

# Into lightness: furniture as proxies for radical experimental structural design

Carlos BANON\*, Hui Ping TOH\*, Felix RASPALL\*

\*Singapore University of Technology and Design  
8 Somapah Road. 487372 Singapore  
[carlos\\_banon@sutd.edu.sg](mailto:carlos_banon@sutd.edu.sg)

## Abstract

The use of digital manufacturing has opened opportunities for innovation in structural design. The high cost of architecture scale makes experimentation unfeasible. Furniture design opens opportunities for exploration, experimentation and prototyping. New fabrication process like Additive Manufacturing (AM), Computer Numerical Control (CNC) or thermo-forming, in combination with parametric digital design tools, can be applied using furniture as test-case that provide substantial resolution for structural design consideration, before upscaling it to building or structural designs.

The paper presents background research pertaining to application of structural design using furniture as proxy -likewise Eames, Gehry, Prouvé, Greg Lynn, among others- to experiment and to understand experimental structural hypothesis. Empirical studies of five state-of-the-art designs by the authors explore the opportunities and challenges in the area of structural performance, material selection and transition, mechanical properties, manufacturing process and assembly procedure. All projects investigate the load distribution through lean structure members, the proportion of supporting points on the ground with respect to material mass, the slenderness ratio of the structural member and the overall span and applied force capacity in functional load cases. This process demonstrates the effectiveness of experimental furniture design to bridge the gap between intuitive structural knowledge and digital simulations, and to provide hint on the implication of structural strategies in the field of architectural design and to solve complex challenges at the level of conceptualization, development of components and assembly workflow.



Fig 1: a) Timber modular grid system on rebars; b) Cardboard structural reciprocal table with CNC Zund cutter; c) Parametric tables using bamboo legs with bespoke PLA 3D printing; d) Space frame table using metal 3D printing; e) OH Platform for the Venice Biennale, using thermo-form table tops and nylon 3D printing joints.

## References

- [1] J. E. Gordon, Structures: Or Why Things Don't Fall Down, London: The Folio Society, 2003.
- [2] F. Otto and J. M. Songel, Conversation with Frei Otto, New York: Princeton Press, 2010.
- [3] E. Allen and W. Zalewski, Form and Forces, John Wiley & Sons, 2009.