FutureWood: Innovation in Building Design and Manufacturing

Edited by Philip Beesley and Oliver Neumann

Future**Wood**

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Spine:

Future**Wood**

Neumann • Beesley

Back cover:

Future**Wood**

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Future**Wood**

Innovation in Building
Design and Construction

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Preface

Robert Woodbury

Wood and tools. They bring to mind the cabinetmaker's factory, boat build-er's jigs, the residential construction site, concrete forms and the amateur's workshop. Each is at the end of conception, where already set ideas become reality. Mostly what is made are the ideas of others -- the hand holding the tool is not that of the designer. The history of design would appear to force such a separation between design and its realization. Modern artifacts are complex and demand specialized knowledge and machines for their produc-tion. It is easy, or at least expedient, for designers to leave tools and materials to others. Sadly, the common view of designers being ungrounded in practical reality may be simple historical necessity.

This book is a bridge. Its contributors, designers all, show how new tools can span the historical gap between thought and hand, between idea and materiality. Contemporary computer-aided design systems and digital fabri-cation machines allow us to bend the process of design in on itself, to connect its start and finish. Both computation and physical machines are tools for working the substance of design. Computational tools enliven the sketch. Once modeled inside a computer, a sketch becomes plastic. We develop, refine and adapt it to context. We create alternative sketches in the hundreds. Digital fabrication makes these sketches physical, as models, prototypes and built form. The loop closes as we use the physical sketch to inform the world

of ideas. And the world of ideas changes as we learn the consequences of our design choices.

The contributors to this book are explorers in this new world in which design and craft intertwine. But why wood? In contemporary design it is but one of a myriad of material choices. The answer lies in the material itself. Wood is easy to work and form; it is accessible to many. It affords possibility. Joining, laminating, carving, bending, cutting and finishing become sources of design ideas. Wood is also "difficult"; its grain can vary unpredictably. Its differential strength and shrinkage with and across the grain, its limits of folding and bending, and the peculiarities of the joint each pose creative challenges for design. Lastly wood can be beautiful. It rewards inspiration, thought and effort.

Wood, though it is the focus here, remains a placeholder. Each material poses its own questions to computer-aided design and digital fabrication. Contemporary practice worldwide is engaging these questions using all materials and across design domains. But action is inevitably localized. We build for specific sites, actual clients and with local expertise. Through their focus on the new tools for design, the old material of wood and their particular design situations, the designers behind these articles are our guides into new possibilities.

Niagara Credit Union at Virgil

Philip Beesley
University of Waterloo;
Philip Beesley Architect

The new banking centre of the Niagara Credit Union at Virgil stands on a site that acts as the gateway to the old town of Niagara-on-the-Lake, Ontario, while fronting a new suburban development. A key requirement of the project was to conserve the historic character of the area and enhance the fragile balance of surrounding agricultural lands, all the while accommodating the town's wish for new development and strong commerce. The architects were invited to consider practical questions about authenticity and substance—or how could enduring, rooted qualities be achieved using lightweight commercial construction?

The project team pursued hybrid qualities. Key design strategies used a minimum of material while offering an experience of depth. A lightweight structural system employing a hovering basketwork canopy of interlinking laminated and stranded-timber members was developed for the public spaces. These elements link arms to form a lightweight structural meshwork supporting the main roof and extending outward to the exterior. Tall, branching timber columns support this structure. A massive column type was conceived using exposed glue-laminated young-growth softwood lumber grouped in offset cruciform bundles. Repeating arrays of these columns framed the main hall and stood as a series of open 'groves' around the exterior. The columns frame the heart of the building—a light-filled great hall. A front veranda populated by fields of exterior columns running along outdoor walkways give shade and create a streetscape that encourages interaction with the public. Reinforcing this skeleton, thin skins of ledgerock and limestone were manipulated in order to present a topography of elongated, folded planes. These surfaces extend the thickness of enclosing walls.

