MATERIA ARQUITECTURA #13 | SANTIAGO | 2016 | págs. 22-29 ISSN: 0718-7033 Interview

Alejandro Zaera-Polo: Technology is one of Architecture´s Fundamental Tools

Reception Date: August 10th 2016

Acceptance Date: August 15th 2016

KEYWORDS Computer Assisted Design | Sustainability | Parametricism | Real Estate Market | BIM

Alejandro Zaera-Polo: Technology is one of Architecture´s Fundamental Tools

Interview by Mauricio Loyola

Skype interview, 10th August 2016

The Spanish architect Alejandro Zaera-Polo, Director of the office AZPML Architects, is Professor and former Dean of Princeton University School of Architecture, and guest Professor at Yale University. His works and theoretical texts have been published extensively in journals like *El Croquis*, *Quaderns*, *A+U*, *Log and Volume*. Most of his theoretical production can be found in his book *The Sniper's Log: Architectural Chronicles of Generation-X*.

Zaera-Polo was co-founder of the well-known Foreign Office Architects (FOA) and Dean of Berlage Institute in Holland. Some of his most outstanding projects are the Yokohama Maritime Terminal (2002), the Spanish Pavilion at the Aichi International Exhibition (2005), the Carabanchel Residential Complex (2007) and the Meydan Commercial Complex (2007).

For those of us who were in architecture schools in 2000, the Yokohama Maritime Terminal was an iconic construction of the integration of digital technologies in the design process. What is the role of digital technologies in your work today?

They continue to play a very important role. I have always had total faith in the fact that technology is a fundamental driving force of architecture. Now, we simply have other technologies. When we did Yokohama, we were still photocopying and making *collages*; now, everything is done digitally. In my office we communicate by Skype and we share digital files exclusively. We also have other instruments that are extremely important, even if I do not manage them. My partner, Maider Llaguno is very skilful in the use of these technologies. She uses computational models of fluid dynamics, she knows how to write code, she works with Python, Processing, Grasshopper, and even with ANSYS and OpenFoam. Her joining the office has been very important because it has basically meant an updating of production technologies. Maider´s doctoral research on air modeling and variations in the building envelope has also begun to generate new possibilities in projects of the office, not only in terms of building provision but also as generators of new aesthetics.

For example?

One of the things that interests us most at present is that, when you have to model or simulate reality with a finite element analysis (FEA) software, you divide reality into cubes, in voxels which are characterized by certain attributes and functions. When you want to put reality inside that instrument, it inevitably tends to be determined by those voxels, which form a very powerful underlying geometric structure. When we make a project with this type of technologies, in a certain way, we end up being slaves to that three-dimensional grid because getting out of it means high computational costs, which makes us adopt almost automatically geometries that are 'voxelized', like eroded boxes. This, which at first seems a regression in relation to the sophistication of the world of double curvature surfaces, is for us an opportunity to develop other architectural possibilities. It is a return to the rough, the broken, and the approximate, instead of the soft and malleable precision of the NURBS. It is as if the voxels had become the material attributes of the project.

And in regarding to the production process of the project?

From the point of view of the production process, digital technologies are also much more important than before. We now do projects with BIM: everything is already into the computer. You move an element and its coordination is automatically managed by the software. It is a way of working absolutely mediated by production technologies and it is extraordinarily inflexible. Informatics is the fundamental vehicle we work with; when we started, it was not always possible to quantify everything, but now it is a basic default. It is always worth thinking about production media. What is the implication of doing a whole project in BIM, from the beginning? What is the

★ The Yokohama International Passenger Terminal was designed by Foreign Office Architects (FOA). It was inaugurated in 2002 after eight years of construction. It is 430 meters long and 48.000 square meters. The design proposed by FOA (Alejandro Zaera-Polo and Farshid Moussavi) won an international tender in which over 600 offices participated. The work won one of the six RIBA Worldwide Awards 2004. Source: archdaily.com; farshidmoussavi.com; architectenweb.nl

★ Maider Llaguno is an architect of the San Sebastian and Barcelona higher technical schools of architecture, and has a Master´s degree from the GSAPP of Columbia University. She worked for FOA between 2006 and 2009. Source: http://azpml.com

★ Python and Processing are programming languages. Grasshopper is a plug-in of visual programming for Rhinoceros 3D. ANSYS (Fluent) and OpenFoam are programmes to analyse computational fluid dynamics. (CFD).

