What Is Parametricism?

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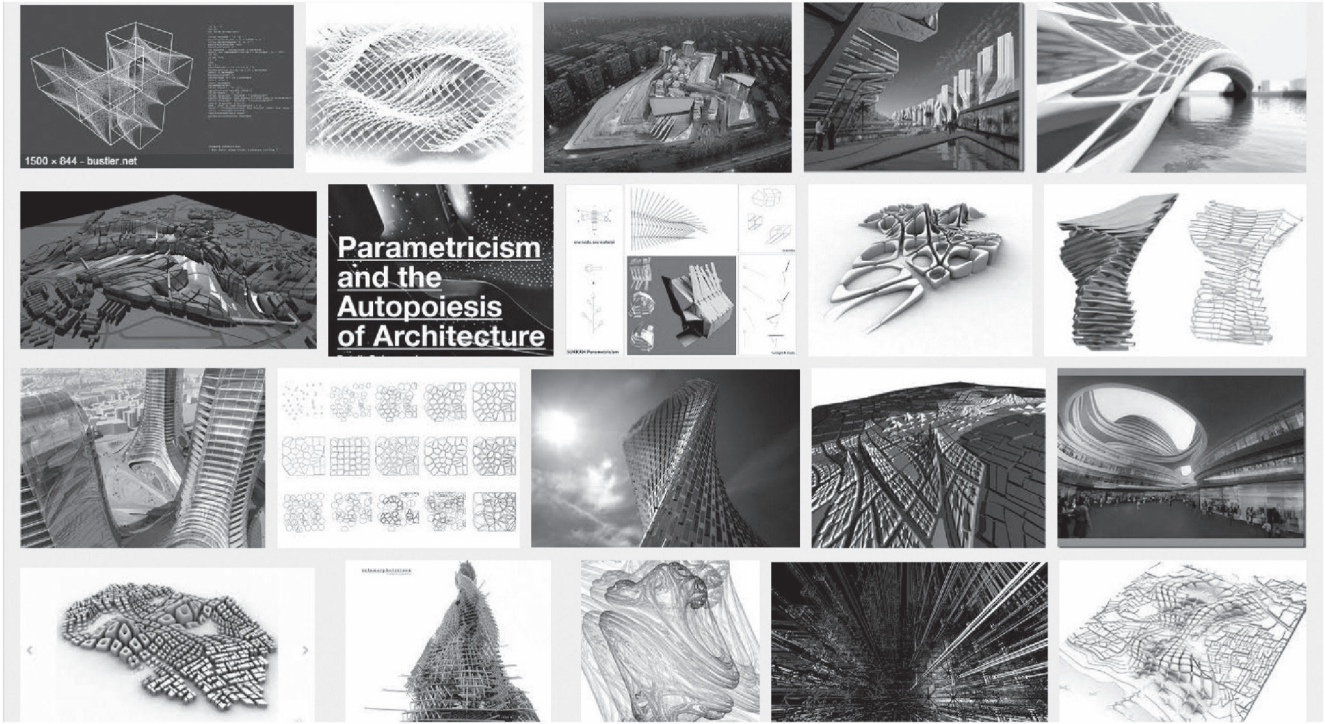

Google image search: Parametricism

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to our readers

Parametricism is probably one of the most redundant and abused words in architecture schools today. In this issue we ask, "What is Parametricism?" Read through its actions, it is the process by which we organize information, approximate the world and visualize its measurements. The parameter, as a variable of differentiation, defines the limits of a system and the conditions for its operation. It is through parameters that we are able to produce certain logical relationships between parts. Fundamental to this, however, is the assumption that the object or phenomena we are modeling is in fact quantifiable.

Advances in computational processing have promoted our capacity, and thus faith in the ability, to systematically classify and itemize the world around us. But this increased level of complexity has been hijacked by formal exhibitionism. The "Parametricist Manifesto" concerns itself solely with appearance.

"Negative heuristics: avoid familiar typologies, avoid platonic/hermetic objects, avoid clear-cut zones/territories, avoid repetition, avoid straight lines, avoid right angles, avoid corners, …, and most importantly: do not add or subtract without elaborate interarticulations.

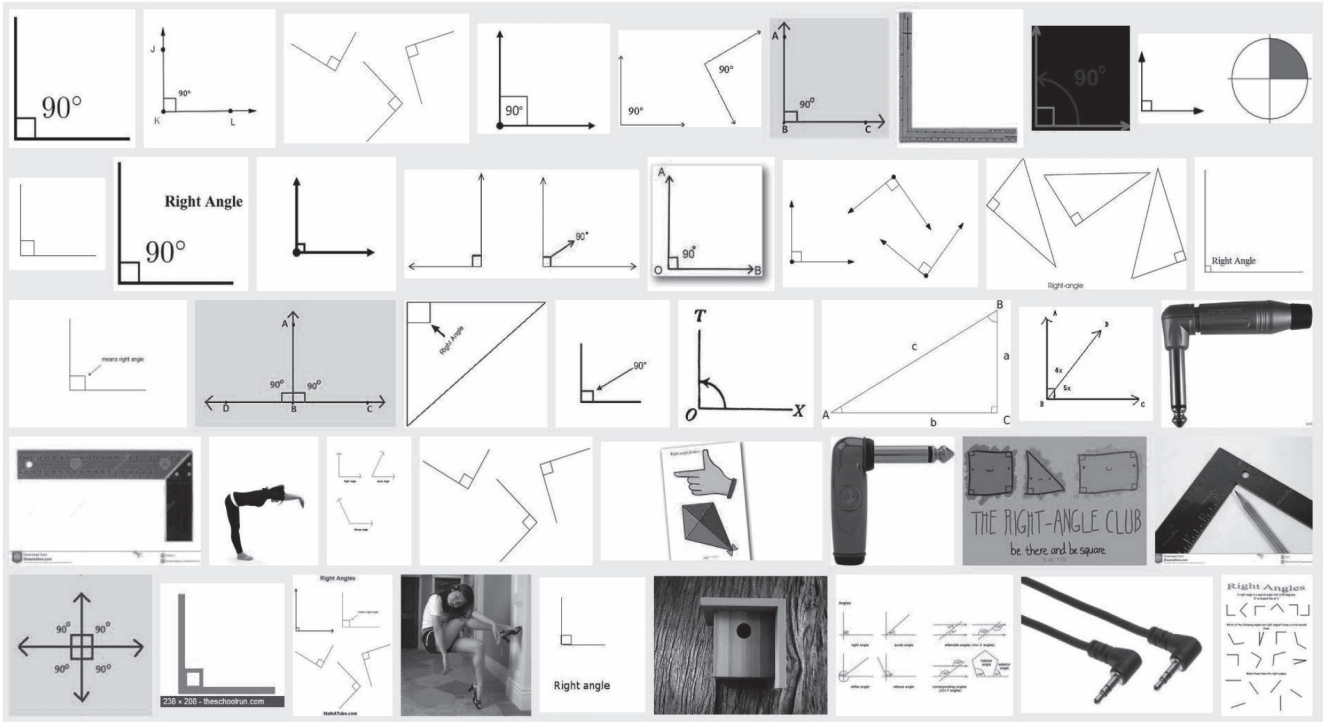
Positive heuristics: interarticulate, hyberdize, morph, deterritorialize, deform, iterate, use splines, nurbs, generative components, script rather than model, …"[1]

Under the guise of form, Parametricism has removed itself completely from political discourse. However, objectivity is its biggest misconception. It is not only embedded in a long history of technocratic methods of control, from the theories of cybernetics proposed by Jay Forrester to the network systems by the RAND corporation, but it is also predicated on exclusion—every selection involves a rejection. In this bracketing of information, the author of the parametric system assumes an active, subjective role in emphasizing intentional decisions over accidental ones.

A rejection of the term Parametricism is clearly visible within the contemporary discourse. Alternate terms such as "digitally intelligent design," "algorithmic design," "object oriented design," and even "post-parametric design" have arisen to describe this vastly differentiated field. What these design theories do share, however, is a predilection and belief in the tool. The basis of this belief is the faith in numbers to represent our world.

In this issue we address indoctrination with Mark Wigley, debate the digitality of ground with Mario Carpo and Peter Eisenman, contextualize Parametricism's historical past with Reinhold Martin, move beyond the term with David Benjamin, concern ourselves with the interaction of objects with Biayna Bogosian and Maider Llaguno, and delimit the limits of optimization with Daniel Davis.

1 Schumacher, Patrik. "Parametricism as a Style - Parametricist Manifesto." 2008. www.patrikschumacher.com



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instead of saying I want the banana

Mark Wigley in conversation with C, LV and VL. Recorded March 7, 2014

C: To start with we would like to identify a key word, parameter, as in parametric and Parametricism. Our understanding of a parameter is a number that is a result of our obsessive quantification of reality. This has been enabled through technological advancements and our ability to comprehend, hold and process data at a much larger scale. With this assumption that now everything can be quantified, and now that we have access to it, this has led to a more complex understanding of the world. Parametricism attempts to represent this complexity and through it moves beyond modernism. But Schumacher's definition of Parametricism is a description of a process that leads to a specific formal output. To me this seems like an unverifiable theory because the only way to critique or judge it is based on form.

MW: I was looking up the definition of parameter on my phone while you were talking. It's quite a word. Parametricism on the other hand is the wish of the person using the term, whether it be Patrick Schumacher or anyone else. He's using this word in the hope that a certain group of people will subscribe to it. That's his dream: to do something important, to think of Parametricism occupying the space that used to be occupied by the word Postmodernism. Which is not a very interesting aspiration if you think about it. One possible response would

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be to say there is no such thing as Parametricism. That's not a good description of what people have been doing in recent years. Not because these people are not somehow linked, but because you haven't described what it is that links them. Or because what they're doing isn't an "ism," that no single account would do the work justice. Or because your theory is incoherent and overburdened with too many misunderstandings of too many thinkers and designers. All of these accusations are accurate but the main problem for me is the ideological one, the overtly fascistic dimension of such a totalizing ambition. I am profoundly opposed to this project, even though I have no right to be because I could always be more knowledgeable about what those people are doing and what he's trying to describe. So lets just say that I am expressing an aesthetic prejudice against what this person is trying to do, not a prejudice against the aesthetics of contemporary computationally based work but a prejudice against the aesthetics of a certain way of doing theory. The way he is understanding Parametricism for me is entirely fascistic. It's not just like control or about control. It is the aesthetics of control. The crime is the attempt to produce a totalizing theory, that is to say, the idea that everything could be described in this particular way. It reminds me of the not very well disguised fascism of Christopher Alexander's *Pattern Language.* Perhaps it was not by change that Alexander was one of the very first advocates of computationally driven design. The pseudo-scientific aesthetic of a book with the form of 1.0, 1.1, 1.1.1, 1.1.2. etc. already alerts us to the nightmare. When a student at Columbia, at the end of Patrick's talk, said, "But you seem to have left out the aesthetic," he hesitated, as if this was a moment of surprise and deep insight, and said that is a good point, he should include it. You could just see that he wanted to go "1.1.3.1, Aesthetics" instead of wondering if that's a challenge to the whole system.

