



Dipartimento di Ingegneria e Scienze Applicate

Lecture EXTREME SHELLS

INTERVIENE Prof. Sigrid Adriaenssens Princeton University

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## ABSTRACT

Shells are slender rigid curved structural surfaces. Due to the advent of digital parametric design tools and increased computational power over the past decades, we have seen a surge in the research, design and construction of large-span iconic shell structures with sculptural and form found forms. This architectural trend has focused on shell surfaces as architectural form makers. Unfortunately much less research has pushed the boundaries of engineering their fascinating mechanical qualities to improve the quality of life of every-day people. In this presentation, the algorithms and methodologies developed by Form Finding Lab to generate thin shell geometries that efficiently deal with extreme loading and environmental stress will illustrate. Two different scales will be touched: at the civil scale, the focus it will be on how large-span shell structures can be shaped to resist earthquake loading and how corrugations in the shell surface can be tailored to avoid resonance. At the architectural scale, it will be shown how elastic shell geometries found in nature can be distilled, interpreted, upscaled and optimized for adaptive facade applications

## BIOSKETCH

Sigrid Adriaenssens is an associate professor in the Department of Civil and Environmental Engineering at Princeton University, where she leads the Form Finding Lab. She obtained her Ph.D. on the topic of bending active lightweight structures at the University of Bath (UK). Prior to her arrival at Princeton, she was a project engineer at Jane Wernick Engineers (London, UK) and at Ney and Partners (Brussels, Belgium). She has published over 50 journal papers, 2 books and numerous other publications on the topic of the mechanics and form finding of lightweight structures. She is the co-chair of Working Group Concrete Shell Roofs of the International Association for Shell and Spatial Structures, the Vice-Chair of the ASCE Committee on Esthetics in Design and the Editor of the Journal of Space Structures. She has won a number of awards, including the ASCE 2018 George Winter Award.

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