★ Maider Llaguno completes her PhD at the ETH-Zürich with a thesis on the role of building forms and envelopes in urban microclimates at a neighbourhood scale. Source: http://azpml.com

★ Voxel (from English, 'volumetric pixel'), is the minimum cubic unit of representation of three-dimensional objects used by some programmes of solid modelling.

★ Non-Uniform Rational B-Splines (NURBS) is a computational method to generate curvatures and complex surfaces.

★ BIM (Building Information Modelling) is a technology that allows the production and use of a digital integrated and collaborative model, of all the physical and functional characteristics of a building throughout its life cycle.

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implication for the project, what are the decisions produced almost automatically, and what are the new areas of freedom, still modifiable or controllable? I still believe it is very interesting to think how these production systems have an effect on the way in which we can theorize the project.

Do you think there is a lack of awareness of this impact?

Yes. There is a kind of silly reaction against these mechanisms, from architects who have never understood them and will probably never understand them. And since they have now been trivialized and are not in fashion, they use easy criticism to justify their inability and say "now buildings can be square again". In fact, buildings can be square again, as I was telling you about voxels, but they do not need to be square. I think that exile or exclusion of any formally complex geometry now seen in schools or in magazines is a temporary phenomenon.

I would love to know your interpretation of parametricism.

I always say that the idea of parametricism was invented by me (he laughs).

Have you told Patrik Schumacher?

No, I have not told him (he laughs). Well, he invented the word, very well invented, but the first experiments done on this topic were done by us at the Architectural Association before Patrik came to teach and became interested in this type of technology. Diploma 5 of the AA was the first place where we began to do research on production by computer, what we would now call parametric and quantitative. Diploma 5 based this on the possibility of beginning to think about the project in a parametric way, as if it was coming out of an AutoCAD menu. Obviously, there was also an influence from the scientific thinking of OMA, graphics, and quantification as an architectural tool. With Yokohama´s success, this research became predominant at the school and it was then that Patrik joined AA, mounted the DRL and began to work with these instruments.

I had been interested in the computer before, since I was at the GSD. I like to tell this anecdote: at that time, I was a genuine '*paleto*' from Madrid who arrived at the GSD with practically no English. For a strange reason, I became interested in computers, with the distance I felt because I did not belong to the elite of the school. I am sure that if I had been North American I would not have learnt anything about computing, because computers were ill-regarded by sophisticated GSD designers; they were seen as instruments for geeks who would be devoted to their PhDs or to do technological products. But, since I was a *paleto*, I did not care, I did not even notice that being interested in computers was not fashionable. I registered into all the computer courses. One day I met Rafael Moneo on the corridor and he asked me "what courses have you taken this semester?" and I said "I have taken this one, this one and this and this, and my third computer assisted design (CAD)

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Parametricism is a concept coined by Patrik Schumacher in 2002 to describe a contemporary architectural style characterized by the intensive use of digital technologies of parametric design and complex and variable geometric forms.

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Patrik Schumacher (1961) is a German architect (Stuttgart Technical University). Before graduating, he studied mathematics and philosophy at the University of Bonn. He is associate-director of Zaha Hadid Architects and Professor at the University of Innsbruck. He is the author of *The Autopoiesis of Architecture, Vol.1: A New Framework for Architecture* (Wiley, 2010); *The Autopoiesis of Architecture, Vol.2: A New Agenda for Architecture* (Wiley, 2012) and *Parametricism 2.0: Rethinking architecture's agenda for the 21st Century* (Wiley, 2016). Sources: zaha-hadid.com; worldcat.com

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The Design Research Laboratory (DRL) is a programme of the Architectural Association leading to a Master´s Degree in Architecture. It was founded in 1997 by Brett Steele, current director of the AA, and Patrik Schumacher. Source: aaschool.ac.uk

★
Harvard Graduate School of Design.