The massive ceiling of the central hall is composed of clusters of thin vertical vanes of stained spruce, creating a darkened lining whose depth plays

Niagara Credit Union
Evening view of Custom-designed glue-laminated columns forming a canopy around perimeter

against the sun-filled space within. The meshwork created by the linked upper branches of the column system in the main hall, together with slatted shades supported by the outer veranda structures, make a filter that modulates direct light . The structure employs engineered wood trusses for framing the main plenum integrated with light steel bracing and framed decking for outlying spaces.

The interior acts as a convivial town square lined by a variety of services and amenities. Reinforcing personal relationships with members of the Credit Union, the offices of personal financial advisors, commercial officers and banking assistants all look directly into the space. On the second level, glass-fronted spaces for professional offices overlook the hall.

The new building stands close to Virgil's major street edge, reinforcing pedestrian footpaths. Timber veranda-shelters provide a nearly continuous perimeter to the facility supporting exterior parking, drive-in banking and service-entry circulation. This site design invites future developments in the town to join in a close-knit main street approach, restoring a lively community of shop fronts that used to the sidewalk. Parking is integrated in a tartan-grid of planted areas lying behind the main street edge. The approach contrasts with large highway-scale setbacks that have characterized the recent development along this arterial.

On winter evenings, warm light comes from within and makes the building an inviting beacon.

