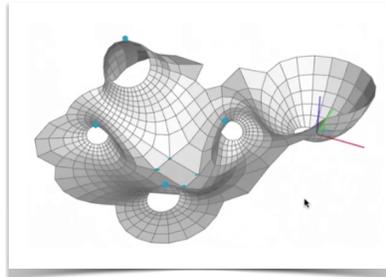


# Computer Science & Architecture



Computational Caustics



Shape Exploration



Wire meshes



Self-Supporting Structures



Planar Intersections

## Abstract

In this talk I will show how innovation in architecture can be fueled by new research results in computer science. I will first introduce a new geometric optimization framework for interactive shape exploration, form finding, and dynamic simulation. This framework is versatile and easy to implement, yet allows for efficient and robust computations. Most importantly, it can easily be extended and customized to a specific design task. Examples include optimization and editing of planar, circular, or conical meshes, form finding under different physical energies, such as minimal or self-supporting surfaces, and interactive exploration of constraint design spaces.

In the second part of the talk, I will discuss several more specialized research projects to illustrate how optimization can link early stages of concept design with the physicality of materials, the constraints of assembly processes, or performative and functional goals of a design. These projects highlight how advanced computation and novel algorithms can enable new forms of creative expression not possible before.

## Bio

Mark Pauly is a professor of computer science at the Ecole polytechnique fédérale de Lausanne (EPFL). He received his Ph.D. degree with highest distinction from ETH Zurich in 2003, was a postdoctoral researcher at Stanford University from 2003 – 2005, and assistant professor at ETH Zurich from 2005 – 2009. Mark's research focuses on

architectural geometry, shape analysis, geometric optimization, computer animation and design. He collaborates with architects, designers, and engineers to develop new computational methods for form finding, performative design, material-aware construction, and digital fabrication. His work on architectural caustics (<http://lgg.epfl.ch/caustics/>) received the best paper award at AAG. Mark is a PI of the new Swiss National Competence Center for Research on *Digital Fabrication – Advanced Building Processes in Architecture*. He is also a co-founder of *faceshift AG*, an EPFL spin-off company creating advanced face tracking and animation software.

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