

Synthetic Making

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Introduction

Various approaches of virtual and physical modeling have led to a synthetic form of making that is plastic and scalable in nature. This shift from traditional forms of representing and generating architecture now offers a better possibility of full-scale construction and fabrication processes and links transparently to industry. Architects are beginning to dynamically inform the visioning processes of assemblies and design through a range of precise subassemblies. Further to this end, the synthetic techniques and materials are opening up avenues for designers to investigate a range of fibers and fabrics that radically transform light and color renditions, and texture. Investigations in the realm of traditional materials such as stone, wood, and concrete continue to evolve, as do their associated methods of making. As a result of synthetic technologies, architects today have the possibility to work along side industry engineers and professionals to design

castings, moldings, patterns, and tools that challenge not only the architectural work of art, but industrial and product design as well. This cultural shift from physical space to virtual space back to physical space and the combination of hand-, digital-, and robotic-making offers a unique juxtaposition of the built artifact to its manufacturing that challenges both spatial conventions and also the levels of precision and tolerance by which buildings are assembled. Traditional forms of documentation for example result typically in discrepancies between the drawn and the actualized which are now challenged by the level of precision and tolerance at the virtual level. It is within this context that leading-edge architects and designers operate today. Yet, how the profession and the academy respond to these opportunities remains an open line of inquiry and addressing these concerns opens up the rich potential enabled through synthetic making.

On Digital Making

The papers presented *On Digital Making* reflect these concerns and offer critical insight into the possibilities available through digital media today. The presentation sections fall into two intrinsically linked sub-categories – Pliant Spaces and Superficies-Integral and Applied. Pliant Spaces are capable of responding to a range of forces. These are not limited to physical constraints of actual construction but rather, they dynamically intersect with the unseen determinants of natural forces and calculable figures relating to flexibility of material and form as well as economics. The resulting constructions articulate the structural and spatial characteristics of material strength and durability. Often these full-scale projects are at odds with the precision of the digital software and the time constraints of a traditional studio schedule. Superficies - Applied or Integral relate more to communication through direct systems approaches as manifest in virtual contexts, such as gaming, studio design/practice, and actual contexts-structure, skin, and form. The underlying common theme rests in the convergence of an approach to design, fabrication, and assembly that goes beyond what architecture looks like. Instead, the notion of the superficial directly informs the artistic intent of the designer or fabricator. In this sense, the two could actual converge and become one in the same.

Pliant-Spaces

Mahesh Senagala's paper *Curvilinear - Tensile Fabrications* documents the work of his design studio. His stance reflects an untapped area in traditional design

research - tensile systems, or more specifically, tensile fabric structures (TFSs). Investigations into minimal surfaces however are not new to architectural discourse. Investigations by Frei Otto at the Institute for Lightweight Structures at the University of Stuttgart and Le Ricolais at the University of Pennsylvania sought to discover structures that have "infinite span and zero weight." Otto's complex lightweight tensile and membrane structures and Le Ricolais's soap bubble experiments made apparent the minimal surfaces within specified geometry. Prof. Senagala discusses the evolution of the form-finding process in great detail, ultimately synthesizing the necessity for entrepreneurial partnerships within the context of the 21st century design studio. His systematic approach to studio separates into three distinct processes- design, fabrication, and erection. While this tripartite studio organization is not new, his stance on running the studio as a "firm" provides an insight to the linkages necessary for today's design build approach. This strategy has also worked successfully at the Digital-to-Digital Studio at the University of Kentucky, Studio 804 at the University of Kansas, and the Design Build Studio at Yale University. What is most significant about Senagala's approach is the necessity of full-scale mockups using the actual material and structure. Architectural design research is no longer reduced to abstraction or representative substitution. His process of investigation minimizes the final erection time. "The pacing of our projects differs significantly from non-tensile structures. For instance, nearly three months of time were spent on the project with absolutely nothing built above ground on the site. Then on

one fine morning, everything went up within a span of four hours.”

Larry Barrow’s paper leverages the role of technology in his *Performance House Modular House System*. This research strikes a balance between production and mass-customization by establishing an up-front “systems thinking” approach to design and fabrication. The resulting kit-of-parts “establishes a sophisticated means of Industrial Design systems thinking for design-make-operate” that allows for variations to occur, in terms of siting, form, and structure without compromising cultural diversity. While this research is still in its infancy, the research cultivates an architect’s approach to the extreme landscape, from tornado or hurricane alleys, to energy challenged zones. “This is not intended to be a ‘concept’ house; our goal is to bring the ‘concept’ to market.”

Christopher Schindler’s and Instant Architects (Zurich) collaborative exhibition entitled *Inventioneering Architecture: Building a Doubly-Curved Section through Switzerland* “tests the possibilities of establishing a digital process chain in building practice.” Their initial investigations call for an adaptive building system that offers uniqueness, efficiency, and economical construction based upon serialized and individual parametric design and information processing. The resulting products present a range of realizable forms that establish an information-first approach to design.

Superficies-Integral and Applied

This session establishes the use of digital representation as a determinant for ornament-both integral and applied. Shilpi Kumar’s paper *Architecture and*

Industrial Design: A Convergent Process for Design creates a bridge between the two sessions. Kumar demonstrates the integration of architecture and design through the processes of industrial design. Kumar successfully overlaps modularity and repetition to discuss the inherent complexity in the organizational and communicative exchange of information. He observes that architecture is an inclusive art that communicates through image, shape, geometry, and pattern and thus architects often bring outside disciplines to bear upon design.

John Elys’s paper *Digital Ornament* begins at the rudimentary concepts of texture mapping applied to architecture through gaming programs. For Elys, this appliqué is not solely an image; rather it is a complex surface for inscription. His research develops the concept of digital ornament as “an expression of technology” that is simultaneously kinetic, yet latent with creative potential, and offers architects and scientists alike an opportunity for direct integration and 3-dimensional development. “Architecture has developed digital technological advances, appropriated their usage, and re-interpreted the methodology of architectural production.”

Branko Kolarevic’s paper *Manufacturing Surface Effects* stems from the intrinsically linked relationship between tools, process, and material as a form of “ornamental minimalism.” Kolarevic invokes David Leatherbarrow’s observation that, “Through its surfaces, a building declares both its autonomy and its participation in its surroundings.” This duality of purpose is seen to intentionally inform the work of architects such as Herzog & de Meuron and Bernard Cache. Like Elys, Kolarevic

warns that any “superficial application of ornament” would result in decorative surfacing that might beget “unnecessary embellishment.” Kolarevic argues rather for the necessity of patterning and ornamentation that informs both surface and structure.

These six papers collectively present an array of opportunities that are currently available within and around the academy. The potentials and pitfalls as applied to practice and pedagogy offer an intriguing milieu for further investigation and discussion at the Synthetic Landscapes Conference and development beyond the event.