Figure 2
Construction phase; glue-laminated columns framing into roof structure
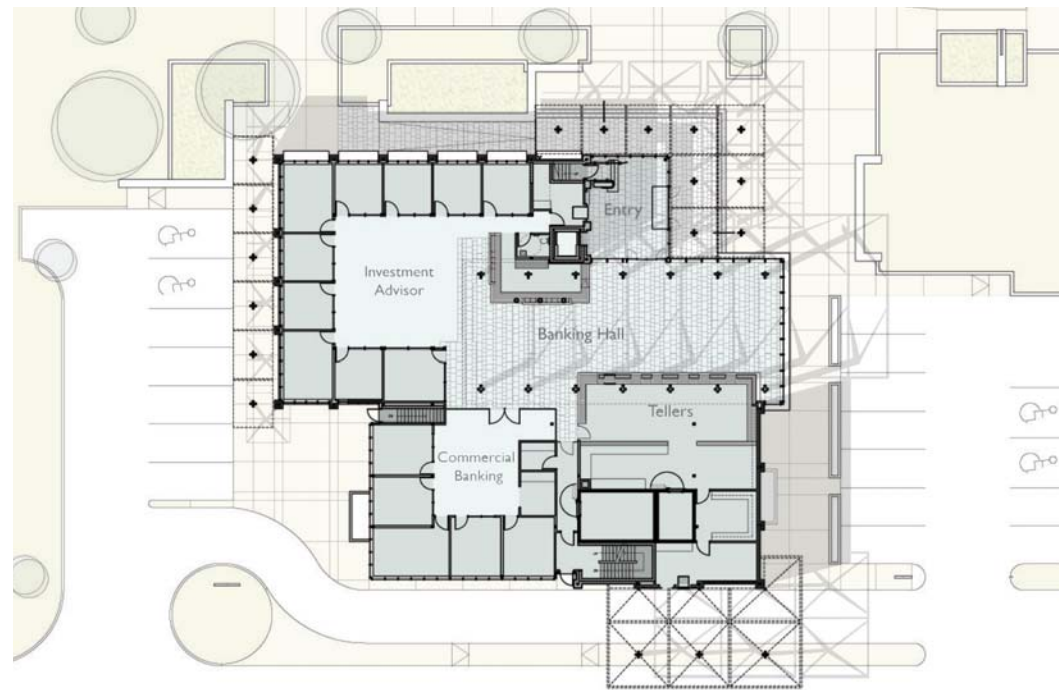
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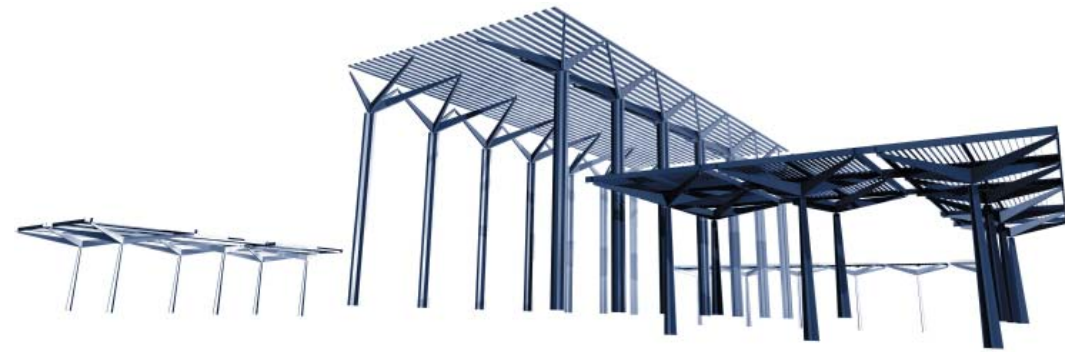
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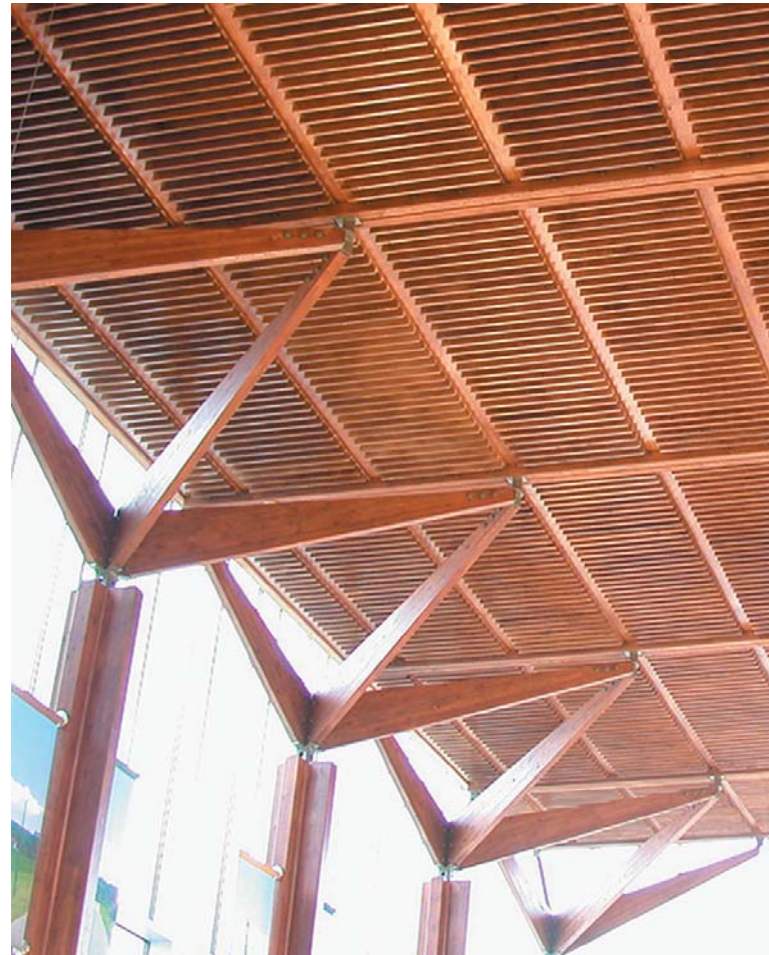
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Great hall with framed view of landscape beyond

Author Biographies

Omer Arbel

Omer Arbel Office Inc.

Omer Arbel graduated from the University of Waterloo School of Architecture in the summer of 2000. After tenures with Enric Miralles, John and Patricia Patkau, and Peter Busby, which included notable works such as the Scottish Parliament in Edinburgh and the new Inform store in Vancouver, Omer opened the OAO in January of 2006. OAO (Omer Arbel Office) is a Vancouver-based practice operating within the fields of industrial design, architecture and material research.

