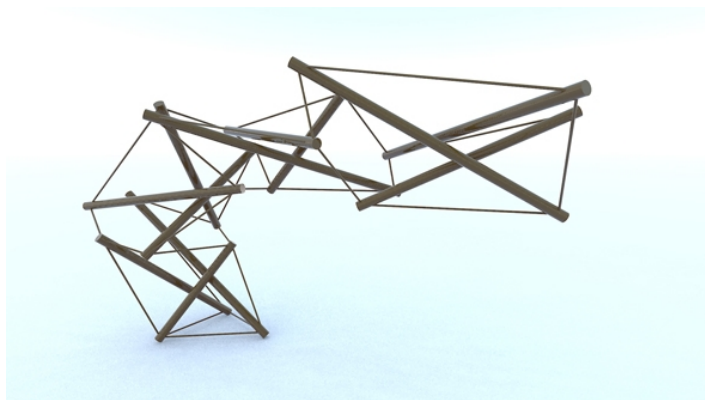# The Architectural Review

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Advanced Geometry Lessons at the Pompidou

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In Paris, a conference on Advances in Architectural Geometry explores the future of CAD, but leaves non-technical implications largely unexplored

The computer has become the nearly exclusive means by which architects and designers think through problems and generate rationalised forms. It's no wonder then that the discipline has begun encouraging architects to gain a deeper understanding of this tool, rethinking its use beyond the metaphor of merely simulating pen on paper.

The biannual Advances in Architectural Geometry (AAG) conference examines this new set of design methodologies known by an ever-growing list of names: parametric design, computational design, generative design, and now digital design. The third iteration of AAG, held 27-30 September, saw the conference grow from 130 attendees in a lecture hall at the University of Vienna to over 400 attendees packing the auditoria of the Centre Pompidou. While the AAG does showcase the latest

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algorithms and software which in several years' time will be behind the buttons pressed and commands issued by architects around the world, it also brings architectural presentations in line with science and mathematics through a rigorous peer-review process emphasising empirical proofs over formal beauty and philosophical locution.


Thomas Kiser and Michael Eigensatz presented a means to control caustics allowing the creation of black and white images from pieces of glass or metal. The use of this technique to project an image of Alan Turing onto the wall of the Centre Pompidou

Of all the work presented, the most overwhelmingly positive reaction was received for a research project by Thomas Kiser and Michael Eigensatz on caustics, the seemingly random patterns of light created by reflective and refractive surfaces (for instance, the light patterns on the bottom of a swimming pool). After years of research and manufacturing they presented a means to control this previously ephemeral phenomenon, allowing the creation of black and white images from pieces of glass or metal. The use of this technique to project an image of Alan Turing onto the wall of the Centre Pompidou's darkened auditorium provoked 300 architects and engineers to burst into spontaneous applause, whistles and cheers.
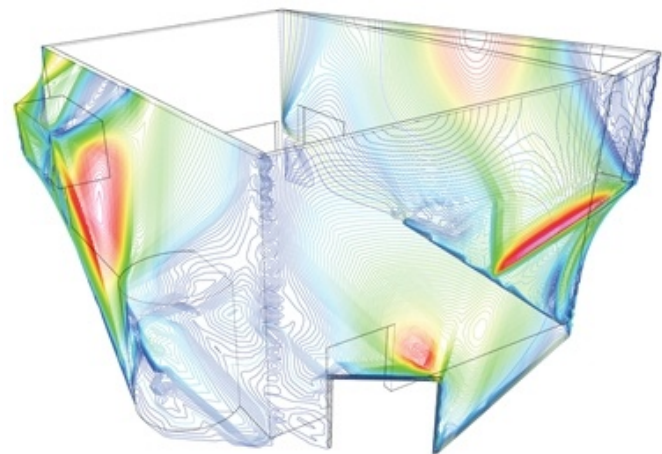
Front Inc's custom software for the cladding of Kukje Art Center facade in Seoul

