

Open-Source Architecture

Guest-Edited by  
WENDY W FOK &  
ANTOINE PICON

# Open-Source Architecture

05 | VOL 86 | 2016

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WENDY W FOK AND  
ANTOINETTE PICON

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ARCHITECTURAL DESIGN  
September/October 2016

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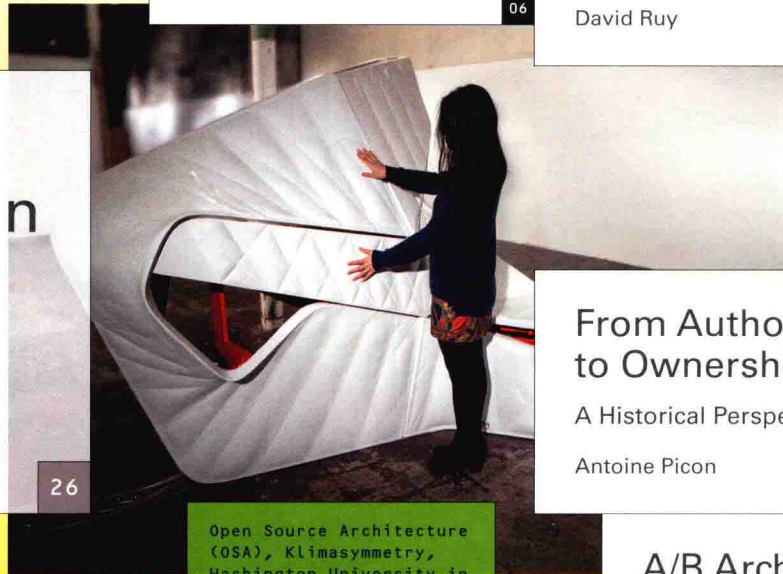
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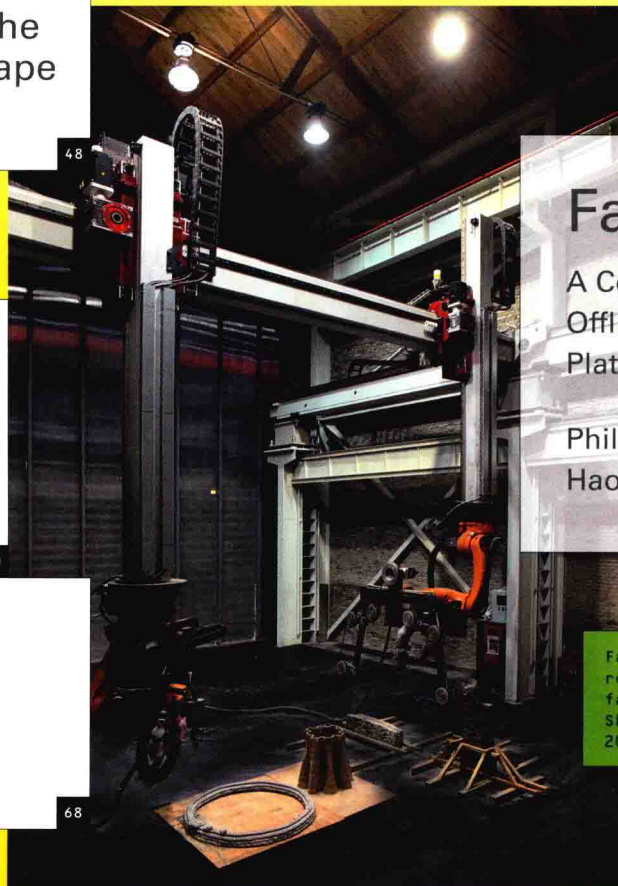
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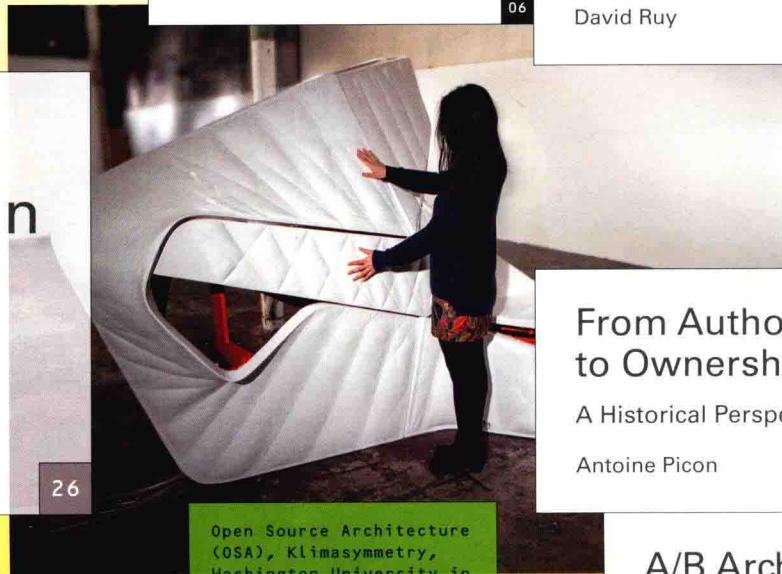
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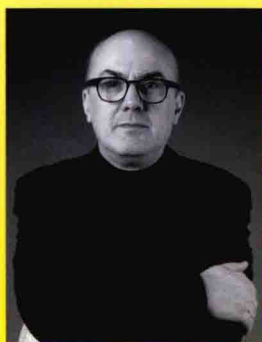
WENDY W FOK AND ANTOINE PICON