Arbel's debut piece, the 1.1 shelf, was a finalist for a 2003 D&AD Yellow Pencil award (known as the 'Oscars of industrial design') and lost in the final round of judging to the G4 imac by Apple Computers. The 2.4 cast resin lounge chair won a Chicago Athenaeum's 2003 Good Design Award, a 2004 ID Magazine Design Review Honorable Mention, and a finalist citation for a 2004 Yellow Pencil. Now in the permanent collection of the Chicago Athenaeum Museum of Architecture and Design, the piece has been exhibited all over the world, most notably at the Totem Gallery (New York), the Chicago Athenaeum Museum, the Vancouver Art Gallery, the Design Exchange (Toronto) and the D&AD forum (London). Arbel was selected by Wallpaper magazine as one of 15 up and coming designers of our generation. More recently, he has been recognized for the design of the 14 Series cast glass pendants for two different clients – the progressive Italian lighting manufacturer Kundalini in Europe and the small start up manufacturing house Bocci in North America (for whom Arbel is acting as Creative Director). This design has been shortlisted for an iF product design award and for the 'Best Newcomer' Blueprint award.

www.omerarbel.com.

Philip Beesley

Philip Beesley Architects
Associate Professor, University of Waterloo

Philip Beesley is an experimental architect and sculptor who focuses on public buildings and visual art. His creative work has been recognized by the Prix de Rome for Architecture (Canada), a Governor-General's award, a number of Ontario Architects Association Awards of Excellence, and two Dora Mavor Moore Awards. His built works include a series of schools, theatres and community facilities. He has been a member of several art and performance collaboratives and often works in stage and gallery installations. In parallel with his practice, he is an Associate Professor at the University of Waterloo School of Architectureas well as the Fabrication theme leader for the Canada Design Research Network and co-director of the Waterloo Integrated Centre for Visualization, Design and Manufacturing (ICVDM), a high-performance computing centre. The Niagara Credit Union has been recognized with the Ontario Association of Architects Architectural Excellence Award, the Canadian Wood Council Woodworks award, and the Niagara-On-The-Lake Heritage Conservation Award, 2004.

www.philipbeesley.com

Hagy Belzberg

Belzberg Architects

For a decade, Belzberg Architects has functioned as a group of young designers guided by the experience and curiosity of Hagy Belzberg. Each individual from the firm was drafted by his/her peers for specific skills, which merge in various ways. The aim is not only to conceive of designs, but to manifest them as well. The will of the firm is to test the effects of our working methodologies within physical environments.

The firm aspires to create and exploit designs which are cohesive in spatial experience from form and texture through more traditional models of color and light. The results are often physical realizations of digital practice enriched by the tangible qualities of material/product and embodied in a continuous, whole architectural experience.

www.belzbergarchitects.com

Christian Blyt

President, GreenHus Design Ltd.
Associate Professor of Industrial Design, Emily Carr Institute of Art and Design

Christian Blyt is an Associate Professor in Industrial Design and Coordinator of the Innovations in Wood Design program. He received his MA in Interior Architecture and Furniture Design from the University of Arts and Design in Helsinki, Finland and a technical diploma in Wood Product Manufacturing from BCIT. His work encompasses a wide range of experiences in different segments of the wood design and manufacturing industry. He is also a partner in the design and manufacturing firm, Greenhus Designs Ltd. that will be commercializing his patented master thesis Corelam™ (an all-wood corrugated plywood product) and a founding member of the Bark Design Collective.

FieldOffice

Douglas Hecker
    Partner, fieldoffice
    Assistant Professor, Clemson University
Martha Skinner
    Partner, fieldoffice
    Assistant Professor, Clemson University

Douglas Hecker and Martha Skinner are assistant professors at the School of Architecture at Clemson University and co-founders of fieldoffice. Their interdisciplinary practice has been recognized internationally through exhibitions, publications and awards, including 4 awards from ID magazine and inclusion in this year's 10th Venice Biennale of Architecture. As the 1999 Walter B. Sanders Fellow at the University of Michigan, Skinner developed Notation A/V, a seminar about the merging of drawing and video. In 2004 Hecker founded cusa.dds, a digital fabrication shop and research facility at Clemson. Hecker and Skinner graduated with honors from the University of Florida and completed their studies and internships in New York City. Skinner received the Abraham E. Kazan Fund Prize for Urban Design Studies from Cooper Union in 1995 and Hecker the William F. Kinne Fellowship from Columbia University.