Of course it's just an attempt to produce a system and all systems are totalizing. It's not yet a crime to want to have a totalizing theory and all theories are more ambitious than they can say. But in this case the particular totalizing theory turns on the concept of parameter. Parameter implies formula. There's a formula and if you adjust a parameter within it you're going to get a different result. Adjusting a sufficient number of parameters would come up with any object, or in reverse any object could be perfectly described if just had the right parameters and measures. It says the world could not be just fully calculated, but could be thought of in terms of a formula, a formula more efficient than the world. The complexity of the world is reduced, or at least absorbed, along with the contradictions and unknowability of the world. Parametricism is another pathetic attempt to contain the strangeness of ourselves and our worlds. It tries to expel any otherness. And this gesture, of excluding the other, is the very basis of the greatest darkness in human history and the human present. This dream of having a complete description of the world that is smaller than the world lurks in all theory, and lurks with an

implied violence that requires vigilance from us, even in the face of a seemingly modest and open theory, but is repulsive when turned into the very ambition and effect of theory, hence the need for vigilance. The dream of so-called Parametricism is the quasi-theological dream of having the blueprints for world production. One more architect applying for the God position. It is such an uninteresting way to understand things.

Furthermore, it displays such an impressive historical naivety. To oppose this way of thinking to so-called modern architecture is ridiculous because so much of the ideology of modern architecture turned around the idea of minor variations within in mass production. The idea of mass customization is an inevitable step, already implied in the nineteenth-century logics that drove twentieth-century architects. To go from the Henry Ford idea that every car is the same car, one model, only black, to a world of personalized 3D printing is not a shift from a non-parametric world to a parametric world. It's a significant shift in the number of parameters but remains within a logic of parameters. The ability to generate any shape at any time produces an aesthetic of novelty but the approach is not novel. The search for formulas, the awareness of parameters, has a long history in our field.

C: But we could also say that the iPhone is nothing new and that it is simply a much smaller mainframe computer that at one time occupied a giant room. Due to the increase in its processing power and decrease in its size, it is not a new innovation in itself, but this continuation of customization has allowed new and novel uses with it.

MW: I agree and I think that's what I mean when I say it is significant that you can now mass customize, but the significance is not a system change in the sense that now we are in the fluid world of the parametric and we used to be in the fixed world of the right angle. The other related problem with it is that Patrick wants to associate that way of thinking with the work of the Hadid office as if that work comes out of parametric logic, rather than the other way round, that parametric logic has enabled that work to evolve in compelling ways. It involves a more or less criminal claim that certain early projects done as paintings by Zaha are already that way. To read her early work as proto-parametric is to catch only one dimension of the brilliance of that early work. It's important to remember that Zaha, one of the genuine minds in our field, was trained as a mathematician, so basically this is a mathematician who paints, disrupting the complacencies of architecture but also drawing so thoughtfully on architecture's own history, most obviously the Russian avant-garde but ultimately a wider spectrum. Zaha is a much more interesting confusion of the mathematical and the aesthetic.

LV: In 2011 Farshid Moussavi, in her article in A*rchitectural Review*, "On the Need for Parametric Thinking," she criticized

Parametricism as being a closed, formally driven movement that aspires to novelty but that produces always expected results.[1] In opposition to this she claims for a parametric thinking, a network of thought able to produce an intelligent architecture "that embraces the full complexity of our environment." Having in mind the word parameter and its double sided meaning, Schumacher on one side, Moussavi on the other, how have you experienced the emergence of this term in architecture during your deanship?

MW: On a biographical note, Greg Lynn was in my first class when I first started teaching at Princeton in 1988 or 1987. I like him a lot and his work was not yet down that path but it was really on the edge of that direction. At that time Hani Rashid was teaching here at Columbia and then Greg joined him in Bernard's experiment with the new computational technologies. There were three "paperless studios" which I think were Scott Marble, Hani and Greg. Bernard was a wonderful curator in making space for these very young people in the school. It required another kind of gesture to support the next generation that was doing stuff with computers. So very quickly, over the 15 years of Bernard 's leadership, GSAPP became global epicenter for this kind of thinking. Then you start to get another generation as those students who were in the first paperless studio start to become teachers. By the time I arrived, you had the reverse problem: the first set of teachers remain interesting but their students have now become religious teachers, wanting their students to do the same thing that they did. That early experimental thinking had become academic. I began a process of outsourcing the experiment to other schools, basically Parsons, Penn, Pratt, Sci-Arc and so on. Basically we provided the faculty for about 5, 6 or 7 schools to concentrate on this stuff. And those people who were becoming quite stale with us did much better in these places. They became terrific teachers which is wonderful. By being in other schools they were finally able to develop their own angles. You can imagine the kinds of people I am thinking about. Since this is a laboratory school, each experiment has to be displaced by the next. that was the old experiment, which is now being carried out in a network of schools.

In a certain sense, what began here was what David Benjamin would describe as "post-parametric." It's another logic in which the parametric itself is no longer so infinitely magically wonderful. It is just the beginning of an argument rather than the endpoint. It is now just a basic toolset, rather than a religion. Every architectural office in the world is now deeply parametric by virtue of the software platforms they use, the platforms used by the galaxy of their consultants, but also by their clients, all the way from the data flows in individual houses to the management of whole cities. There are so many counter-strategies that can be employed in this environment. For example, David Benjamin's studios attempt to reverse engineer parametric thinking. Not tweaking parameters to generate

shape but testing all possible shapes to maximize a series of performance qualities whose interaction is not clear. In other words, discovering hidden parameters rather than starting with them. It's saying, "I don't know the truth, but I could randomly test every possible solution." The software could deliver me potential answers. A project that does everything it has to do without explanation.

C: Right. If you assume that the software will deliver the answer, the question then becomes the answer, the question becomes the truth. By saying I want to get a skyscraper that will optimize sunlight and create nice wind flows, is that any less of a truth than saying I want a skyscraper that looks like x, y and z?

MW: I think it is just a way to reposition the concept of parameter in the conversation as a step towards starting new kind of conversation. Basically I feel personally very close to the "parametric" generation but their thinking has become normalized in the profession. What used to be thought of as a very exciting revolution and a form of avant-garde practice is now simply what you need to do to build an office building. Right now it is being deployed to reduce budgets and ambitions more than it is being used to liberate new potentials. Parametric thinking is not inherently progressive. If you want to be regressive then parametric thinking is super useful. Of course the ability to have 40 different professionals working on the same drawing at the same time and the drawing react to all the changes made by everyone else can generate great work. For example, when Ben Van Berkel did the Mercedes-Benz building the whole building would redraw itself in response to every minor change and the design was able to evolve in a holistic way without adding to the budget. The building could go further under such conditions. And this can be radicalized into the possibility for much more experimental multi-dimensional operations, and easily lend itself to open source operations because there is no real requirement that one particular person has to be inputting something. I strongly feel that architecture will gain a lot by going open source. And even there, the reverse engineering approach that Benjamin is exploring can evolve. Almost anyone could input anything into a design and another set of calculations would explore both the consequences in terms of current thinking and the possible new forms of thinking that might be implied.

VL: By using "big data" potentially.

MW: Yes. So you could have for example an object that is produced and not really have any clarity about how it was produced or who produced it, but the feedback is two thumbs-up and a new way of judging emerges which could turn into a new mode of producing. I don't read in the Schumacher approach a real love of taking the author out of the picture. Authorship is simply being relocated to the authorship of a

meta-theory. I think architects have insight into so many things, but they are not philosophers, they are not mathematicians, we have to preserve a little bit of space for the architect as a unique and complicated species.

What I think happened here in the school was that the parametric, which was a disruptive experiment and then became a profession norm, is now going deeper and is actually becoming more radical, even though it no longer has an aesthetic branding. The C-BIP studio was the first time within a school that a serious attempt was made to see what would happen if an array of engineers and students would occupy the same digital construction site without the usual protocols of authorship. Every object designed in that environment could be used by your colleagues but you would have a responsibility to the maintenance of that object. There is a kind of crisis coming down the pipes towards architectural education because your generation has developed such sophisticated ways of sharing knowledge, ideas, images and scripts. How could architectural education remain so addicted to such threatened ideas about authorship, about studio culture, and about the way that objects are experienced in everyday life. Not by chance, one group of students is busy making an open source library. You guys are creating the environment that will ultimately be the environment of your own education. The role of schools of architecture as a platform is about to change and I think that is refreshing.

C: You already hinted at this idea of the self-legitimizing nature of parametric thinking in the sense that when you speak of the designer as controlling parameters to create the world and being in the position of god, we are putting faith in the original person who is choosing the inputs to be manipulated and produce the outputs. And then there is a direct line that can be drawn back from the outputs through the algorithms to the inputs that can be calculated and rationalized. But that takes an initial jump in faith to agree that the inputs are valid in the first place.

MW: Of course. as a card-carrying believer in doubt, if I can say that, what's interesting about architecture for me is the launching of a hypothesis in the space of doubt. The whole thing about doubt is that you have to make decisions. Decisions are not ever made for you. A decision is a jump. I could go left or right, nothing is telling me what I should do, I just have to decide which way to go and do it. Decision involves a leap, a jump into the abyss without knowing what will happen on the other side. The parametric logic is afraid of that, it's terrified of decisions and more than anything else it's terrified of jumps and of doubt. What it says is "don't worry we can calculate everything!" To believe that everything can be calculated doesn't mean necessarily that you're a boring person, but it really helps. I mean, if you really do think that everything can be calculated you are very likely uninteresting, or, you would just wish yourself to be a formula, a calculating machine. In

that sense I am super old-fashioned in the idea of architecture as an act of unjustifiable confidence. It is a form of confidence. It asserts itself, it makes a statement and a stand. It's a kind of gesture in the space of doubt. Of course doubt has a certain shape and mathematics can help you locate the shape because all of us calculate. I am not against calculation. I just went to a calculating machine to see what that word parameter means. What calculation does is to define what I could know, which only then acts as the silhouette of what I don't know, the doubt. I can do the calculation and have little guidance other than to remind me what I don't know, which is an invitation to decide, to jump, to invent. And some people are not that great at that. I prefer it when design and theory are in the hands of the ones who jump, the ones for whom the unknown, other, the danger of the other, is the very source and reason for being alive.