One of the few projects culminating in a realised building was presented by Jeffrey Kock and Benjamin Bradley from Front Inc, who wrote custom software to solve the seemingly intractable task of simulating the interactions of the half a million interlocking rings of the Kukje Art Center facade in Seoul.
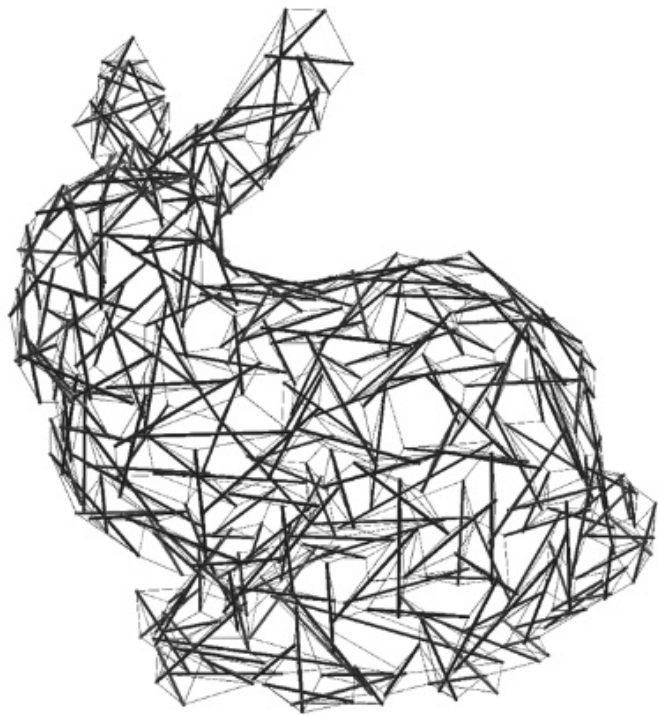
Tomohiro Tachi's tensegrity models derived from origami suggest new design strategies as any volume can now be transformed into a tensegrity web at the touch of a button

Their result distributed rings along a minimal surface of the building, creating in essence Frei Otto soap films out of this filigree metal fabric.Tomohiro Tachi from the University of Tokyo presented software capable of turning 3D models into tensegrity structures, opening up the possibility for tensegrity domes, blobs, or even bunny rabbits, demonstrating how an extrapolation of well understood but simple principles, repeated millions of times in a software simulation, can completely reconceive an otherwise tired architectural cliché.

One of the more fascinating outcomes of his research was the discovery of an isomorphism between folded paper models and tensegrity structures – in other words, any form constructed from folded paper such as origami can be constructed as a tensegrity structure and vice versa. While still untested, it holds fascinating implications for robotic fabrication now that AAG workshop presenter Gregory Epps of the London start-up RoboFold has developed software to take robot arms through

the complex folding motions required to crease metal.

Yet throughout the two days' overwhelming display of computational research, obvious criticisms seemed to go unanswered: why do all the computational pavilions look so similar despite drastically different underlying algorithms? Throughout, the AAG presentations seemed to detach themselves from the process of creating architectural designs. A recurring question for many of the presenters was why they spent months or years of their lives bending over backwards to solve a problem which could have easily been solved by slightly tweaking the design, and the reply was always the same: this is what the architect wanted. They dictate, we rationalise.

Geometry in architecture is patently capable of doing more than merely solving problems: it can offer cultural critiques or artistic statements. Some 37 years ago, at the very site of the present conference, Gordon Matta-Clark created a literal intersection of architecture and geometry with his piece Conical Intersect. Unfortunately, the repercussions of this particular architectural geometry, or any discussion of the world beyond a well-defined set of technical problems, were notably absent. In fairness, many of the discoveries presented would only have been possible without getting bogged down by questioning architectural repercussions or how they might fit into a historical and critical framework, though this mindset does nothing but encourage Toyo Ito to reply, after being asked about the scripts and algorithms of his buildings, that there are no scripts and there are no algorithms: there is only architecture, leaving Mutsuro Sasaki the task of explaining the sophistication behind his work and justifying Ito's presence at the AAG.

Abandoning the isolation giving rise to these projects would be a mistake, though it would be irresponsible not to acknowledge what software's pervasiveness in architecture means to both disciplines. Finding this proper balance is yet one more unsolved problem, but one that with time the AAG is surely capable of solving. So despite the inevitable growing pains, the two days of presentations pushed the boundary between possible and impossible slightly

outward. And that, regardless of anything, was
a great feeling to be left with.

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