Guest-Editors Wendy W Fok and Antoine Picon have been collaborating since they met at the Harvard University Graduate School of Design (GSD). Fok is a trained architect, practitioner and educator, and Picon is a theorist and historian. This issue of  $\Delta$  highlights their complementary perspectives on the challenges of ownership and authorship within the emerging field of digital and computational design for the built environment.

Envisaging the pertinent and ever-changing territory of the current landscape of architectural and design practice in which the advent of open systems and variable models of operation are affecting the emerging economy, legal and political attitudes of technologies in 3D printing, capturing and computing, Fok and Picon have taken this moment in history to document and invite a wider discussion of digital property in the world of open-source architecture.



Wendy W Fok is the creative director/founder of WE DESIGNS, which provides creative strategies for the built environment, as well as Resilient Modular Systems, a socially missioned venture and public-benefit corporation that focuses on innovative modular components using hybridised composite materials for the building industry. Her awards include the Autodesk® Pier 9 AiR (2016), Young CAADRIA Award (2015), Digital Kluge Fellowship awarded by the Library of Congress (2014–15), the Art Directors Club of New York's ADC Young Guns 11 Award (2013), and the American Institute of Architects (AIA) Dallas 'Express Yourself' Women in Architecture Award (2013). She has a Master of Architecture from Princeton University, and a Bachelor of Arts in Architecture from Barnard College, Columbia University. She is an Assistant Professor of Integrated Design at Parsons, and completed her Doctor of Design at the Harvard GSD. Her doctoral research investigates computational innovation, the ethical/equitable application of technical methods of digital fabrication, and issues of intellectual property law within ownership and authorship property rights for the built environment.



Antoine Picon is the G Ware Travelstead Professor of the History of Architecture and Technology at Harvard GSD. He works on the history of architectural and urban technologies from the 18th century to the present. In his book *La Ville territoire des cyborgs* (Editions de l'Imprimeur, 1998), he began to investigate the changes brought to cities and architecture by the development of digital tools and digital culture. His three most recent books – *Digital Culture in Architecture: An Introduction for the Design Profession* (Birkhäuser, 2010); *Ornament: The Politics of Architecture and Subjectivity* (John Wiley & Sons, 2013); and *Smart Cities: A Spatialised Intelligence* (Wiley, 2015) – deal extensively with this question. He received science and engineering degrees from the École Polytechnique and École Nationale des Ponts et Chaussées, an architecture degree from the École d'Architecture de Paris-Villemin, and a PhD in history from the École des Hautes Etudes en Sciences Sociales.

Their collaboration on this issue of  $\Delta$  is part of their ongoing investigation of what is perhaps one of the greatest revolutions the architectural discipline has witnessed since the Renaissance.

# The Own Revo

INTRODUCTION

WENDY W FOK AND ANTOINE PICON





# ership lution

+Pool,  
East River,  
New York,  
2016

For civic projects, which tend to involve multiple stakeholders, an open-source design process that is collaborative in approach is particularly effective. +Pool is a community-driven crowd-funded initiative. It aims to create a pool that will enable New Yorkers to swim in clean river water thanks to a filtration system that will additionally purify half a million gallons of water every day.