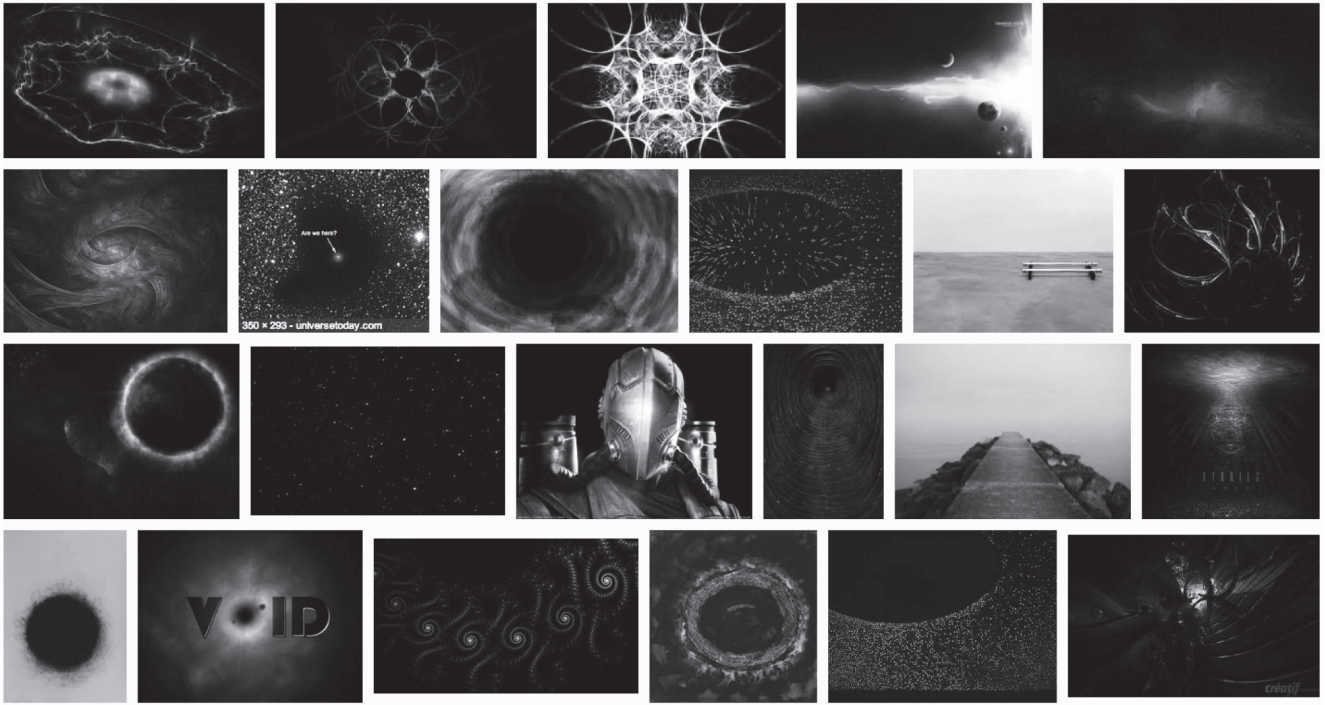
VL: Do you think they're lead by belief or intuition?

MW: Or you choose to fall in love with this thing that you have made, that you don't know, that you cannot know, even though you made it. But you love it, because love is that word for that thing which you can't calculate but you don't want to be away from.

VL: Would you describe that as a belief?

MW: Umm… that's what's difficult to know. Certainly in the religious sense, in Christianity love and faith are identical words. Love is exactly when you believe, despite the evidence, you believe in that which could never be calculated precisely. The counter religion is that I can count everything and now I'm god. It's not like the being that is everywhere and nowhere. It's like I am Patrik Schumacher suddenly. Somehow the figure of the architect is right there at the center of the intersection between mathematics—that which can be calculated—and art—that which engages with that which cannot be calculated. At a certain point this school said I can make art out of calculation, and that went pretty well. Then it was no longer art, it was business. And now we are wondering what the relationship between architecture schools and calculation is today. My cute answer would be the very fact that you are asking me these questions.

1 Moussavi, Farshid. "Viewpoints: On the Need for Parametric Thinking." *Architectural Review*. 2011. http://www.architectural-review.com/



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filling up the void with presence

Mario Carpo and Peter Eisenman in conversation with G & L. Recorded March 25th, 2014.

L: In Mark Wigley and Peter Eisenman's conversation at GSAPP in September of 2012, "The Cat Has Nine Lives," the discussion on subject of phenomenology was centered on the issue of ground.[1] Also, going back to what Mario has said, the issue of Phenomenology in the digital realm has been defined as a digital metaphysics of presence, or a shift of the ground into the digital platform.

PE: First of all, the digital people are unaware that they have become phenomenologists. They are filling up the void with presence. It is not to deal with the absence of presence but with presence. What they produce is all objectification. We are talking about a new kind of Phenomenology—you see these strange shapes that are all figural, what Mario would call spline modeling.

L: Exactly. Mario's essay in *Log*, "Digital Darwinism," states that Parametricism and its supporters are trapped in this. Also, they do not fully engage with the tool where their architectural output lacks variety. Quoting Mario, They seem to be "stuck in this spline based visual environment as the ineluctable stylistic expression of digital making."[2] Then, to define digital Phenomenology, it represents a return of the designer, "to the artisan state and also the end of the Albertian paradigm. The

artisan does not analyze and quantify, but makes and senses through the body's digitally mediated prosthetic extensions."[3] In line with this, "a new computational alternative is the cause of a revival of traditional, irrationalistic, or vitalistic, beliefs into the intuitive powers of artistic creation." We see two sides of digital Phenomenology. The first is the group that remains unaware of the digital ground—even though I believe there is a new awareness that is growing.

PE: Let us assume that what you are talking about is largely unaware.

L: On the other hand there is the side of computational design that deals with irrationalism and intuition. Figures such as Antoine Picon and Michael Hansmeyer have also been writing about this possible return of ornament, and new space or possibility for meaning in the computational architecture and symbolism.

MC: I think for me, the key is irrationalism and vitalism as the animation of the inorganic. This is odd if you think of the computer as a machine. We do not think of machines as tools of irrationalism. Often times, like in the 90s, computers have been interpreted and seen in an irrationalistic way. We have a key word—which is problematic to use but it is embedded in this argument—which is the magic of technology. Let us not forget that the inspirational text for Alberto Perez-Gomez's *Architecture and the Crisis of Modern Science* was not Heidegger, it was Husserl.[4]

PE: …which is a big difference in Phenomenology.

MC: Taken from the interpretation of science from the West is the idea of the enchantment of nature. The idea that there is magic in nature, which science thought it could explain. We can use these tools to dominate nature, to apply it to our views, *et cetera*. This is what many phenomenologists lament. The Scientific Revolution has taken this enchantment out of our view of the world. Ironically and paradoxically, the digital tools have been seen by many as a way to bring some of this enchantment back into our *Weltanschauung*.

The important link in this bizarre conceptual framework is the work of Ilya Prigogine, the post-modern philosopher and scientist who wrote *Order Out of Chaos*.[5] This book was so influential for many people in the 90s. There is a chapter in Prigogine's book titled "The Re-enchantment of Nature." He uses quantum mechanics and thermodynamics to bring back indeterminism and magic into our view of the world by claiming that there are things in nature that we can never predict. Nature has its own will and can make things that no science will ever predict. This was before the digital tool. When computers came, people said that computers were even more magical than quantum mechanics and thermodynamics because there

is indeterminism in computation. This is where many strange things start to happen. Some people use computers as tools of rationalization. Some people use computers as a tool to extoll the indeterminacy, which they perceive is embedded in nature, which is very odd, yet many of our friends are subscribers to this notion.

PE: And this indeterminacy is what one would call either irrational or vitalism. That is the manifestation of it.

MC: Yes. It is the magic of nature. It is, by the way, a matter of pure ideological choice. No one can prove that nature is magic, but nobody can prove otherwise. If you drop a pen, most of the time it falls to the floor. I would argue, it will always fall to the floor, but I cannot prove it. There will be someone who claims, one of these pens will not fall to the floor. It will take a walk, go to Starbucks, and drink a cup of coffee. He cannot prove it. I cannot prove the opposite. It is pure ideology.

G: If it is a choice of ideology, why do you feel that majority of people choose to consider the computer as this magical tool?

MC: Because some people like magic.

G: There seems to be a growing awareness of inhabiting this environment, which coded with someone else's rules and are trying to take as much agency back as possible from the software by committing what could be understood as violent acts against the rules that have been imposed on them. They are able to go very far in what they can command the computer to do for them on their own terms. I guess I am trying to understand when and where the magic happens with computation.

MC: The way that I am using magic may be seen as derogatory... Let's talk instead about indeterminacy, a more neutral and scientific term. If you are looking for indeterminacy in computation you can find it. Many scientists will argue that there is a degree of high mathematics in computation, which can be described in indeterministic ways.

PE: I want to go back to something that you mentioned in passin**G:** the question of ornament. Jörg Gleiter, believes that you can have much more control over what you are trying to do using ornament than you would have over a full building.[6] He is saying that at a limited scale of discourse, computation and the digital operate in an interesting way that produces things that are unexpected. These things are not vitalistic.

MC: Actually, it is quite the contrary. The point is that since these arguments are ideological and cannot be proven one way or the other, with the same tool, we will have people that use it in a scientific way and people in an anti-scientific way. There is no way that we can prove that either are right, or...wrong.

PE: As far as I am concerned, what is worrisome are the people who do not realize that computation could be a way out of the Albertian paradigm, but are stuck in something which will never get them there. If you take Schumacher, he has a great desire to get away from spline modeling and homogeneous space, but he doesn't. He is very serious about what he does, and very intelligent. You can't say he is wrong, but he has a disposition. There is nothing without a certain level of authorial control. To me the authors running most of these parametric algorithms are phenomena oriented.

MC: From a historian's point of view, computation has been hijacked from the beginning by tools of simplification, calculus and spline making. It was probably inevitable in the technological context of the time but it was still a very reductive use of computation. In the 90's, they used computation to emulate calculus, to use calculus as a tool of design and a tool of fabrication. When Peter started to dream of computation, it was not to simplify things, it was to complexify. Then soon things went in the opposite direction because small data took over. There is the possibility today that big data may bring some of that complexity back into the game.

PE: You also make the caveat that big data will allow you to complexify, but limit authorial control.

MC: Yes. At some point when there is too much data, we need some simplification to make sense of the world. Computers do not work that way. There is a disconnect between the logic of our minds and the logic of computation.

PE: Mario, the problem was exemplified in your conference, not only by Hansmeyer, but also by Philippe Morel's chair. He said, "I can produce 50,000 of these." To which I respond, "Why bother?" Each one starting with the first iteration is ugly. Anyone can make a chair that's comfortable to sit in, but to make a chair that is comfortable and enjoyable to look at is a really difficult occupation. Phillippe Morel cannot design chairs.

MC: I don't think that he can sit in them.

PE: You can't look at them. And the real problem is looking at them.

MC: He invented voxelation, in a sense, and for that we have to give him credit. His voxelated chair will be as iconic ten years later as Greg Lynn's teapot. You cannot make tea with Greg Lynn's teapot. You cannot sit on Philippe Morel's chair.

PE: They don't have what I consider to be the formal characteristics of heterogeneity. Both the teapots and the chairs are homogeneous. The particular way they are put together does not allow for complexity because the same unit is repeated

over and over again in a different staging, but it's the same unit.

MC: In the teapot, these are continuous splines. In the case of the voxelated chair, you could make it more disjointed if you choose to do so. I think there is a need to not just have the perpetually new. Morel's 50,000 iterations give you something new for a hundred years. However, there's no way of choosing. Which one of these voxelated things is "good"? What are the criteria? In the mechanism, the algorithm that he has set up, good isn't in it. In other words, what would make one select even a hundred of the 50,000?

L: That's where the idea of the author that is getting lost in digital computation comes back.

PE: It's a different author though…

L: It's a double author. You are the author of a parametric system, then you (or someone else?) are the author of an evaluation system or logic, that then leads you to the final decision.

MC: The idea has been around for twenty years or longer. In some technical fields, it is probably inevitable. For twenty years we have been coping with this predicament, and it still does not make much sense to the design profession. Who wants to design a generic object, a family of objects which will only exist in an accidental instantiation which you cannot control? When you design parametrically, this is the inevitable logic of a parametric system. You cannot customize each final end product one by one. You can only design the general system.

PE: Look, let me just say this: the people who go to Columbia, like you all, who learn how to deal with complex algorithms, proposing algorithms, dealing with animation, et cetera, often find themselves ending up doing computer games.