★
Paleto: Rustic person, without skills to manage in an urban environment. Source: rae.es

course", and he replied, taking me by the elbow: "that is being interested[1] in the worst sense of the word" (he laughs). Naturally, because he was not at all interested, he said that if you devoted your time to working with a computer you were never going to do anything as a designer. And he was right, because before 1990, the computer interface was very hard and it required so much effort that, evidently, your capacity as a designer was affected if you dedicated your time to that. But he did not count on the fact that the interface could evolve so quickly that my generation would be able to jump the means of production and abandon traditional methods completely.

That was the time of technological change…

I truly belong to the generation that shifts from traditional production means – from pencil, rotring and paper – to digital means of production. And that is exactly what happened in 1990. I did my thesis project directly on the computer and I was the only student who did it that year. The following year there were five or six, and then cables were put in all of the GSD trays because all of the students were working with computers. So, the change took place literally in two or three years; computing stopped being a field for specialists and became a tool that everybody had to be able to use.

★ Student's.

I understand that moment of explosion of digital technologies in architecture, but parametricism as a theoretical concept, as a style, is something else which, in fact, has been much criticized. What do you think about that?

I think it is a very good name, I think it is appropriate, a genuine contribution to discourse. Patrik was able to capture very well the moment when architects became interested in forms which were not intersections between other forms – they were not booleans they were not collages, nor compositions of primitive forms –, but forms that had a degree of differential resolution that could not be obtained before with any instrument, and they were suddenly feasible and becoming a style. I totally agree with Patrik in that there is a parametric style and that many people are interested in exploring it. It can already be seen that it is not 'the definite style', because it is now out of date. Evidently, like all manifestos, it is polemic and causes debate and criticism. At a certain moment, there was that trend, in the same way that there is now a kind of involution against that type of aesthetics and a return to the architecture of simple forms 'for themselves', because, even though new prophets of post-parametricism are ready to make an appeal to rationality and economy of generic forms, they are not necessarily the best or the prettiest.

★ Booleans means geometric forms constructed or derived from boolean operations (union, subtraction, intersection) characteristic of the first software of three-dimensional design.

(1) N. from the Translator: The Spanish word "interesado" (interested) has a second connotation close to "selfish" or "profit-seeking", meaning that a person is carried away too much by interest, or only moves for it.

You can produce any form today, but… what for? where is the merit?, where is your capacity when everything is possible?

MATERIAL TECHNOLOGIES

Digital fabrication technologies progress at a pace that suggests that 'everything can be done' today. You are somewhat skeptical or critical of this idea, why?

It is not that I am skeptical, in fact, I believe that if you have money, you can do anything. I find that exploring the possibilities, which are boundless, is less interesting than exploring the boundaries. That is, knowing within what costs certain forms can be produced, or determine what is the threshold from where you can no longer produce certain forms, I think this is a much more interesting research than the one that would come up when we say "I am going to see if I can now manage to make a triple-curvature form which, in addition, folds topologically over itself…". This does not interest me at all. The possibilities are already so many that they have produced the rejection that we see now. You can produce any form today, but… what for? where is the merit?, where is your capacity when everything is possible?

In this context, what is the relevance of handmade and crafting in architecture?

There is a very big difference between handmade and crafting, clearly in favor of digital. I think that the idea of crafting has not disappeared, it has been made more powerful. But I do believe that there is a crafting of digital fabrication or of 3D printing. However, I believe that manual instruments are no longer of interest because there are other production mechanisms which are far more powerful.

Do you think that the lower relevance of manual instruments is a risk for the material tradition of architecture?

