

A New Robotic Brutalism: Additive Architectural Elements

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The 3D printer, a machine which has long been characterized as characterless due to having little to no constraints, is in fact highly distinctive. The Additive Architectural Elements project aims to reveal the 3D printer's own and highly idiosyncratic architectural tectonics and narratives. Choosing commonplace prototypical architectural motifs such as floors, columns, doors, windows, walls, and ceilings we developed strategies as to how the layering of concrete, the relentless three-dimensional drawing of extruded lines of material, and the act of corbelling can suggest new strategies for building. Our question is: what is the architecture of 3D printed concrete?

Per visual and material association, we became interested in the architecture of Brutalism, borrowing and advancing formal and material strategies developed during this period. For us, Brutalism is most intriguing when bottom-up material processes meet top-down expressive decisions made by the architect: when a symbiosis between material and method of construction facilitates specific architectural characteristics such as fluidity, cantilevers, and texture, as well as accommodates the architect's willful design expression in the overall building assembly. In many of the great brutalist buildings, this oscillation is expressively present, hence our interest in that time period. In both our research and practice we aim to bring about and introduce such balance to new processes of making.

The A New Robotic Brutalism – Additive Architectural Elements project investigates prototypical methods for 3D printing at the building component scale in ground-up layered assemblies. Rather than further focusing on the technical advancement of 3D printing technology, this project operates consciously within the status-quo, researching a paradigm-shift that has already occurred but never fully and consequentially been explored architecturally: the 3D printing of buildings with concrete. In a 3D printed structure, all common architectural motifs and building components must be re-thought to fit the

logic of layered construction. For example, a concrete printer cannot print in midair; therefore, the otherwise simple exercise of making a rectilinear window opening becomes de facto an impossibility. Rather than drastically altering the process (stopping the machine to insert a beam), we believe that shortcomings become opportunities for design: as the printer can incrementally cantilever, one possible logical consequence is for the window to become a triangular corbelled arch. Seemingly advanced technology unexpectedly enables narratives that connect to obsolete or archaic structural strategies such as corbelling. Other strategies deployed in the manipulation of form are the modification of printing direction to overcome printer deficiencies, g-code manipulation for smart material deposit, or alterations of geometries for structural reasons related to the fabrication process.

In a series of seven full-scale 3D printed concrete prototypes, forty-nine 3D printed PLA models, seven proto-architectures 3D printed from PLA, ninety-eight element drawings, and one hundred-ninety-six photographs, the A New Robotic Brutalism – Additive Architectural Elements project explores the architecture of 3D printed concrete within Mushroom Columns, Force Columns, Smart Poche Walls, Ceilings, Floornaments, Doornaments, and Corb. Windows.

A NEW ROBOTIC BRUTALISM Additive Architectural Elements

By Leslie Lok and Sasa Zivkovic

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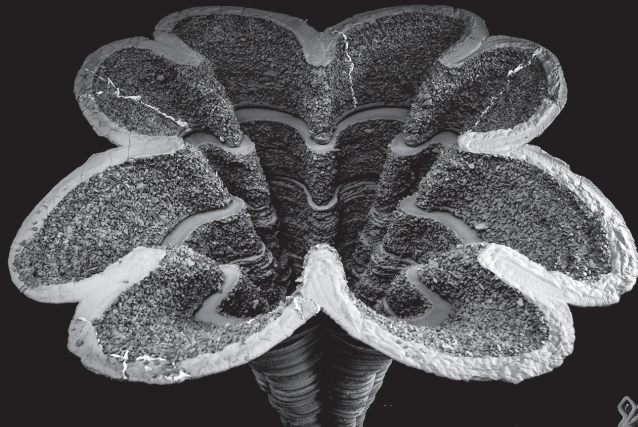
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Daedalus Self-built Open Source 3D Printer



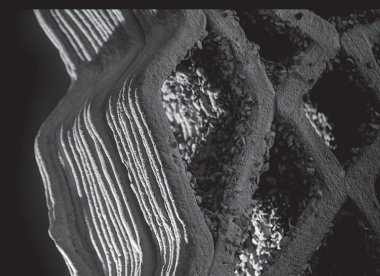
Material Tests



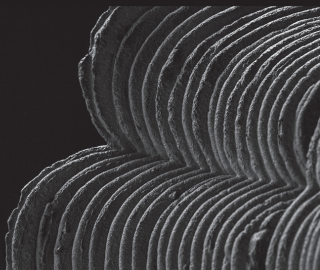
Smart Poche Walls



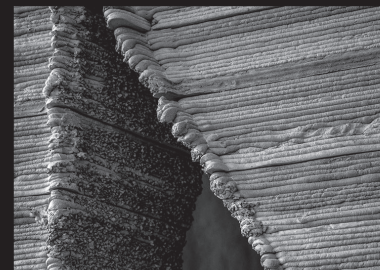
Doornaments



Force Columns



Column Cantilever



Corb. Windows