MC: Yes, where this logic works perfectly.

PE: As far as architecture is concerned, there's no market for it. The difference in what they can make in architecture with this skill versus working for a computer game is enormous. It seems to me that architecture is probably one of the last places for this, because you ultimately run into phenomena. What's very strange is that there is no such thing as a virtual house, whereas the virtual environments that are created in computer games have endless possibilities. They have an avatar that has nothing to do with phenomena. So what do we have? People walk by things and the color changes, because they want movement—architecture resists movement. Greg Lynn is now working with robots. He wants houses that change their orientation so that when you wake up in the morning, you're upside down. That has to deal with basic Phenomenology, with gravity…

MC: With phenomena.

MC: Do you know the book by Leo Strauss called *Persecution and the Art of Writing*?[7] It's about Maimonides and the tradition of encrypting hidden meaning in esoteric texts. He finds traces of this in many traditions. That is the book that gave Carlo Ginzburg the idea of finding similar strategies during the Protestant reformation.

PE: You see, traces, by the way, are not phenomena.

MC: They're indexes. It's a text which has two layers of meaning. If you are initiated, or a wise man, you will find the flag. From the flag you will find the hidden meaning which is there, but not for all eyes to see. It's a long tradition. Even Jesus Christ used it.

PE: There are two Derridian terms that I think are really important in "anti-context." One is the supplement, which is not the thing itself, but the thing added to the supplement that is other than the supplement. The other term is the hinge, which holds together the supplement. The hinge—or *briseur*—is what Derrida was talking about. It is the thing that connects, the connector. It's like the *passé-partout* in paintin**G:** the thing that connects the painting to the frame is the white paper. He would call that the *briseur*. The kinds of lexical items that you find in post-structuralism are just those kinds. See, I had thought that Phenomenology, along with post-structuralism, was dead. I thought, "Phew, those guys are finally gone." I wrote my dissertation in response to Norberg-Schulz. I thought these guys were gone, that post-structuralism had wiped them out. They are like a virus that has come back even more virulent than before. I think it is an amazingly interesting topic, by the way, because post-structuralism was really the antidote that killed off this first wave of phenomenology.

MC: Not entirely...

G: Mark Wigley talks about different examples of texts by saying that "you probably have this on your shelves but have never read it… but you have read it." I think what has happened with Phenomenology, like you said, is that it has lingered, been embedded. People say them without thinking about it. It has become part of the everyday conversation.

PE: Well, they think that because they are dealing with architecture, they have to be dealing with presence.

G: I would say that during undergrad, I would have never been able to speak articulately about any of this. But I could have just as easily been accused of thinking phenomenologically.

MC: For a student, it's in the air.

G: It's in the air! I think that's something that has permeated into studios.

MC: But we are lucky in one thing. The two parties—the old "phems", if we can abbreviate, and the new "phems"—do not realize that they are part of the same family. The old guys still think that all that is digital is against them. The new guys, with a few exceptions, do not realize that the arguments that they are making. They do not recognize where they are coming from. This is good, because the time that they make the connections, we are done.

PE: In other words, if they make this connection, they should be able to solve the problem.

MC: But they never will.

PE: No, they should be able to solve the problem. There's no question that the possibility of the algorithm gives that idea of a singular, heterogeneous complexity. So far, we haven't seen it.

L: Are you saying that all of the designers that are currently working computationally are somehow going towards Phenomenology?

PE: The reason why they are in computation is that it promises salvation. They think they can overcome the problems of the author, the problems of presence, *et cetera*. I don't believe they realize the trap they're in.

L: My question is: does a computational design that is not phenomenological exist at this point?

PE: There could be.

MC: There should be.

PE: There should be.

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Google image search: operator

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a compulsion to grasp the world

Reinhold Martin in conversation with W, C, G and LW. Recorded April 4th, 2014

W: Today we want to go over the problems of representation and the logics of control that are embedded in computation and Parametricism. One story we want to start off with is that of Jay Forrester and the idea of cybernetics. Mr. Forrester is a founder of the different theories of system dynamics and in 1969 he wrote *Urban Dynamics*.[1] He got on a plane after meeting with the Club of Rome and diagramed what he thought to be a model of the world. Then came *World Dynamics* immediately after.[2] We want to start there, with the thinking that went on about merging cybernetics with political theory and how the idea of control and the ability to create a steady state at the level of society were implicitly embedded within.

RM: Before we get to the dynamics and the crisis of American power in this era, which is really what this is, we should ask what is at stake. It seems to me that one of the things that is most evident is an attempt, a need, a compulsion to grasp the world somehow—to almost hold it in your hand. You know, this is a very old reflex. It's as old as maps. It's as old as globes.

W: Counting is another one you've mentioned as well...

RM: Well, yes to some extent… It's as old as demographics, for example, in its different forms. To be more specific, to grasp the

world as a system comes into its own in the immediate post-war decades. Forrester's work is a type of systems theory that is both technologically and epistemologically in a relatively mature phase. The history of cybernetics and systems theory is, to a large extent, bound up with this problem of grasping the world, as I tried to show in *The Organizational Complex*.[3] It acquires an icon in the image of the earth seen from outer space, such as the "Blue Marble" photograph. This is sometimes said to inaugurate a phase in which suddenly humanity grasps itself, sees itself from the sky. I think this is the culmination or the apogee of a longer process. You could say that another signal technological moment is Hiroshima and Nagasaki, as well as in the early 1950's, with the hydrogen bomb. In about ten years, the whole myth of scientific progress is demolished. That's one side, while the camps and the Holocaust are the other side. This is part of a postwar context of anguish over technological systems out of control, producing mass death. Before the war—and architecture has this in spades - there was an intense investment in the notion of progress and the perceived capacities of new technology. You had this kind of paradox after the war of mass death and various forms of emancipation or modernization, *et cetera*. So, yes, the hubris, but also within that already is a kind of disability, a kind of inherent crisis. Built into it, perhaps in a kind of dialectic of modernization or modernity, are certainly the persistent hubristic, heroic, imperialistic attempts to grasp the world in order to manage it.

C: An idea that I've heard, quite ominously, is "the shock of the destruction of World War II" and this massive amount of death. I think that understanding and describing are key. In order to avoid such a traumatic event, we need to describe the world and understand how it devolved to this state. You were mentioning this model that Forrester drafted on the plane, when they took it back to the lab and simulated it, it showed that the world would self-destruct.

W: They projected a pretty immediate fall into economic decline, nuclear warfare…

C: Right. That marks a distinction between letting the world experience things as they come and being able to describe it and understand it in order to avoid such things. In order to describe, a prevalent line of thought was the need to quantify.

RM: Right, that gets us to parametrics. This is just a little historical sketch, but let's continue to the other end of the story. In the 70's, largely as a result of the Herman Kahns of the world—the futurists, futurologists, think tanks, and systems modelers who were constantly running scenarios and making these maps—were prophesying doomsday in order to acquire authority and, to some extent, manage the system. There is also a critical side to this. It's not just these maniacal futurologists. What happened in the critical social sciences just a bit later, to a large extent in response to this monomaniacal

drive, was the critique of totality. This goes by many names, the most well-known of which is "postmodernism." If you read Jean Francois Lyotard's *The Postmodern Condition*, you'll see that it's a critique of systems theory.[4] Keep those stories in your head: that's actually what he's talking about. Forrester is at the far end of what Lyotard was critiquing. Again, it's not just in the mad scientist version, but also the governmental, political science version. Lyotard doesn't speak of numbers, but of narratives. He also has in mind Marxism and capital accumulation. All of this was representative of the master narratives of modernity: the stories of progress and teleology. If you think about these modelers, that's what they're doing, playing out master narratives. His response was the petit *récits*, the small narratives, which is one of the branches of postmodern theory. Now, vis-a-vis numbers, in this phase of modern technocracy in the West, the story is also about the UN, the World Bank, the Ford Foundation, the management of the global economy and of development. They're running the numbers, too. As a result, you have ideas like the population explosion. That had a huge effect on urban planning. As Paul Edwards shows in *The Closed World*, this kind of modeling is parametric.[5] It's about minima and maxima. It's if/then. This type of thinking and the technology associated with it, the feedback loops that it fetishizes, are all the basis for world-gaming, war-gaming, and the financial models of this systems universe. And it's heterogeneous! I'm trying to emphasize this.

W: But that's important to note, because then that proves that this is a tool set and a way of seeing, more-so than implicitly being…

RM: I want to understand these as something more than merely tools that can be used independent of an author or agent. In American public discourse, for example, this is the way in which technologies like guns are discussed. There's one side that says: "guns don't kill people, people kill people." That seems to me to be counterintuitive. In fact, there is something about, in this case, the weapon that predisposes the situation. We can talk about technology, instruments, and systems in different ways around this issue that don't have to be linearly causal. It's not simply the reversal either, where these things acquire an inevitable teleology, and no matter what there will be death and destruction because of these weapons. Although, they certainly—and it's historically obvious—vastly increase the risk of massive damage. That's the key word in this discourse: risk.

At some level, these things are interchangeable epistemologically. What they are all doing, in one way or other, is modeling a future, and they're doing it with numbers. So what do you do? One response to the numbers is narratives, little stories. Numbers are not just numbers. There is history. There is ideology. That's step one: to historicize the numbers, to situate and connect the numbers and the narratives. One of

the things that computers do, particularly as they have become so ubiquitous, is displace these narratives. They, as it were, naturalize the numbers. One of the inevitable contradictions of this type of modeling is a version of the old problem of the map and the territory. The map and the territory could never match. All possible variables could never be taken into account in a systems equation. At some profound level, you just don't know. Not knowing is built into the equation in parentheses. It's not so much x1, x2, x3, x4, the string of variables that play into the system. It's the limit on this set of quantities—the bracket—that bears upon the historical process.

W: As distinct from this other historical…

RM: Right, or something else. When you play it out logically, it is fundamental. You must at some point limit the set in order to run the equation. Otherwise, you are simply reproducing the entire world as a computer.

W: We're presenting Parametricism as a "belief" in this volume, which seems to be one of the more critical points: the belief in the ability to quantify everything.

RM: It's not just postmodernist cultural critique that took this on, though that was certainly one important line. Again, think about it through the inherent limits of the set, even if there is a certain accuracy to the variables. At some point you have to limit it, and you can't account for everything. That itself can become mystical. There are unrepresentable things, uncountable things, and so on. The number one: this is one of the most mystical numbers in the world. I mean, talk about belief. What constitutes one?

There are various sets of theoretical and logical philosophies that deal with this in esoteric and scientific ways. This thing that is called Parametricism, whatever it is, is often designated as an alternative to a world-view that deals with words, text, and representation. So you have enumeration versus representation. Representation is inherently unreliable. We learned that from post-structuralism, postmodernism, etc. Enumeration, on the other hand, we can apparently count on.

