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editors

catalogue

architecture, art, engineering, culture, fashion

**FUTURE
PROTOTYPING**



Future Prototyping Exhibition Catalogue

Held at the Melbourne School of Design,
The University of Melbourne
24th February – 27th March 2020

This event is part of Melbourne Design Week 2020, an initiative of the Victorian Government in collaboration with the NGV, 12th – 22th March. Call for projects was held between the 19th September – 4th November 2019.

Edited by Paul Loh, Mond Qu and David Leggett

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Book cover designed by United Make.

We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture on whose unceded lands we conduct the research gathered in this book. We pay our respects to their Elders past, present and emerging.

FOREWORD

JANE BURRY

The Future Prototyping exhibition comes to us in 2020, the year for 20-20 vision. The focus of the exhibition selection criteria were first, ideas (non-commercial), second, novelty and third, the potential for future impact of prototyping in architectural design.

The curators of this exhibition are uniquely qualified to assemble this collection of current, but future-focused, Australasian prototyping practice and academic work. Paul Loh and David Leggett are partners in the dual Melbourne architecture and advanced fabrication practices LLDS and Power to Make. Mond Qu, is Founder and Director at United Make. They marry design and making in every breath they draw, and share an Architectural Association (AA) background and an ongoing Melbourne University studio teaching present. Their publications, including Dr Loh's short essay in this catalogue, tease out the way in which making and prototyping can be the force generating design, not merely a testing ground for abstract design propositions. Their own research in the exhibition speaks as highly as words of these agendas. The works exhibited were selected from a very exciting and challenging field of entries, the panel adhering closely to the criteria to ease deliberations. The result is an eloquent and enquiring collection, an inspiration for future prototyping.

Suddenly, but not serendipitously, in 2020 in Australasia, the sense of urgency for paradigm change is at a new pitch; nowhere more so than in the built environment. In numerology, the number 20 signifies diplomacy and the ability to bring a project to conclusion and is 'the perfect biblical waiting period'. The post millennium wait for decisive action on climate change in Australia must now be over.

The need for not just incremental but radical paradigm shifts means a new heightening of experimentation to find workable solutions. "Workable" means rapid iterative prototyping, working across disciplines and at every level from material testing and bio investigation to investment in carbon neutral and negative buildings. Prototyping is core to architecture, as never before.

In exploring, in the most recent decade, the prototyping practice of 50 leading global architecture practices for the book Prototyping for Architects, Mark Burry and I discovered that, digital practice had not only fostered a singular Bauhaus-like revival of physical prototyping, but a diverse field of prototyping practice understood differently by every architect or engineer of whom we asked "what is a prototype". We found out that architectural and design prototypes were tools for: thinking and feeling, experimental verification/falsification, testing processes or performance, manifestations of data, progenitors, and often the built project itself. This exhibition aptly reflects this diversity across a broad palette of materiality, used as the primary organisational strategy for the catalogue. But the curatorial taxonomy also captures other qualities; from biological to biodegradable, earthen to mineralogical, light-weighting to waste-eliminating, visually-affective to reactively-sculpted, temporal to textile, pneumatic to auditory, paper to metal, interactively artistic to robotically prosthetic, self-organising to tele-present, artificially intelligent to mixed reality, and timber: steam-bent, elastically-curved, carved, recycled, actuated, irregular, deep-structured and data-inventoried.

Future Prototyping is a collection rich and rare.



2019+

Milling+

Sight+

Architecture+

Timber+

Infinite —

SuperSuccah

SuperSuccah is a lightweight, elastically curved and twisted plywood pavilion that evidences a fabrication-aware approach to the design of topologically complex architectural forms. In establishing creative feedback relationships between algorithmic design strategies, material testing and prototyping, the pavilion exemplifies how the known constraints of a designated fabrication process can serve as a productive basis for the innovation of architectural form.

SuperSuccah demonstrates increasingly complex speculation of the architectural object as a differentiated field-condition that constantly shifts its character depending on the relative motion of the inhabitant and the weather. Rapid shifts in strip alignment ensure that at any time the observer will be presented with both extremely transparent (4mm on edge) and entirely opaque aspects. The strong twisting of each element presents surfaces of all angles to register, reflect and redirect the sun, wind and rain such that small changes in the external environment trigger amplified effects in the micro-climate within.

The design comprises six prefabricated shells that harness mirror- and rotational-symmetry to resolve the complex overall geometric expression. The use of symmetry delivered significant benefits across multiple project demands spanning fabrication, transportation and most importantly structural analysis. Together, these ensured that the complex formal ambitions of the work could be balanced against the tight timeline and budget; need to establish a design-for-disassembly logic, and; the extremely demanding engineering requirements of such an unprecedented structure. The most notable being the very high wind-loads resulting from the exposed coastal site.

The project's complex surfaces are constructed from a matrix of 4mm and 6.5mm twisted and bent plywood ribs. The orientation of the ribs is derived via computation of quasi-asymptotic lines found upon a quad-dominant isothermic minimal-surface (zero-gaussian-curvature). The description and application of asymptotic gridshells has been offered by Pottman (2016), Schling (2018) and others. Like traditional gridshells, highly performative structural shapes that utilise very little material are possible. Unlike traditional gridshells however, asymptotic grids possess further geometric properties relevant to construction: Firstly, asymptotic lines give rise to normal constant strips that are entirely developable and therefore easily produced using standard sheet material and 3-axis CNC technologies; secondly, these strips unroll parallel offering part nesting efficiency; finally, the resulting lattice of strip elements all meet perpendicular to one another ensuring a friction-fit joint capable of serial assembly.

SuperSuccah was commissioned by Shalom for 'Succah by the Sea' as part of 'Sculpture by the Sea', 2019 in Sydney. TTW engineers provided structural and wind engineering. Fabrication facilities were provided by the University of Technology, Sydney.

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Photo by Hamish McIntosh, Courtesy of Office Feuerman.