



FABRICATION

EXAMINING THE DIGITAL PRACTICE OF ARCHITECTURE

BEESLEY CHENG WILLIAMSON

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Philip Beesley, Nancy Yen-Wen Cheng and R. Shane Williamson, editors

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Fabrication

Examining the Digital Practice of Architecture

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Fabrication

Examining the Digital Practice of Architecture

Philip Beesley, Nancy Yen-Wen Cheng, and Shane Williamson

How can emerging industrial processes reshape building design and construction? This book focuses on making buildings in a new way.

We are presenting design ideas, technical innovation, and fabrication expertise that address crucial issues. Authors investigate how to effectively design and practice architecture with automated prototyping and manufacturing. We want to understand where this might lead, and how it might change the nature of architecture itself. We are just beginning to discover the opportunities to be found in integrating automated fabrication within the practice of architecture. At the same time, the new century has brought very mixed perspectives on confident Modern progress. A cautious scrutiny of 'innovation' is needed.

Fabrication is an old word with the straightforward meaning, *to make*. The roots of the word lead to the origins of architecture. *Making* has been considered a virtue by ancient writers and modern politicians alike. *Fabrication* (and *homo faber*, 'one who makes') have served as fundamental terms that constitutions and contract laws have been built upon. Shaping and working with materials is at the core of Western civilization. However at a point in human history where nature is steadily being replaced by human artifice, the consequences of *making* are far from simple. Whether for good or ill, our new fabricated environment is transforming the world.

The machines change our practice. Just as the industrial revolution displaced workers from country to city, a quiet revolution is now changing the trade-structure of construction. Entirely new skills and management methods are demanded of new automated construction, displacing the manual laborers who previously supported the construction industry.

Computer-controlled fabrication machinery is changing how we design. What does it mean to make buildings this new way? The new machines are challenging our romance with drawing. We have given the conventions of plan, section, and elevation a special status in our society. Their influence on architectural form can readily be seen in the prevailing use of three planar dimensions – front, side and top – in buildings. In traditional practice, orthographic drawings serve as instruments of legal control over construction, supporting a relatively stable hierarchy of owners,

designers, and contractors. These abstract instruments of control have tended to be valued above material qualities. The *work* of architectural design and the *labor* of construction are separate, and not equal.

While the separation of design from making tended to increase in the past two decades with the introduction of computers, this trend has begun to change. Designers have new ways to touch and shape the construction process, getting ever closer to direct manufacturing of full-scale assemblies with advanced material qualities. This suggests that an increasing challenge is being posed to traditional hierarchies that value ideas over action.

The machines change what we can make. Custom cutting, shaping, and depositing tools invite us to make new forms. Using new materials can lead to composite building structures that incorporate sensors, displays, and a range of mechanical functions. Fundamental behaviors of buildings will be influenced by this. The next generation of architecture will be able to sense, change and transform itself. The tools we are examining make this kind of responsive architecture increasingly possible.

The papers of the AIA/ACADIA Fabrication conference give a spectrum of responses to these issues.

Craft, Materiality, Humanity

Ryszard Sliwka considers our changing perception of materials, how we relate to them with our bodies and our imaginations. Patrick Harrop challenges us to reintroduce the risks of traditional craft and material resistance within a new world of mechanistic certainty. In a keynote address titled *Fabrication and Human Factors*, Mark Burry considers the broad question of how automated design and construction can contribute to expanded human experience.

New Materials and New Industries

George Petrides and Kate Simonen-Luke discuss how traditional materials of timber are being automated. Chuck Eastman's consultancies to the US steel and concrete industries are expressed in a detailed review of new industrial practice. Michael Stacey offers the concept of 'slow architecture and fast design' as a paradigm of fabrication, and contrasts European practice by means of a debate with James Timberlake, author of *Refabricating Architecture*. Branko Kolarevic explains how new materials can be used to create structural, adaptive skins that

SPEAKERS

The Sagrada Família
west transept rose window, a rapid prototype
Mark Buny
Spatial Information Architecture Laboratory
RMIT University

New Methods of Architecture and Building
Charles Eastman, Design Computing,
Georgia Institute of Technology

The Glass Office SCL office and showroom in
Brisbane, Queensland, Australia
Martin Riese and Marc Simmons FRONT Inc.

Bahá'í Temple temple of light
Siamak Hariri, Hariri Pontarini Architects
by Marsha Kelmans

Manufacturing Architecture
Michael Stacey
Digital Fabrication Research Group
Metropolitan University of London

SmartWrap Pavilion
James Timberlake, Kieran Timberlake Associates

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The Association of Computer-Aided Design in Architecture

www.acadia.org

ACADIA was formed in the early 1980s for the purpose of facilitating communication and critical thinking regarding the use of computers in architecture, planning and building science. A particular focus is on software, hardware and pedagogy involved in education.

The organization is committed to research and development of computer aids that enhance design creativity and that aim at contributing to construction of humane physical environments.

One of ACADIA's missions is to present an annual conference on topics of interest to the architectural CAD community. The conference and the publication of its proceedings are a channel of communication among experts in the field of computer-aided design in architecture. The conference site moves each year, providing exchange with schools of architecture around the country.

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John Tector North Carolina State University

FABRICATION:
Examining the Digital Practice of Architecture

How can emerging industrial processes reshape building design and construction? Design ideas, technical innovation and fabrication expertise come together in this forum where theory can be translated into practice. Discussion includes a spectrum of critical issues affecting architecture today.

International leaders in design and research examine how automated prototyping and

manufacturing can transform environments. Presenters consider digital interfaces and production tools and discuss their long-range implications. Professional presentations and academic papers are complemented by practical workshops, tours and exhibits. In addition to on-site displays of new rapid-prototyping machinery, design work and material samples, an exhibit exchange with the UK-based Building Centre Trust provides exposure to leading-edge

European building technologies. Additional events accompanying the conference include a SmartGeometry Workshop on parametric modeling and an Education Summit focused on teaching digital design.



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References

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