[laughter]

This seems to me, on the face of it, to be untenable. Now, move number two or number three of those we are listing would be to inspect the instability of numbers and to consider countability and uncountability, not so much as ontological properties, but as functions of the system. Philosophers often do this. One could think of singularity, for example: a thing that is a set unto itself. It doesn't belong in a set. It's singular. It's an event, to use the language of Deleuze or Badiou. One could also think about how the one, or two, or three, gets produced, meaning historically put into the world. If you read

chapter five or six of *Utopia's Ghost* on mass customization, the chapter describes and analyzes the process of designing the headquarters of Union Carbide by Kevin Roche.[6] The question is: who is the mass? It turns out that that the mass is divided and by definition structurally not one. In order for Union Carbide to run the numbers—early parametrics—they did user surveys. The doesn't look like the kinds of "parametric" environments we're seeing today, but in some sense it works like that, as individualized, mass customized office space designed around a limited set of parameters. Epistemologically, it's all there. For that set to come into focus, for the kind of human who requires and responds to those kinds of input-output relationships, humanity itself has to be partitioned. Somebody actually has to die. In the case of Union Carbide, there was tens, if not hundreds of thousands of people who did die in some relationship to it. I'm talking about the gas leak in Bhopal that killed tens of thousands of people immediately and many others later, which became a massive international scandal. It was resolved mainly in favor of Union Carbide. The main function of the court case was to count the deaths and the injuries. How do you quantify this? Victims and their families were forced to make legal claims in an undetermined space—the juridical space that is under construction is itself quite ambiguous.

C: It's actually interesting that you bring up the idea of the courtroom, because it seems to me that the courtroom is one of the few places in society that is not subjugated to numbers in the same way…

RM: Really?

C: Yea, in the sense that we can talk about how someone has died. Did it happen by manslaughter or by premeditative murder? Yes, there are these degrees of murder, but it is still determined by a jury through discussion, conversation, and argument. That's not to say that one dead body is not the same as another, but that there are more humanistic and circumstantial…

RM: Historical. We could say historical processes, right? Historical means society doing what society does.

C: The idea of the courtroom is that every case that is brought there has to be reevaluated each time.

RM: That's the American system in principle. Maybe another way of saying it is that there is an historical or narrative element: stories need to be told. They need to be compared. Judgment is collective, ideally. Inherent in that, very much to your point, is a kind of agon—a contest or debate. The public sphere, whether it is a courtroom or the counting done for a census, is contested in many directions. Think about a census: not everyone wants to be counted.

You can understand why. And yet, to be counted is to be registered, to have papers, thus gaining access to whatever social welfare there may be available, as well as access to other benefits of the system. To put it bluntly, counting is a political act. There are different regimes, different spheres, in which that act works politically. There is no space—social, natural, or otherwise—in which there is absolute transparency and where numbers are merely and simply numbers, uncontestably so, even in the natural sciences. In fact, scientists are by definition totally circumspect about numbers. They never believe anything. The whole point of science is to prove that the number is wrong. Don't simply take numbers for granted, then. Don't exceed to the authority of numbers.

C: In your debate with Schumacher, you mentioned that in the evolution of how society thinks, normative laws have been replaced by the performativity of procedures. We were hoping that you could unpack those terms—normativity, and performativity of procedures.[7]

RM: I actually don't remember the context in which that came up. What were we talking about?

C: It was in your introductory remarks after you brought up Lyotard and the term "computerized society," to which you began speaking about normative laws of Euclidean geometry being replaced by computerized rule-based procedures.

RM: Oh yes. Well, to schematize very generally. The norm is a modern phenomenon. Think of something like Taylorism or early to mid-twentieth century graphic standards. The Modulor belongs in this general category—a kind of standardization and modularization that goes on all over the place. There are certain kinds of repetitive, iterative behaviors and figures that circulate in this sphere of normalization.

Meanwhile, rule-based procedures and algorithmic, feedback-driven activities emerge. The standards are still standards. They are not so much if/then statements, they just are. But the new, and more flexible, feedback driven norms (as shown, for instance, in John Harwood's work on ergonomics), derive from new ways of classifying and diagramming the world in a variety of ways. This kind of technological performativity, the performativity of the norm and of normalization, operates according to feedback.

There is another notion of the performative that is part of Lyotard's discourse (and that of many others): the speech act and the performativity of social roles. In other words, we enact gender roles and social status in a number of ways. Those enactments are coded, symbolized, and also situated so that they acquire force and meaning in different ways. If in the courtroom the judge says "quiet," people obey, because the judge is in a position of power.

The same goes, for example, for performative statements about architectural quality. It's very funny, I have to say. It's been a long time since I had heard a student or a critic say, "That's a good design. That's a good building." That's something that you might think is a part of everyday speech in architecture. The more common concern, and tell me if I am being too reductive, is how is it done.

W: Yes and no.

RM: Tell me how you debate what constitutes a good building.

LW: Part of it is the discussion around the building's narrative.

RM: That's the performative part.

LW: How you present and how you make an argument about the existence of your building. Then you try to relate different elements of the building to your narrative.

W: I think there is another part to it as well. When we look at a drawing, we know how it was made. That gives you a clue into what they were doing to make the drawing and what they are trying to argue. There is a whole discussion that we have about the validity of somebody's ideas—whether or not they have a good idea and subsequently how well they have represented it? We always are quick to comment on the quality of the representation.

RM: The good news in this, and this is more an observation rather than a criticism, is that the argument reinforces the premise that cultural value is performed. It's not some absolute ideal or canon of works that one has to measure up to. Rather, it is an analysis of how certain historical figures did it—this is their diagram, this is their argument, and this is their theory.

G: I've noticed recently that whenever a student at GSAPP presents process it usually has a negative response. Earlier in my education, I was certainly able to say, "I did this, which led to that," and so forth. You could never get away with that now. I talk to friends at other institutions and they still talk that way about their work. To them, the procedure is the justification.

W: Thank God that the initial diagram that one presents at the beginning of every presentation is finally dying off. That used to be a staple of so much work.

RM: When I used to teach studio I would make people present their projects backwards. Show the project first and then talk about the process. It's not that the process is wrong. It has been fetishized. I think that one of the ways it has been fetishized is that Parametricism is conceived as pure process, as purely procedural. The object is never admitted as evidence into the courtroom. The primary evidence is the numbers that get you

there. There is something to this—it brings value judgments down to earth by saying that it is all practice and performance. But that too can be fetishized and idealized as a kind of end in and of itself. The reverse would be to ask, "Why did you do it? What is the value of it in the end?" One way to translate this into a critical question vis-à-vis parametric design is, "Where did you put the parentheses in the variable set? What is in? What is out?"

The more philosophical response would play these two things together, where there is the performance. The performance can become rhetoric, and rhetoric is real—argumentation is real. The reverse side is just as mystical, where you pretend the drawings speak for themselves. The architect is mute, or they are like Louis Kahn, uttering cryptic meaningless statements that have something to do with bricks or something to do with shadows. Then you think that must be good because I don't understand what the hell he's saying.

There's still some deference to rational argument, then. On one hand there is a kind of hyper-rationalism that veers into technocratic, managerial Forrester-like madness. On the other, there are uncritical relationships to numbers. I just want to highlight that, and put it back into a historical context. As I tried to explain in regards to another Forrester diagram, what seemed to be a rational, numbers-based account of public housing in the city, was founded on all kinds of financial and socio-political assumptions that became self reproducing. It had to do with fear and racial dispossession—fear of the other. Forrester built that fear into his equations, so of course the equations were going to reproduce it. That's the one thing we certainly know about equations: built-in assumptions will be part of the output.

C: You mentioned how this system lends itself to capital and that certain assumptions are built into it. There was a recent ad campaign for Motorola cellphones that starts with the assumption that you need a new phone.

G: You design your dog, you design your office, you design your life. I think that mass customization is the way Parametricism sells itself to society. This system of variability that we have control over can give you all of these options in the same way as once we had to just make you one thing.

RM: Absolutely it is standardization versus variety. The first question is "who are you that you desire these things?" You are certainly not "one," that's for sure. Deleuze is good on this—he calls you a "dividual." You are divided into passwords and cellphone colors and even sometimes different formal identities. As more of these variables are introduced into the technosphere and the social sphere, the more opportunity there is for self-differentiation. So the fantasy of finally gathering all of the variables together into one "self" is in fact

inherently schizoid. That's also what capital is. Sometimes the simplistic critique of these things refers to something called the consumer society: "oh it's just consumerism." What I want us to be able to ask is who is a consumer and what is a consumer? A consumer is not just some cliché who desires commodities. A consumer constitutes an "it," a he and a she—sometimes mixed together in a series of fissures that run along many different lines, which often correspond to the fissures in the larger society. It is anything but self-determination that consumerism is trying to sell you. It is exactly the indetermination of the self that capital produces. One of the things that architectural, technological, and social analysis of "things"—whether cellphones or buildings or cities—helps us with is demystifying capital. Because where is capital anyway? What does it look like? This thing is capital. It's not like there is some god-like figure out there manipulating the world such that we have multi-colored cellphones; rather this is what it is, it is right there in front of us. It can be sobering to think that we, meaning those of us who work in the world of design, operate that system. We're not merely subject to it as passive victims or beneficiaries of this wonderful or terrifying system. We are the system. That's what they used to call the people who sat at screens looking for Soviet planes coming over the horizon. They thought their reflexes were faster than the reflexes of the machine to push the button to initiate the first strike. They were called operators. Just like others who interface with machines and systems, like telephone operators. We are the operators. Not because you have a cellphone, but because of the design of that cellphone, and the design of anything to do with that cellphone. An operator is clearly different from an author—that's part of what it comes down to for architects. Where is design anyway? How do you make decisions? Who is designing it—you or the computer? Well, the answer is really neither. It's a kind of cyborg system. It's not that the computer made me do it or that I am some independent author who simply uses tools. Rather, we are linked up and hooked into a kind of… the old-fashioned term used to be a man-machine system, a kind of cyborg monster with its feedback loops and iterations—just like a feedback loop between the screen, the brain and the hand, in which, in the case of some operators at least, the fate of the entire world essentially rests.

ALL: [cackling]

RM: It's true! You heard about the guys at the nuclear silos who were getting drunk and playing card games… So they are neither independent judges nor simply machines. It's complex and of course dependent on the kind of technological system, all of which has a certain logic. That phone is essentially an interface that somebody designs—somebody who is not classically an author or architect in the heroic, old-fashioned sense. That somebody is an operator of the system. They have intense responsibilities. So part of our response and responsibility could be to ask ourselves and our colleagues

what does this mean? What are the consequences of arranging the world in this particular way? Who are the masses of mass customization? Who is the desiring subject who needs a plaid cover on their phone? Of course, underneath the cover there are these standards and protocols that seem non-customizable. Some people will say "oh that's fine, but it's only the surface." I actually don't think that's the real issue. The real issue is that it is potentially all customizable. You know, that the whole thing could in fact be customized. So the question is, what are its consequences?