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Karl Daubmann

Principal, Ply Architecture
Asst. Prof. of Practice, Taubman College of Architecture

Daubmann is a principal of PLY Architecture and Asstant Professor of Practice at the University of Michigan where he teaches studios and seminars related to materials, building technology, construction, and digital fabrication. His work in both practice and research investigates the role of digital technology in design, originally through simulation of real world phenomena and, more recently, through fabrication. Daubmann received his BArch from Roger Williams University in 1995 and his Masters from MIT in 1999.

www.plyarch.com

Marty Doscher

IT Director, Morphosis

As the IT Director at mOrphosis, Marty Doscher is responsible for overseeing CAD production for the company and its consultants. For five years at mOrphosis, and 6 years prior, he has successfully managed the integration of diverse and complex project teams' CAD drawings and models. His primary focus is the integration of virtual building models into design and construction processes. Whereas models have always been fundamental to the design process, they are now also tightly integrated into construction documents. With projects such as the Wayne Morse US Courthouse, San Francisco's Federal Building, the University of Cincinnati Recreation Center and the new academic building for The Cooper Union for Advancement of Science and Art in New York, Doscher is leading the effort to integrate architectural and structural 3D models with the contractor's shop drawings. This integration is leading to a more collaborative and streamlined shop drawing creation and review process, resulting in significantly fewer changes in the field.

Doscher holds a Bachelor of Science with major in Architecture from Georgia Institute of Technology and a Master of Architecture from SCI-Arc. He has lectured and taught on various modeling topics at ACADIA, AIA, and Zweig White, USC and UCLA among other venues and universities. He has also tutored several parametric design workshops with Generative Components.

www.morphosis.net

Tom Faulders

Beige Design

Thom Faulders founded BEIGE Design in 1998. The design studio places equal emphasis on specula-tive research and applied practice. With its active interdisciplinary presence, BEIGE projects range in scale from architecture and urban interventions to the design of environments and product prototypes. The studio pursues architecture as a real-time and responsive medium, and explores dynamic systems to investigate contemporary space in an age of customization.

Faulders has received numerous honors, including awards from the Bienal Miami + Beach, the Architectural League of New York, and the San Francisco Museum of Modern Art. He currently teaches Architecture at the CCA in San Francisco.

www.beigedesign.com

Douglas Gauthier

Principal, SystemArchitects

Douglas Gauthier is a partner with Jeremy Edmiston at SYSTEMarchitects. The practice has been pro-filed in Time Magazine, Metropolis, AD and Architectural Record and has won various awards including the New Housing New York Competition, the SECCA HOME House Competition, The Architectural League's Young Architect Competition, and, in 2006, the prestigious RAIA Wilkinson Award.

Douglas holds degrees from Columbia University and the University of Notre Dame. He has received grants from the Fulbright Program, The Graham Foundation, and The New York State Council on the Arts, and is a 2004 MacDowell Colony Fellow. Prior to SYSTEM his work included two collabora-tive projects which received the Berlin ARCHITEKTURPRIES and an Architecture Magazine Award. Douglas has taught at Columbia University, Parsons School of Design, Barnard College, Yale University and Princeton University.

www.systemarchitects.net

Michael Green

Principal, mcfarlaneGreen Architecure + Design Inc

mcfarlaneGreen's architecture and design is a product of collaboration, investigation, innovative building methods.. The firm's experience ranges from the hands-on crafting of smaller projects to the design and project management of large scale, complex multi-user facilities. mcfarlaneGreen's projects range from architecture, interiors, and master planning including airports, hotels, bars and restaurants as well as civic, commercial, cultural, educational, residential, retail and transportation projects. www.mg-architects.ca

Achim Menges

Professor, Academy of Art and Design Offenbach, Germany
Professor, AA School of Architecture London, UK