Not at all. Materials continue to be there and they are very interesting. Before, buildings were made of brick, wood, stone, steel and concrete; today they are made of Styrofoam, Tyvek, Dryvit, EPDM, aluminium, PVC and stuff like that. There is another wider and more interesting range of materials. It is a very interesting potential realm. Digital production machines work on new elements, but also on the old ones; thus they substantially extend the way in which they operate. Gramazio and Kohler have done wonderful research on the possibilities of using bricks in an innovative way by placing them with robots.

BUILDING ENVELOPE AND SUSTAINABILITY

A typical topic of your work is your concern for the building envelope. What makes you focus on the envelope as a central element of architecture?

It was something that I found when I was working on real projects. In the end, you realize that a large number of projects are absolutely pre-determined, whether you like it or not. When you build a shopping centre, for better or for worse, you can never invent the shopping centre of the future, simply because the market does not give you space for that. There are inertias that are being constructed as the material

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Fabio Gramazio and Matthias Kohler are architects and researchers of the ETH Zürich. They focus on digital design and fabrication using industrial robotic technologies.

life of a civilization develops, which are irreversible. Among them are, how a social develling is organized, a shopping centre, an airport or an office building, or what is the depth there must be between the façade and the nucleus of an office building. They are parameters given by the market. It makes me laugh when someone thinks he is going to invent the shopping centre of the future. It is a project that, most probably, will not reach anywhere. This does not mean that you cannot change things, but changes have to be much more incremental.

To pretend that we are Le Corbusier or Mies van der Rohe, who lived at a time when there were indeed opportunities to change the internal structure of the building, is simply naïve. I would not keep anyone from trying to do it, but it does not seem to be a very productive or promising research.

Then, the envelope seems to be the last resort of decision left to architects…

Yes, exactly. I realized that when I went to a meeting about the building of the shopping centre and we were talking about the façade, everybody listened to me thinking "he is the one who knows". But this is only one part of the reasons why I am interested in the building envelope. The other part is that there is a series of very important problems, the most important that architects have to solve nowadays, that are really solved in the envelope and in the massing of the building: problems of power consumption, insulation, and thermal and hygrometric operation. Any section of the shopping centre of the future that you have to build is the same; if the envelope has de proper dimensions, it will function well in ecological terms, which for me is far more important than the special effect that we can supposedly be able to produce. This is an important research in which we can have a voice and the capacity to decide and on which we can construct a discipline. Global warming or energy consumption are extremely important and if we, architects, were able to tame this beast, we would be 'kings of mambo'. Fifty percent of carbon emissions is produced in cities and in buildings, and sixty percent of energy is consumed in cities and in buildings. You can dedicate thousands of millions to develop the best fuels for airplanes, but the impact that is going to make on the environment is insignificant if we compare it to the impact that finding technologies and architectural forms capable of improving the power consumption or the energy absorbed by buildings may have. When I think about this, I see it very clearly. I cannot conceive any other way to progress in the practice and in the discipline.

I have the impression that for an important group of architects, the flag of sustainability works more as an excuse of design than as a true social or environmental concern. Do you share the idea that there is some hypocrisy in the discourse of sustainability in architecture?

I do not know, and it is all the same to me if people take it hypocritically. It is the most important field in which architects can work today. Besides, I like excuses very much. I have even written a 'theory of the excuse', according to which it is more

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interesting to think the history of architecture as a series of excuses than as a series of manifestos. This is the result of having been involved in the academic and the professional world: I frequently met students or collaborators who did very strange things because they liked them, because they had seen them in a magazine or because things had just turned out that way. To me, this seemed tautological and totally soporific, like the majority of those architectures which are architecture by itself, that do not set out any problem nor find a solution. My reply was invariably that not a single line could be drawn until there was an excuse for it. Other architects, perhaps, just need to say "I am interested in symmetry and in asymmetry, and I play with these concepts that have been part of the discipline since times immemorial". For me, the excuse has to be economical, functional; that is to say, that it gives the project a certain legitimacy beyond being merely architectonic.