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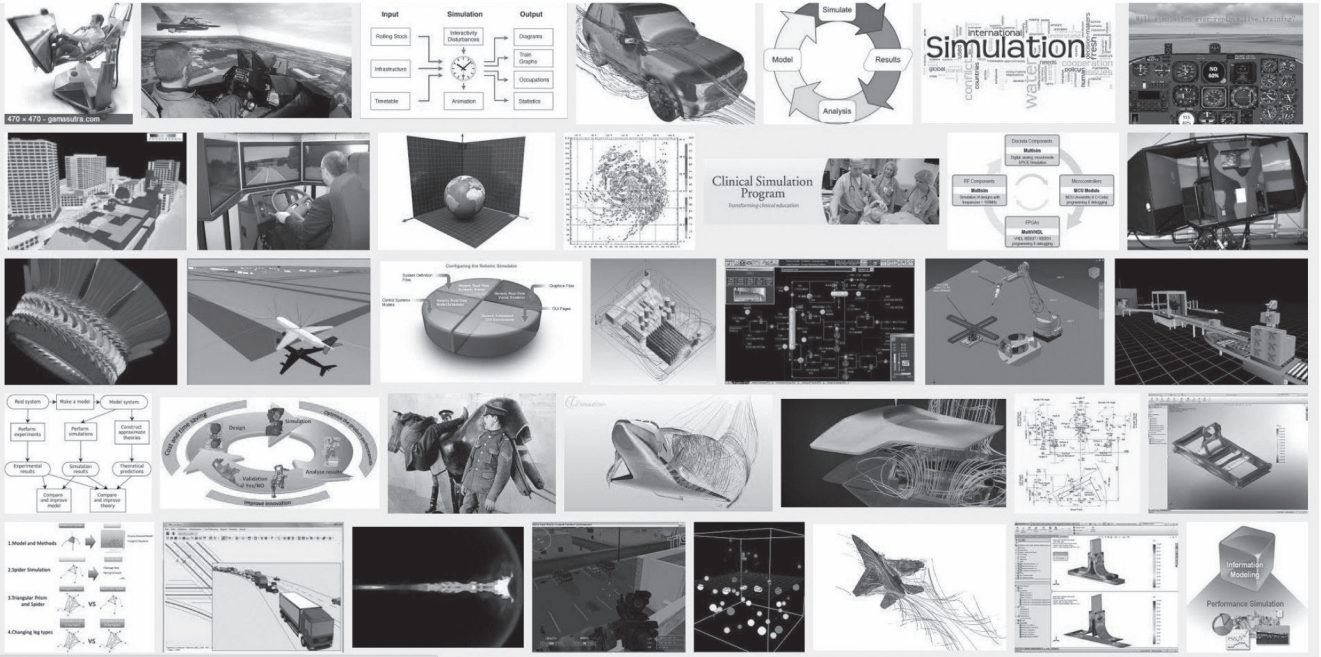

Google image search: simulation

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you set up the model

David Benjamin in conversation with DH, LV and LW. Recorded March 3rd, 2014.

LV: We looked at the history of the word "Parametricism," coined by Patrik Schumacher. Regardless of its origin, we are interested in knowing what parametric design is for you.

DB: Parametric is an overused term. I sometimes quote my computer science colleague: "that is a ridiculous notion. Every software is parametric." I have had a similar attitude to yours, where I try to demystify the term, to get beyond it, so that ideas and their unfolding into techniques can be evaluated more precisely. That was the motivation behind a series of events called "Post-Parametric" that I organized along with a friend and Computer Science faculty member, Michael Reed. We had a series of presentations distributed among five or six events aiming to question, broaden, and re-frame computation in design. We want to understand what could be possible in the coming five to ten years, skipping the word "parametric" because it's meaningless at this point.

LW: What is your definition of post-parametric?

DB: It's just to say, let's get beyond parametric as a term.

LW: What constitutes a post-parametric operation?

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DB: There is no specific operation or tool. We are asking in the series, what are the possibilities of computation in design? Any possibility should be considered through the light of post-parametric, starting from scratch and thinking more precisely about terms, tools, and techniques. One of the presenters from IBM's *Watson* proposed that maybe an interesting future would be to feed massive amounts of data into a machine that can be taught to be intelligent in new circumstances. There is no term for that yet, but it is a pretty sophisticated idea that we can debate.

Another faculty of Computer Science, Eitan Grinspun, is working on what he sometimes calls "directed simulation." We all know that we can take a computer model and digitally simulate its structural performance, the flow of air around it, its environmental impact, etc. Up until very recently it has required a huge amount of computational resources to undertake those studies. Grinspun and others have been working very hard to allow users to have real-time feedback from simulation. If you change the shape of the building slightly, you see the impact it has on the street below. You change it back and see a different impact. If you could see, in real time, the performance ranges of multiple criteria, such as structure, wind, etc., and read those results simultaneously, it could change the way we design things.

DH: This seems to deal with dynamic processes specifically. What you describe is a system where you adjust something and watch the result, as opposed to a process in which you set up something that grows into a beautiful form that looks dynamic but is perfectly still. What were the origins of this idea of real-time dynamics processing for you as it pertains to architecture? Where else do you see it happening?

DB: It relates to something that I don't typically think about in the same line of conversation with parametrics. For a long time, I have been personally interested in what I call "Living Architecture," bringing architecture to life. This is related to the Living Architecture Lab that I direct here at Columbia. Some of the earliest experiments involved sensors and actuators. Can we use simple versions of electronics and computers to do things like sense air quality and open up a breathing envelope based on the results? It is interesting to me that buildings are already alive in some ways, changeable over time, and adaptive to different people and the environment. Because of recent technological developments in biology, it is now possible to use living organisms as a way to make architecture more alive. This has the potential to change the way we design and think about architecture. Computation can be a way to bridge that. Our understanding of biology is advancing incredibly fast. We know a lot more about biological systems like genomes, humans, and any other organisms than we did ten years ago. Also, it has become increasingly possible to do things like cut and paste DNA in order to change living organisms. Part of the

way science is advancing is through computation. If biologists can take this advanced understanding of these complex systems and put it into software, then designers and other non-experts can start using it. These systems are so complex that it's unlikely that architects and designers, at least in the near future, are going to make progress on actually manipulating biology. However, if it can be encapsulated in a computer model, architects can take advantage of it. In other words, I think there is an interesting potential for what we've called "bio-computation," which could be another future direction of new developments in computation and design.

LW: Computation requires quantification. In your research and your work, have you encountered anything that can't really be quantified? How do you deal with that?

DB: That's a great question. The short answer is: of course. I would never want to pretend that everything about design, or architecture, could be quantified, or could be encapsulated in a computer model. The question is, what are some good techniques to deal with that? I've had a lot of great experience in exploring that with my students in the past eight years or so. I've always made it very clear with my students that it's important for them to take a position on what they do in a computer workflow, like in the C-BIP workflow, or like in the multi-objective optimization workflow I've explored in other studios. It's important to understand that those workflows are only accomplishing part of your desires and responsibilities as an architect. There are still some interesting debates and discussion around whether you can take things that are on the surface qualitative and try to compute with them. I wouldn't want anyone to pretend that you could put everything in the computer. If you did, you would have to recognize that as your position.

One of the speakers at "Post-parametric," an amazing researcher named Kevin Slavin, has the famous TED talk about how algorithms are ruling our lives without us quite knowing about it. It's a similar idea in concept. We need to become more aware of it. What are the assumptions going on that are affecting us? There are thousands of assumptions built into the actual software application, whether its Grasshopper, CATIA, or whatever. Someone programmed those, and those have rules and assumptions that are affecting your design. Plus, everyone knows that if you put in points and lines into a parametric model and allow the parameters to change, you're never going to get anything out that's not points and lines. Who made that decision? You did. You set up the model. There are hundreds of decisions like that that happen in any design. It seems like it is not even worth asking whether there is anything outside of the computer. Of course the computer isn't doing everything for you. You made hundreds of decisions and the computer application made hundreds of decisions. It's important to be aware of those decisions and control them.

DH: The computer compresses them. There's a great many happening at a greater speed.

DB: What I think is important about the idea of parametrics right now comes down to a series of assumptions. What most people mean by parametric is that you have a series of inputs in a 3d model that you can change. You can change the values of those inputs and all of a sudden you get the ability to generate hundreds, or thousands, or tens of thousands, or hundreds of thousands of possible models. Very easily, you can get into a situation where there are literally billions of combinatorial possibilities. That can be interesting, but in itself it's not necessarily great. Parametric is not about some image of a gradient of variation of an object in a field, which I think is the image everyone has in their heads, which is a problem. Any model can have a lot of variations. It doesn't have to be a smooth gradient, and it doesn't even have to be an array. Endless variation for variation's sake is not that helpful. How can we be smart about using those variations for something that we desire and ideally to enhance our creativity.

Another thing to be concerned about, which I think parametric design is actually being used for with interesting effects, is the ability to generate a lot of possibilities, evaluate them for things like cost, revenue, or other levels of what I call "cold-blooded efficiency," and then hone in on only the things which are helping to achieve some bottom line. I think that's a more real, and long-lasting, and scary possibility of parametric design. Once you can generate buildings of combinatorial possibilities and evaluate them for things like rentable floor area and cost of materials, then all of this power of computation is going to be used to make boring buildings, or—possibly worse than boring—buildings whose values don't resonate with society. One really interesting possibility that has been underexplored is using the exact same tools not to generate patterns, not to generate cold-blooded efficiency, but to discover things that you want that wouldn't have occurred to you otherwise. It's basically a way to enhance your creativity and to show you something new.

LW: Right, it's more of a tool, rather than a style or any formal representation that signifies complexity.

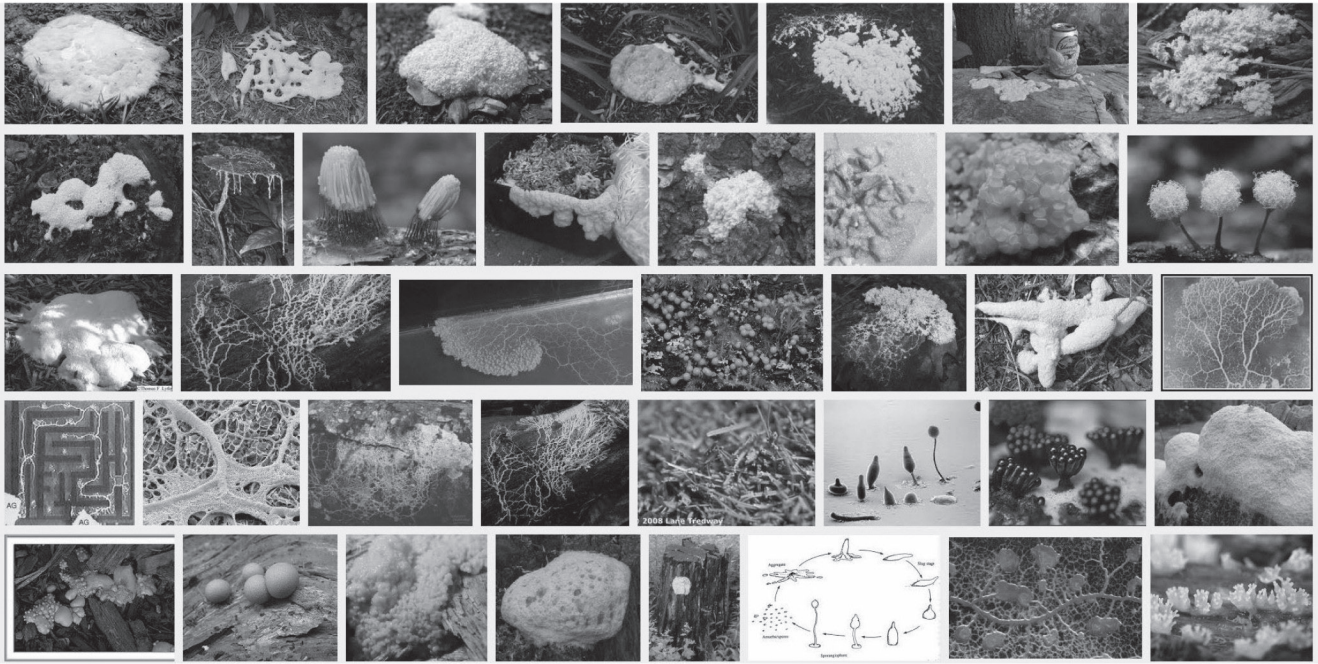
DH: It seems like the architect becomes an assessor of values, or translator of values. Is the role of the architect to carve out or identify values, and then produce something new that is unexpected, and then assess it against those values? Do you think that's where architecture circles back and regains agency from the computer as a monolithic terror that takes away creativity? What do you assess? How do you create an aesthetic and moral position?