Digital technologies, and digital fabrication in particular, have profoundly changed the status of architectural design. While the design process has been accelerated, the results, generally in digital format, can be indefinitely circulated. In theory, its physical translations, from prefabricated parts to entire buildings, can now be replicated with great fidelity or customised at will to adapt to specific needs. Because design now travels at spectacular speed and can easily be shared and modified, information in digital format has also opened new perspectives for collaboration. Building information modelling (BIM) epitomises these.

Ease of replication and increased collaboration are actually connected. They converge towards the possibility of a truly open-source architecture based on sharing software, ideas and models. However, the question remains as to whether this possibility will become reality. Among the obstacles that may prevent extended collaborative practice from gaining momentum is the problem of fair retribution raised by the multiplication of contributors to a project. In an open-source architecture, there can indeed be various authors behind a given building, from the individual who wrote a piece of software to the designer who used it to create an architectural model, and from this designer to his or her colleague who customised the model and got the resulting project built. Additional authors can be easily added to the chain. The initial software may, for instance, be enhanced with plugins; models can be customised at various levels.



In such a context, one might think that the ultimate question is about authorship. Actually, as in other domains where digital technologies are disrupting the conventional way of doing things, it is the challenge of fair retribution that seems more pressing.<sup>1</sup> It raises the key topic of ownership, in other words of the legal status of the various forms of involvement in the design process that are emerging today.

The original objective of patent and copyright laws was to promote innovation in technology and the applied arts. It was only gradually that it extended to purely intellectual and artistic works. In the US, the first copyright law passed in 1790 did not cover architecture; it was granted only to authors of books, maps and charts. From the dawn of the 20th century, architectural blueprints were given some protection, but it was not until 1976 that architects' plans and drawings were explicitly included in copyright legislation. However, this legal framework is today showing its limits because of the extraordinary diversification of architects' interventions, services and products, and above all because of their more and more complex modes of interaction and layering in a practice that has been completely transformed by digital technologies. The US is not the only country impacted – far from it. This is a global phenomenon calling for innovative legal solutions to the question of copyright.

In other words, whereas authorship used to be the main concern of the architect, ownership is becoming a more and more central question. Not only does it condition the possibility of an open-source architecture; it reverberates on many concrete aspects of the professional lives of designers. 'Open source', 'ownership', 'copyright': these are some of the keywords of this issue of  $\Delta$ , which examines the various ways in which they are now intersecting.

Elemental,  
Quinta Monroy,  
Iquique,  
Chile,  
2004

This residential development, one of Elemental's 'half a good house' projects, offers another possible interpretation of collaborative design by providing a series of robust concrete blocks that can be completed by their inhabitants. In various socially sensitive contexts, open source and collaboration can apply to self-construction.

*... whereas  
authorship used  
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concern of the  
architect,*



In the articles gathered here, digital techniques of design and fabrication, new techniques of replication and customisation, BIM and collaborative practices appear as major factors of change challenging existing legal structures and copyright issues. They outline a new design geography of the world in which US and European conception centres are often in direct relation with Chinese manufacturing facilities. However, this geography is less and less polarised between places devoted to conception and others where manufacturing takes place. China, for instance, is rapidly becoming a major hub of innovative design experiments, as epitomised by the contributions to this issue of Philip Yuan and Hao Meng and of Feng Xu (pp 52–9 and 82–91). Along the various networks that emerge, more and more often at a planetary scale the do-it-yourself culture that has thrived since the early days of publications like *Make*, as well as the various open innovation practices that have developed in the design field, coexist with their opposites: traditional productive organisations and innovation models. This issue of *Δ* also represents an attempt to map this complex transition between the old and the new, the well known and the uncharted.

In his contribution, David Ruy (pp 16–25) begins by analysing some of the contemporary legal issues raised by the evolution of architectural practice in the light of the opposition between an authorial and a professional model. Instead of a mere shift from authorship to ownership, he advocates a subtler balance between these two terms. In counterpoint to his caution, Aaron Sprecher and Chandler Ahrens (pp 26–35) resolutely explore the new possibilities of adaptive knowledge and transdisciplinary practice that arise from an open-source condition, which they have pioneered by creating Open Source Architecture (OSA), a collaborative group that brings together

3D Hubs,  
Marvin,  
2016

Marvin is the mascot of the digital printing platform 3D Hubs. An open-sourced version of Marvin is distributed to individual hub organisers when they enter the 3D Hubs platform, which operates a network of 3D printers with over 20,000 locations in more than 150 countries. 3D printing represents a key component of the open-source movement.

