design numerous important works, beginning with the masonry domes of St. Paul´s Cathedral in London. Today, the technical study of historic structures gives rise to a number of unsolved problems in mathematics and engineering, particularly for problems that are three-dimensional. Given that masonry is strong in compression and weak in tension, what are the possible networks of forces acting in a dome with a given thickness? A spiral staircase? A corbelled block arch? How far did historical builders push the limits? And what shapes are possible? This talk provides an overview of ongoing research on ancient structure and poses several problems in mathematics and mechanics.

John Ochsendorf is Assistant Professor of Building Technology at MIT. He holds a PhD in structural mechanics from Cambridge University and specializes in the technical study of ancient architecture.

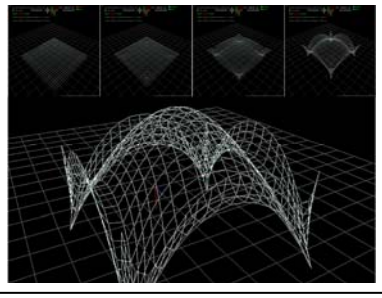


Mamluk dome in Cairo (ca. 1400 AD)

Stone fan vault in Westminster Abbey (ca. 1500 AD)



Spiral staircase by Rafael Guastavino (ca. 1900 AD)



Three-Dimensional equilibrium Structure by Axel Killian (2004)

TUESDAY, OCTOBER 4, 2005
2:30 PM, Building 3, Room 370

Refreshments at 3:30 PM in Building 2, Room 349