DB: The same framework used by the "cold-blooded efficiency"

model could be used by a more creative model. If you were to say, "Okay, I don't just want to value things like revenue and efficiency. I want to value public space, environmental impact, and a new aesthetic." You could pick those and try to measure them as you're exploring these combinatorial possibilities. I think that it can get really interesting if the parametric model itself can be used to frame a public discussion and public debate about values. We could get one version of Hudson Yards that has a high public space score but a low environmental score. We could get another version that's vice versa, and we should debate about them. Which one is more important? Is it important to have a medium score of both? When do we allow one score to go higher? As opposed to taking away our ability to discuss, to debate, to have agency, to exercise judgment, these models almost demand it. I love this, and I teach this all the time with my studios that use optimization software in the framework of numbers. As soon as you have two objectives or more, there is not a single result that's mathematically best. You have a whole set of results. You can say some are better than others, but even the best the computer can ever do is give you a set of designs. You have to choose between them, according to your judgment and values. It's not like the numbers are a totally different framework. You still have to debate and decide. It's not like there is one world of automated objectivity and one world of just sketching on paper.

LV: Right now, we know that you have been teaching experimental studios, like the bio-computation studios or C-BIP. Do you think there are possibilities for a more radical and alternative pedagogical framework?

DB: I think there are many possible ways. Who knows? In five years we may have some better pedagogical frameworks. I do think that it's a good time to question the idea of the single visionary as the studio critic who trains twelve solitary geniuses to work entirely on their own and pretend that they're inventing their whole world. It seems like a good time to do that for a number of reasons. First, the technology allows for the transfer of computer models with embedded intelligence. That enables a transfer of knowledge that wasn't as easy before. In C-BIP, using a building element from a previous studio or from another person in the studio is a transfer of knowledge that is of a slightly different type than would be possible before this kind of technology. For a variety of reasons this generation of students, including you guys, is ready for that, almost demanding that. You're leading the way more than the faculty right now. Even if there were geniuses among us—which there aren't—they wouldn't possibly be able to perform every role necessary to create a building the way they could have fifty years ago. It's fitting because it adds immediate hooks into the profession right now, which is more collaborative and interdisciplinary than ever. It also has hooks into academic traditions, because schools are redefining themselves right now. It's a good time for questioning authorship and collaboration more.



Google image search: slime mold

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chunks of data

Biayna Bogosian and Maider Llaguno in conversation with C and J. Recorded April 17, 2014.

C: One view of Parametricism is that you design a system that you feed inputs into to produce outputs. You can vary the parameters to change those outputs but it is essentially a top-down process. From our brief understanding of object oriented programming, the way it speaks about objects is more of a bottom up system. I was hoping that the two of you could expand on this difference, or if it's not a difference?

ML: Although you mentioned Patrick Schumacher earlier, I understand that you are not referring to Parametricism as a style but to parametric design as a design methodology. Parametric design, or in another word, designing with a set of parameters and their relationships, is nothing new to the architectural design process. Implicitly it is neither bottom up nor top down. Depending on how these relationships and interdependencies are defined, the design approach may be either bottom up or top down or both. Therefore, Object Oriented Design (OOD), which is understood as using Object Oriented Programming (OOP) to design, is also classified as parametric design. OOP associates objects as data fields and behaviors, defining a system of interacting objects. It's more of a "collective" data assemblage than an I/O system, therefore OOD may potentially address a bottom up design approach. However, here again whether the design process

is bottom up or top down depends on how these objects and their relationships have been encoded in relation to the design problem, therefore OOD could lead to a design approach that is either bottom up, top down or both.

BB: In the past decade there has been a tendency among architects, which perhaps goes back to Stan Allen's "From Object to Field" article, to assign a negative connotation to the top-down process and a high regard to the bottom-up. But it's usually not that black and white. When writing the most flexible algorithm in OOP certain variables are declared and conditional statements set. Therefore, when testing design objectives there has to be a relationship between the top-down and bottom-up systems.

C: Perhaps instead of top-down and bottom-up, it would be better to use Graham Harman's "overmining" and "undermining" analogy in which a top-down system would be considered overmining, in that you're focused on the system rather than its parts, whereas in Object Oriented Programming the system is created through the parts and specifically their interactions with one another. Could you explain Object Oriented Programming as it is different than other languages or design principles?[1]

ML: We could argue that as opposed to some more traditional architectural and computational approaches, OOP offers an alternative to symbolic operative modes by focusing on material organizations and agencies. Through Object Oriented Programming we can produce complex and consistent organizations using simple rules of interacting objects that communicate, self-organize and develop ad-hoc communities. The distinctive feature of Object-Oriented Programs is that they are "flat" networks of actors and objects gathered up into assemblies. They act through simple, local rules, processing sensorial and physical data, figuring heterogeneous yet consistent wholes. But since you quote Graham Harman, there is also the question of what this part or "object" is in a design space. For instance, are non-physical or non-geometric instances potentially also design objects? And if so, can OOP help us explore complex design problems through the assemblage of non-relational data in the same design space?

BB: Graham Harman's theory of objects directly builds upon the Heideggerian question of "what is a thing?" Heidegger has been used in the past as a theoretical pillar to describe the relationship of architecture and technology. For architects this return to the theory of objects is due to the introduction of Object Oriented Programming platforms to the design process, which was initiated about a decade ago in architectural schools like Columbia. Programming platforms such as Processing allow writing and compiling code in an efficient manner that allows the generation and simulation of larger populations. This has made the OOP platforms favorable in

experimental architecture. Architects have always operated in multitude of domains at once, and recently they have been drawn to Object Oriented theorists, such as Graham Harman, and Ian Bogost and the influence of the movement in art and literature. This is due to the fact that currently architects are trying to place the computational work generated using OOP in a theoretic context and developing this notion of Object Oriented Design. The Object Oriented Ontology (OOO) camp has also been interested in drawing correlations between ontology and the design aspect, since ultimately the interest is to create discrete behaviors and entities that thrive in relationship to one another.

ML: Yes, it is interesting to look at the parallel discourse around OOO, OOP and OOD. Bruno Latour claims to go back to things (objects) by proposing gatherings of hybrid ecologies. He rejects institutional politics and claims for "Object-Oriented Politics" as a much more effective way to represent the contemporary pixelisation of politics. Within similar lines Peter Sloterdijk proposes an understanding of contemporary politics by absorbing the multiplicity of positions through a material mediation with no need to regularize or homogenize them. In this approach, politics is understood as a mass of hybrid forums that proliferate. On the other hand, in architecture we have mainly focused on the search for new design sensibilities that emerge out of the new digital design paradigm, although we left aside the style question at the beginning of the conversation. Since you started with the word Parametricism, it might be worth also reflecting on how successful or relevant the exploration on the aesthetics of OOD has been so far, or perhaps it's all about its aesthetic inconsistency, or the questioning of whether it is ultimately not about style any more but about how the design problem is stated. For instance, Mario Carpo recently has described the digital design aesthetics derived from big data. He refers to a discreet voxel-like architecture as a possible embodiment of an approach that deals with the management of large chunks of data—"objects" that result in a cellular and coarser design aesthetic.

J: Important to OOP is the idea of discrete objects. As Mario Carpo said in "Breaking the Curve," "the inherent discreteness of nature (which, after all, is not made of dimensionless Euclidean points nor of continuous mathematical lines but of distinct chunks of matter, all the way down to molecules, atoms, electrons, etc.) is then engaged as such, ideally, or in practice as close to its material structure as needed."[2] However, theoretical physics has continued to try to further decompose and reduce our universe to strings and quarks. I think code could be accused of the same thing—reducing agents to specific behaviors or each agent has a desire to do x number of things—lines, functions and parameters. So, at what point is it an object? If it can be reduced to specific intents, what makes it an irreducible thing from the ontological point of view?

BB: An irreducible characteristic of an object is in its definition a cluster of variables and its equal value to other objects. These objects with missions are often referred to as "agents." As a designer when writing an OOP instance, you break the interactions and conflicts of your system into different objects. You think about how the variables of each object will interact with one another. But, when you assign too many rules to an object, the possibility of what it can become is limited. Complexity in this case is not defined by the number of rules each object inherits but could be defined as how the overall system performs as a whole. When writing a multi-agent system as architects, it is important to test the interactions by visualizing the relationships and often we assign geometric primitives to various objects. Problem arises when we short-sightedly refer to the visualized objects as building or 'Architecture'. In Object Oriented Design not all the exchanges and layers necessarily have to be visualized. For instance, in video game design when referring to Object Oriented Design, we are referring to more than just the aesthetics of the game but more precisely referring to the chunks of data that are being exchanged. The popular videogame Minecraft was recently rewritten as an object based interaction. Minecraft world, with its sophisticated voxel engine, allows constant exchange between the parts, but as a player you don't have to know or see all the micro relations. These exchanges become visible when certain conditions occur and new elements emerge. This notion that not everything has to be visualized is a very difficult concept to grasp for us designers. Often in architecture schools courses that teach OOP require the first time programmers to model an existing multi-agent system—slime mold, neurons, flock of birds—and the first reaction is to visualize every single instance of the objects. Beyond the aesthetics question, it is essential to understand how many types of objects are necessary for an OOP simulation. Going back to our top-down and bottom-up discussion in OOD, if you have too little or too many object interactions in a system, then after a while the relationships become predictable or the system goes nowhere. So, as mentioned before, it's always about this top-down and bottom-up balance, or learning over-time how much is enough, or what really kills a system.

J: Yeah, I mean it would be interesting to know what tips the scale—when it stops being object oriented and when it is too top-down. One of the main takeaways from the lectures by Gilles Restin and Graham Harman was this term "emergence," and you used that term when referring to Minecraft, that it was being rewritten to be object oriented and so these things emerge.[3] But that's only possible if it's not being presupposed or predetermined, so it cannot be too top-down. Is it just a matter of feeling that balance out?

BB: Exactly. I think that's where the design problem becomes interesting. On the other hand, we are always faced with the question of the subjectivity of the designer. We can talk

about OOP from an engineer's standpoint in order to solve a problem, or from a scientist's perspective in order to discover new theories.

C: This idea of subjectivity seems to always circulate around the idea of computational design, and it seems as if you're saying that you don't see this way of working as any sort of removal of subjectivity. But the term "emergence" implies an objectivity to the design.
J: We talked about this idea earlier, that there is this ongoing process that keeps running. This is especially true in Processing—the simulation keeps running...

ML: But you stop it...

