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**UNDER EMBARGO UNTIL OCTOBER 2, 2015**

# Rock Print

**Architectural installation at the Chicago Architecture Biennial 2015 by  
Gramazio Kohler Research, ETH Zurich, and the Self-Assembly Lab, MIT**

**Project: A unique installation made from reversibly printed matter**

Gramazio Kohler Research, ETH Zurich (The Swiss Federal Institute of Technology in Zurich, Switzerland) in collaboration with Skylar Tibbits of the Self-Assembly Lab (MIT, Cambridge, USA) propose the first architectural installation built from low-grade granular material and constructed by robotic machines. Conceived as an intriguing vertical object, the installation presents a radically new approach to The State of the Art of Architecture – the official title of the inaugural Chicago Architecture Biennial – and brings forward a new category of random packed, potentially fully reusable, poly-dispersed jammed structures that can be automatically fabricated in non-standard shapes.

A specifically designed algorithm will guide a robotic arm in a three-dimensional “rock printing” process. With the precision that only a robot can provide, it positioned a textile filament layer-by-layer around which loose granular material will form a distinctive shape. The self-aggregating capacity of this digitally crafted design configuration results in a large-scale architectural artefact that requires no additional support elements. Going far beyond the manual assembly techniques of dry masonry, this endeavor presents a unique combination of state-of-the-art digital design and fabrication technology with building material science. It introduces a sustainable, economical, and structurally sound construction method that fundamentally challenges conventional architecture. Following the robotic assembly, the installation will comprise a large-scale architectural artefact in its completed form, exhibiting distinct features, such as: full material reversibility and the respective reusability of the aggregated materials; structurally active interlocking, differentiated structural performance, while yielding high geometric flexibility and articulation.

Visitors will be drawn to the impressive structural capacity of rocks in a formerly unseen and unexpected (digitally crafted) design configuration. Performing a full scale 3D “rock printing process” that uses the self-aggregating capacities of the material itself, this visionary project is the first collaborative installation by Gramazio Kohler Research and Self-Assembly Lab. The group has been researching this process since 2014, which will be exclusively exhibited for the first time at the Chicago Architecture Biennial.

Chair of Architecture and Digital Fabrication  
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## **Gramazio Kohler Research at ETH Zurich**

The group of Gramazio Kohler Research – headed by Prof. Fabio Gramazio and Prof. Matthias Kohler – at ETH Zurich examines the effects of changing conditions in production on architecture. Particular interest is given to the connection of data and material and the resulting implications this has for architectural design. Here, novel building components specified on a computer and fabricated directly by machine not only broaden the spectrum of possibilities for construction, but through the direct incorporation of comprehensive material and fabrication constraints within the design process this also constitutes a unique architectural expression and a new aesthetic. The work ranges from 1:1 installations to the design of robotically fabricated high-rise buildings, and has been exhibited at numerous prominent venues, such as Structural Oscillations at the Venice Architecture Biennale (2008), Pike Loop at the Storefront for Art and Architecture in New York (2009), and Flight Assembled Architecture at the FRAC Centre, Orléans, France (2011). Together with leading researchers in architecture, material sciences, computation and robotics, the group has also initiated the first architectural National Centre of Competence in Research (NCCR) in Digital Fabrication.

[Gramazio Kohler Research, ETH Zurich](#)  
[More about ETH Zurich](#)

## **Skylar Tibbits' Self-Assembly Lab at MIT**

The Self-Assembly Lab is a cross-disciplinary research lab at MIT inventing self-assembly and programmable material technologies aimed at reimagining construction, manufacturing, product assembly and performance. Self-assembly promises to enable breakthroughs across every applications of biology, material science, software, robotics, manufacturing, transportation, infrastructure, construction, the arts, and even space exploration. The Self-Assembly Lab is working with academic, commercial, non-profit, and government partners, collaborators, and sponsors to make our self-assembling future a reality. Outstanding examples of this endeavour into macro-scale self-assembly, programmable materials and jammable aggregations are project such as Self-Assembly Line (2012), Fluid Crystallization (2013) 4D Printing (2013), and Programmable Materials (2014).

