

Multiscale Thermal Design for Buildings

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ABSTRACT

This presentation introduces the principles, processes, and strategies to develop multiscale material systems for buildings that interact with heat in novel ways. The overall theoretical framework consists of (1) utilizing the multiscale configuration of biological material systems as the principle for the design of building element; (2) using the shape and size of heat flow as the key parameter for the design and optimization of the building components; and (3) applying the principles of materials and material processes for selecting and configuring the material systems.

This framework is further examined by presenting related fields of research and case studies. Some of the key sub-topics include: (a) thermoregulation strategies utilized by biological and artificial systems (e.g. from tree trunks to jet engines); (b) state-of-the-art research relating to thermal design and optimization (e.g. dynamic insulation, activating the thermal mass, and optimizing thermal conduction paths); and (c) advanced material systems and processing techniques relating to thermal design (e.g. cellular materials, functionally graded materials, adaptive materials, and additive manufacturing).

BIOGRAPHY

Daekwon Park is an architect and researcher whose work focuses on the intersection of design, material technology, and environmental science. Before joining Syracuse University School of Architecture as an assistant professor, Park has engaged in a wide range of teaching and research opportunities at Harvard, MIT Media Lab, Rhode Island School of Design and École Polytechnique Fédérale de Lausanne (EPFL). During this time, he actively collaborated with Wyss Institute for Biologically Inspired Engineering (Harvard University), Material Processes and Systems Group (Harvard Graduate School of Design), Responsive Environment and Artifacts Lab (Harvard Graduate School of Design), High-Low Tech Group (MIT Media Lab), Changing Places Group (MIT Media Lab), and Media and Design Laboratory (EPFL). As a co-founding principal of the design office SISO (Systematic Input Soft Output), Daekwon also actively practices architecture in both Syracuse, NY, and Seoul, South Korea.