In the end, sustainability is a good excuse.

Yes, yes, it is actually a mine of excuses. It is something else then, when you scratch and the excuses fall; but, well, it is there where you have to work.

INDUSTRY AND MARKET

Your office has one foot in New York and the other in Zürich, places with very different architectural traditions. In the United States, the industry is dominated by corporate architecture. In Europe, architectural practice is understood as a cultural action, with more freedom to explore.

It is a situation caused by the market. I do not think that European architects are more interested in cultural practices than American architects, but the Anglo-Saxon culture is, in general, less collectively receptive to that added value of architecture as a cultural project. The Anglo-Saxon market is harder, it is far more optimized. In the 40s and 50s, General Motors hired Saarinen to build their corporate headquarters; Seagram hired Mies van der Rohe, and so on. The economic activity was more linked to the construction of the city and to the construction of buildings. But long time ago, the Americans decided that it is much more lucrative to pay publicity campaigns with the money that they used to invest in building superb corporate headquarters. They buy and rent totally generic buildings that they can use and discard, that they can leave at any moment to move into a similar one, or let to another company that will not be interested in identifying with its environment either, that is no longer a critical part of its identity.

However, in Europe that is not so yet. On the one hand, the States invest more on building the public space and the city; there are important political powers that still believe in the city and in architecture as important tools of social and cultural cohesion. In North America, customers capable of appreciating that kind of things have been reduced to seeing them in museums, in universities, in a series of bastions of culture which are marginal in relation to the volume of the economy.

★ Eero Saarinen (1910-1961), Finnish architect and designer who developed most of his work in the USA. One of his best known works is the TWA Terminal of Kennedy Airport in New York. At the end of the 40s, he designed the General Motors Technical Center together with landscape architect Thomas Church.

You say that Europe is not like that "yet". Do you think that it is changing or that it will change?

Yes, it is clearly changing. The American model is more advanced, it has evolved more. In England there is a kind of hybrid condition in which the market is almost as powerful as the American one, and the market is quite bad for architecture without the interference of other institutions. The market makes everything *vanilla buildings*, the most generic, the cheapest, more efficient. In Europe there is still a public standard that ensures a minimum quality of projects in which money has been spent. Architecture is taken seriously. In North America, there is almost no public money to make collective equipment; and in England, less all the time.

And then, how should we prepare for this change?

(He sighs). I explain to my students that we are not outside the real world so they should not think of disciplinary topics only, they should initiate conversations beyond the school, with an external audience of promoters, citizens and politicians. I have never done a study that does not have a real project as a final objective. At the AA, I developed the surroundings of the Tate Modern in 1994, the design of Bluewater Shopping Centre in 1995, the South Bank Centre in London, and so on. A former collaborator who is now an academic came yesterday and told me that she was recently teaching one semester at a very important American school and that she was horrified. She could not believe the nonsense said to the students, who were asked to think of the 'problem of space'. Why make students think of space, symmetry, aggregation? You have to teach students to think of the economy of construction, the logistics of construction, the proportions that a building envelope must have so that it may have the proper power behavior. You have to teach them to face concrete problems instead of going on thinking that they will learn by making formal composition exercises, which is what was done a century ago at the *École de Beaux Arts*.

…it is what is done at most schools.

Yes, that is right, it is what is being done, and that is how architects are being trained. I cannot do that, I ask them to get involved directly in real processes, not in obsolete disciplinary speculations.

But, together with defending that very realistic training in practical architectural problems, you have an important theoretical work. Your book Sniper's Log, that contains theoretical texts only, is 600 pages long.

I do not think there is a very big difference between doing architecture and writing. Historically, architects have always written a lot: we are architects because we write. We also draw, but we write a lot. In North America, there is a kind of schizophrenia between those who write and those who build: those who write never build and those who build never write. Finally, neither knows the end of the picture. m

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The Sniper's Log: Architectural Chronicles of Generation-X (Actar, 2012).