## **Context: The inaugural Chicago Architecture Biennial**

The inaugural Chicago Architecture Biennial takes its title, The State of the Art of Architecture, from a 1977 conference organized by architect Stanley Tigerman, which invited leading American designers to Chicago to discuss the current state of the field. The Chicago Architecture Biennial will expand the spirit and scope of this event. It will invite both emerging and established practices from across the world to Chicago to demonstrate how novel advances in architectural design are tackling the most pressing issues of today. In this way it will enrich Chicago's unique role in history as a crucible of architectural innovation. The setting for a succession of pivotal episodes in modern architecture and urbanism, and a context in which architects such as Louis Sullivan, Frank Lloyd Wright, and Mies van der Rohe developed revolutionary projects, Chicago will operate as a nexus for the ideas and practices that are driving global architectural culture in the 21st century.

Overall, the Chicago Architecture Biennial provides a platform for ground-breaking architectural projects and spatial experiments that demonstrate how creativity and innovation can radically transform our lived experience. It offers an opportunity to take stock of more than 70 architectural projects and experiments from 30 countries around the world, establishing a broad foundation for future editions of the Chicago Architecture Biennial. With an incredible breadth of design approaches, research interests, and cultural perspectives, it offers a global stage for debate and the exchange of ideas. The Chicago Architecture Biennial is a vision of Mayor Rahm Emanuel for a global architectural event and an outcome of the comprehensive cultural plan developed by Chicago's Department of Cultural Affairs and Special Events. It is presented through the support of BP, and in partnership with the City of Chicago and the Graham Foundation for Advanced Studies in the Fine Arts.

## Venue

The installation will be exhibited in a prominent gallery in the Chicago Cultural Center: a five-story Beaux-Arts building located in the heart of downtown Chicago. Former home of the city's public library, today the building functions as a thriving public institution that regularly hosts cultural events and exhibitions, and is frequently called the "People's Palace." Overall, the Chicago Architecture Biennial utilizes all of the Chicago Cultural Center's galleries and public spaces for exhibitions and newly commissioned installations – the first time that the entire building will be dedicated to one curatorial project.

The Chicago Architecture Biennial will open on October 3<sup>rd</sup>, 2015 and will close on January 3<sup>rd</sup>, 2016.

## Credits

**Project title:** Rock Print

**Credits:** Gramazio Kohler Research, ETH Zurich, and Self-Assembly Lab, MIT

**Team:** Prof. Fabio Gramazio, Prof. Matthias Kohler, Skylar Tibbits, Andreas Thoma (project lead installation), Petrus Aejmelaeus-Lindström (project research lead), Dr. Volker Helm, Sara Falcone, Lina Kara'in, Michael Lyrenmann, George Varnavides, Stephane de Weck, Dr. Jan Willmann

**Selected experts:** [Prof. Dr. Hans J. Herrmann](#) and Dr. [Falk K. Wittel](#), ETH Zurich; Prof. Dr. [Heinrich Jaeger](#) and Kieran Murphy, University of Chicago

**Selected consultants:** [Walt + Galmarini AG](#)

**Sponsors:** [Pro Helvetia Swiss Arts Council](#), [swissnex](#), [MISAPOR](#), and [Beton AG](#)

**Support:** The project is supported by ETH Zurich and the Department of Architecture as well as by an ETH Zurich research grant. It is co-supported by MIT's Department of Architecture, the MIT International Design Center, and an MIT International Science and Technology Initiative (MISTI) grant.

## Additional links

[Gramazio Kohler Research, ETH Zurich](#)

[MIT Self-Assembly Lab](#)

[Chicago Architecture Biennial](#)

[More about ETH Zurich](#)

[More about MIT](#)

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## Have more questions?

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