*ownership is  
becoming a  
more and more  
central question.*

'Open source' clearly represents one of the guiding threads of this issue of  $\Delta$ . The way this notion has become a key theme for so many contemporary design practices is truly striking.

Deltastudio,  
Albula,  
Rome,  
2016

*below and opposite:*  
A competition proposal for the public square in front of the MAXXI: Museum of XXI Century Arts in Rome, Albula was the result of an open-sourced approach. Designed as an interactive floating structure, it combines elements from historical watermills with contemporary bio-based techniques.





international researchers in the fields of design, engineering, media research, history and theory. Antoine Picon places the opposition between authorship and ownership in a broad historical perspective that may enable a better understanding of some of the issues at stake with contemporary developments such as BIM. The theme of open source is taken up again, albeit from a different perspective, by Carlo Ratti and Matthew Claudel (pp 42–7) who insist on dimensions such as user participation and feedback possibilities as major factors of architectural change.

In his contribution, Jose Sanchez (pp 48–51) brings the open-source principle to a new level by evoking the possibility of a massive re-patterning of the urban landscape through the transposition of the crowd collaboration present in gaming culture to the city. His exploration of a game developed for the purpose of understanding city building presents path-breaking implications not only for urban design, but also for urban politics. The political dimension of collaborative design is also implicitly present in Tristan Gobin, Sebastian Andraos and Thibault Schwartz's vivid evocation of what the notion of digital platform truly entails for design and the consequences it may present for architects (pp 68–73). In contrast to the top-down model of architects irreversibly abandoning part of their prerogatives to developers and corporations, these authors advocate a more bottom-up approach based on their active involvement in the development of the platform language.

'Open source' clearly represents one of the guiding threads of this issue of *Δ*. The way this notion, which originated in

computer science with the launch of Richard Stallman's GNU free software project launched at the Massachusetts Institute of Technology (MIT) in 1983 and Linus Torvalds's creation of the Linux kernel in the early 1990s, has become a key theme for so many contemporary design practices is truly striking.<sup>2</sup> Just like 'open innovation', a term promoted by Henry Chesbrough from the Haas School of Business at the University of California in a somewhat similar perspective of extensive collaboration beyond traditional corporate boundaries, it raises legal interrogation.<sup>3</sup> Again, how is one to adequately compensate all the different contributors in design and innovation processes that challenge existing professional structures?

Fabrication contributes to make this question all the more pressing, as Francis A Bitonti eloquently argues in an article (pp 100–107) that exhorts its readers to look beyond digital fabrication as mere prototyping and to envisage radical changes such as the possibility of truly designing for individuals while mobilising the resources of social manufacturing. Like Bitonti's article, another group of contributions to this issue of *Δ* deal with fabrication in a frontal manner. In their contribution, Philip Yuan and Hao Meng (pp 52–9) describe a new robotic platform created in China to promote integrated design methodology based on extensive collaboration. 'Robotics' and 'collaboration' are key words in Marjan Colletti's fascinating account of his participation in the Spring/Summer 2016 show of Dutch fashion designer Iris Van Herpen. The combination of human body and tools and robot intervention suggests to him the advent of a 'post-digital' regime based on the hybridisation

The combination of  
and tools and robo  
suggests the adve  
'post-digital' regim  
on the hybridisation  
and technology.



An artistic installation featuring a person's arm and hand on the left, holding a black rod. The background is a wall covered in a dense, textured pattern of pink and purple filaments. The text 'human body intervention of a machine based on nature' is overlaid on the left side in a large, white, sans-serif font, with some letters in orange.

# human body intervention of a machine based on nature

Maria Yablonina,  
Mobile Robotic Fabrication System for Filament Structures,  
Institute for Computational Design (ICD),  
University of Stuttgart,  
2016

This artistic installation explores a new production process for filament structures based on the use of semi-autonomous wall-climbing robots to distribute filament. This type of experiment opens new paths to design by demonstrating the potential of robotic construction.