Thin and THICK

Coding Material Logics in Funicular Structures

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3/8" ferro-cement vault
Mfangano Island, Kenya, 2013

3.5" aac brick vault
MIT, Cambridge, MA, 2016

4.5" earth brick vault
Venice Biennale 2016

12" mycelium arch
St. Cloud, MN, 2017

Arch 8833 (CRN 31335) & Arch 4833 (CRN 30773) on Thursdays 6-8:45 DFL

This construction-innovation workshop explores the essential relationship between building materials, geometry, and structures [matter, shapes, and forces]. Students will be divided into two distinct research units: *one focusing on thinness and the other thickness in context of funicular masonry structures.*

In the first part of the course, students will be provided with a base of appropriate structural analysis techniques for pursuing structural design research and knowledge of construction methods. Short lectures will be accompanied by discussion and lab sessions, together with weekly readings. Lab exercises include theoretical design and analysis exercises using both manual and computational methods, construction methods, material testing, and site visits. We will cover the following topics:

- design of historic structures including the evolution of structural designs from ancient vaults of the Middle East and Gothic cathedrals in Europe, late-modern reinforced shells, and contemporary innovations in funicular masonry vaulting.
- graphical analysis
- aspects of computational structural design and analysis
- construction with masonry, including thin-tile vault construction
- properties of construction materials
- environmental assessment / impact of materials and construction techniques

The second part of the course transitions to a workshop/studio format, where teams of students will develop their research project that emphasize thinness or thickness. Each research team will be tasked with developing new material logics for building masonry vault structures. Those logics will be based on other criteria such as acoustic or thermal performance. A series of physical tests and constructions leading up to a large prototype structure to be presented at the end of the semester before an invited jury.

A material budget will be generously provided by the Georgia Tech School of Architecture.

Pre-reqs: Students must have Arch 4833/8833 Structures I; have proficiency in digital design tools such as Rhino, Grasshopper, and/or other scripting languages. Construction/Digital Fabrication experience preferred.