Professor Achim Menges AADip(Hons) is an architect and partner in OCEAN NORTH. Since 2002 he has been teaching at the Architectural Association in London as Studio Master of the Emergent Technologies and Design in the MSc/MArch Program and as Unit Master of Diploma Unit 4. He has been a visiting professor at Rice University School of Architecture, Houston. Since 2005 he is Professor for Form Generation and Materialization at the HfG Offenbach University for Art and Design in Germany. Achim Menges research has been published widely and received numerous international awards. Recent publications include the two AD issues "Emergence: Morphogenetic Design Strategies" / "Techniques and Technologies in Morphogenetic Design" (AD Wiley) and the book Morpho-Ecologies with Michael Hensel (AA Publications).

www.achimmenges.net

Oliver Neumann

Assistant Professor, School of Architecture and Landscape Architecture
University of British Columbia

Oliver Neumann is an Assistant Professor at the University of British Columbia School of Architecture and Landscape Architecture. His research focuses on the role of digital technology in the building process and in broader speculations of emerging material culture. Current building research and teaching projects explore contemporary wood fabrication technologies and mass-customization processes and their spatial, ecological and cultural implications.

Oliver Neumann holds a professional degree in architecture from the Technical University in Berlin, Germany, and a Masters in Advanced Architectural Design from Columbia University in New York. He is a licensed architect with the Architektenkammer in Berlin, Germany.

Christoph Schindler

designtoproduction

*1973 in Erlangen (Germany), Dipl.-Ing. Architect SIA, lives and works in Zurich, Switzerland. Christoph Schindler's special interest is the integration of tradition and technology. He practiced architecture in offices in Stuttgart, New York and Rotterdam. He is co-founder of 'designtoproduction', a consultancy for the digital production of complex designs. In his PhD studies at ETH Zurich, he is researching 'Computer aided realization of non-standard architectural form in timber construction'. He has conducted 1:1 timber workshops at several universities. designtoproduction's innovative timber work has been honored with various awards.

www.designtoproduction.com

Michael Stacey

Principal, WilliamsonWillaimson
Assistant Professor, University of Toronto

Michael Stacey's professional life combines practice, research, writing and teaching. In 1987 he co-founded Brookes Stacey Randall Architects and in 2004 he established a new practice: Michael Stacey Architects. His commitment to design excellence has been recognised by numerous awards, which range from Civic Trust Awards, Bureau International du Beton Manufacture Award and Royal Fine Art Commission Building of the Year Award, Jeux D'Esprit.Key projects include: East Corydon Station, Thames Water Tower, Wembley Gateway Urban Regeneration Masterplan, Enschede Integrated Transport Interchange, Art House in Chelsea, Expertex Textile Centrum and Ballingdon Bridge. Product design for the building industry includes the invention of the Aspect 2 integrated composite cladding system, which is manufactured and marketed by Corus. He is also the author of a wide range of publications and articles including Component Design (2001).

Michael Stacey is Chair in Architecture at the University of Nottingham and Research Professor at University of Waterloo, Ontario. Themes within his research include: digital fabrication, form finding in architecture, offsite manufacture, facade design and procurement, emergent materials and sustainability. His interest in digital design has led to the foundation of the Digital Fabricators Research Group, which focuses on the use of digital design tools in the making of architecture.

StructureCraft

StructureCraft Builders Inc.'s focus on innovative and cost-effective aesthetic structural solutions using wood is facilitated by the application of digital media and fabrication methods. Structural engineering design, shop fabrication and preparation for site installation equally benefit from the development of a detailed 3D model. Despite their geometric complexity, StructureCraft's projects are developed as pre-fabricated "kits of parts" to allow for reduced site erection durations.

Shane Williamson

Principal, WilliamsonWillaimson
Assistant Professor, University of Toronto

R. Shane Williamson is an Assistant Professor at the University of Toronto's Faculty of Architecture, Landscape and Design and principal of WILLIAMSONWILLIAMSON, a Toronto-based architecture and design studio. He is a graduate of Georgia Tech (BSc.Arch.) and Harvard University (M.Arch.) Professor Williamson's research and creative practice involves an exploration of the digitally-based convergence of representation and production afforded through parametric software and digital fabri-cation. Most recently, WILLIAMSONWILLIAMSON was selected for the 2006 Young Architects Forum by the Architectural League of New York.

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Rob Woodbury - SFU School of Interactive Arts and Technology

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