BB: … and this is very subjective. Often what you want to do with a simulation before you hit play is to make predictions based on your initial objectives. If your final result is similar to your initial predictions, are you really making good use of the computational power? As designers sometimes we are post-rationalizing these processes in a pseudo-scientific way, limiting the possibilities of a design space. In any OOD you do have certain criteria that could very well be quantities or qualities. But how do you evaluate the outputs if it's not subjective? If you look at the outputs as your matrix of possibilities, then from this spectrum you select based on the initial objectives which could be budget, efficiencies, etc. But, as mentioned before, it is still very difficult to make this selection as a designer.

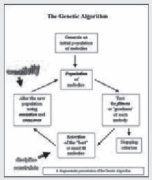
ML: What we often face in architectural projects is that unless the computational process is described through what we could describe as an "engineering" approach, say, defining a performance oriented goal and a specific judgment criteria, it often becomes very complicated to argue for it in front of an audience. However, especially at the early stages of the design process when we deal with an open design space, the available data is often diverse. Therefore, computational explorations are performed aiming at discovering new relationships and consistencies.

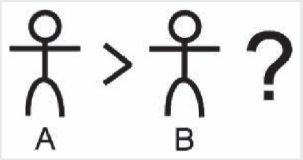
BB: Sure, ultimately it is about the convergence of these contradictory and yet complimentary relationships.

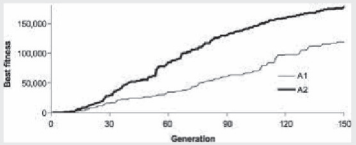
1 Harman, Graham. "Strange Objects Contra Parametricism." *SCI-Arc.* Los Angeles, September 18th, 2013.

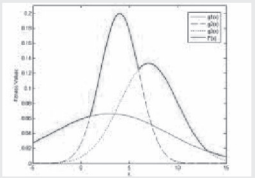
2 Carpo, Mario. "Breaking the Curve." *Artforum.* February 2014. pg. 172

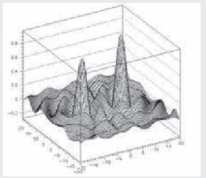
3 Retsin, Gilles. "Object Oriented Design." CAAD Lecture, *ETH*. Zurich, November 9th, 2012

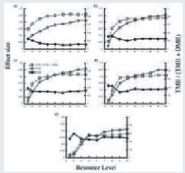


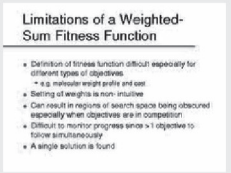


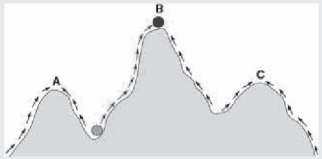


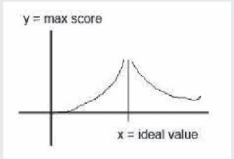


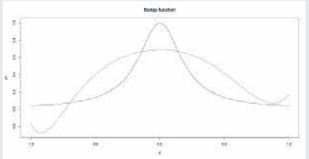


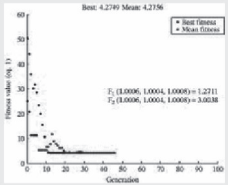


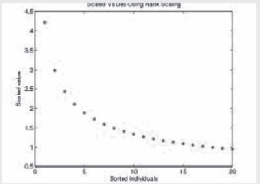


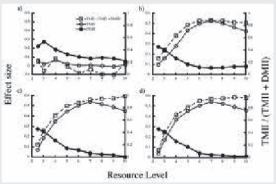


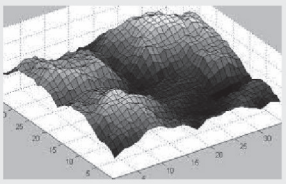


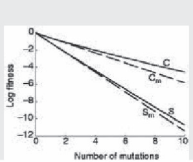


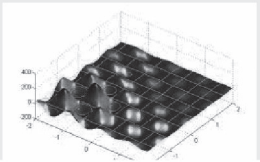


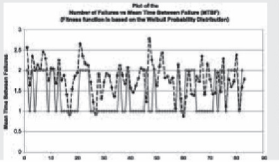


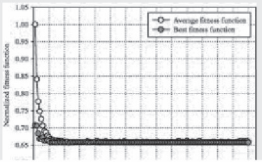


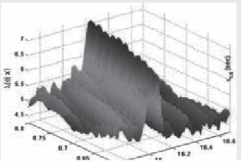












Google image search: fitness function

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not everything is captured by the fitness function

Daniel Davis in conversation with CB and LV. Recorded April 1st, 2014

LV: We've been reading your blog a lot. We would like to start taking a quote from it. In your article "Patrik Schumacher—Parametricism," you wrote, "In Intensive Fields Schumacher himself confuses parametricism and parametric, claiming 'the only precursor of parametricism is Frei Otto.'"[1] Could you please elaborate on this differentiation? Ultimately, what is parametric design to you?

DD: Schumacher refers to Frei Otto as an example of Parametricism. But the way that Frei Otto designs his architecture is quite distinct from what Schumacher describes as Parametricism. The Parametricism Schumacher is talking about is a stylistic output, but Frei Otto is talking about the material properties that he's working with and what materials themselves are computing. If I was to distinguish between the two terms, parametric and Parametricism, I think Parametricism is, to me, a style of architecture. Schumacher defines it as a dogma or a heuristic about what is and what isn't Parametricism. On the other hand, if you look at the term "parametric", it has a distinct mathematical origin that gives it a very defined use and meaning. Parametric is the thing beside an operation that is causing that interrelationship or link. There is this explicit relationship between the parameter and the outcome. I think what you see happening in Schumacher's writing is that it's very easy to get seduced by the outcome and by

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the image of what is being created. The stuff that is happening in the background is kind of forgotten. So Parametricism comes to define "parametric," but we forget where it comes from. From that we have this kind of schism where the two themes – parametric and Parametricism – don't quite line up.

LV: I don't really remember from which article, you defined almost in one single word parametric architecture as "a function."[2] Like the most basic mathematical element.

CB: "Quantity is related to parameters through explicit functions." It's interesting to note that, also in the same article, you talk about how the early mathematicians who use the term parametric use it as any other technical term. There's no difference. It's not a parametric mode of thinking or operating or style.

DD: The word parametric is not a special word in mathematics. It's just this word, like the word parallel or orthogonal. It's not a movement in maths, it's not the next great thing after modernism. It's only when Schumacher adopts "parametric" that it gets this extra layer of meaning. I think my difficulty with the notion of parametricism comes from this re-appropriation of the word "parametric." It's interesting to consider what would happen if Patrik Schumacher had just called it "Hadidism" or something. I probably wouldn't have a problem with it. It would be this little thing that he was doing. Some people would be really into it, making stuff in that style. Some people would be like, "yeah, it's not important." But I think it's this idea that Patrik Schumacher is saying that everything we are doing with computers is inherently in his style or inherently leading towards that, which I found problematic.

CB: To go back to the term style for a second, to what degree do you think there is some kind of formal logic or style associated with parametricism or computational design? We see gradients of complex surfaces or undulating modules. How much of that is inherent in the computational tools or techniques? Or is it a result of larger forces?

DD: I think there are two things at play there. One is, I guess, a sort of meme that's getting generated in architecture, which is that things are emerging within architecture and stylistically people are kind of agreeing and finding this homogeny of what they enjoy. And the other is that computational methods do lend themselves to things which have particular opportunities that are easy to exploit. If you're making an algorithm, and you want to make a swarm or something, it is relatively easy. You can do that in Processing with a couple of lines of code. Because of that, you can create this complexity really quickly and people get off on that. That's what it is. But I think it's important to remember that parametric design isn't necessarily that. Just because parametric design can be used to do that doesn't mean that parametric design is that. For example, we use Revit a

lot here at CASE. Revit, at its core, is a parametric software, and people are out there using Revit to build office towers for lawyers that are really fucking boring. And you wouldn't say that any of that looks parametric. Yet it is computation being used in a parametric way to generate a building.

LV: Sure. Going back to your own definition of parametric architecture, based eminently on mathematics and explicit functions, there are theoreticians like Carpo who are talking about a reemergence of vitalistic and irrational forces in the domain of computational design. He talks, even, about magic, or indeterminacy. How do you see this statement with regard to your definition?

DD: This sort of stuff really fucking pisses me off. [laughter]

DD: There are a lot of people in computational design who are creating problems for themselves that don't need to be solved. I mean, whether or not we have enough complexity in our lives, who gives a shit? It doesn't matter. I wouldn't say architecture's in a bad position, but it has a lot of inherent problems at the moment. It's still really expensive to make architecture. Architecture is still a really risky proposition to build. We're building things that harm the environment. Architecture is still not something that's accessible to anyone but the rich. These are all, I think, legitimate and valid things to be working on as architects. Instead, we're talking about how complex something is or what it looks like. To me they don't seem like problems that we should be focusing on.

LV: In line with what you said about the swarm—that's what people go for—there's a tendency to do complexity for the sake of complexity, just because the tools are giving us the possibility of doing it. But then, another face of computational design, generally speaking, is also optimization. For example, how do you make the best use of the materials for this type of building on this site? Or when you have tons of iterations and you have to select one, so you design a system of evaluation in the end. Is there space for the irrationality that some theorists are talking about? Is there a way to go beyond optimization? Is there a space for "post-optimization"?

DD: I think ideally maybe there is. One of the problems you have with optimization is that not everything is captured by the fitness function. You see this a lot in the work in the 1960s. At that time there was a lot of interest in optimizing floor plates and lots of that work failed. They were trying to work out the optimal walking distance between rooms. The algorithm failed because it couldn't encapsulate the entire design space. They could find the optimum layout for walking but that wasn't necessarily important in terms of architecture, or it wasn't the only important factor in successful architecture. I think maybe in architecture today you see that as well. People will optimize for something and defer the responsibility to the computer

or the algorithm. They'll say that what they designed is valid because the computer did it, without leaving the possibility that there's something outside of what they've simulated that is itself important. I think there is space for—I don't know what you'd call it—post-optimization, or I'd call it a more symbiotic relationship between the designer and the computer. The designer is not deferring their authority to the computer, and they're also not subjugating the computer as being some kind of bad thing.

CB: As we're talking about deferring responsibility, or even algorithms or computation as capturing the design space, it could be argued that a lot of the people who use a parametric logic or computation in the design process tend to reduce architecture to binaries: right or wrong, true or false. However, as we know the design process is a lot more nonlinear and amorphous than that. Do you think algorithmic or parametric design is able to capture, or be flexible enough to capture, the entirety of the design space? Or to what degree do you think it could do that?

DD: Historically in architecture there's been this strange resistance to the design process in practice. You'll see the AIA guidelines for the way that a project is delivered, which works from conceptual design, to design development, to design documentation, and finally to construction. That idea is based on risk mitigation. But there is an opportunity that I see for parametric design, as it applies to the design process. Because the model is flexible and you can change the parameter, or you can change the way the model itself is structured, so that it's possible to change the design later in the design process. If we could make the parametric model flexible enough for this kind of change to occur within it, the design process becomes almost inherently more "designer-ly". The designer could delay design decisions until they can best decide what the impact of those design decisions are. It might then be that an optimization is feeding into that. It might be that their intuition is feeding into that; it might be that they've tested out a lot of things in the parametric model. Rather than making that kind of grand gesture at the start of the project, they're able to make it at the end of the project. Of all the things that we're discussing tonight, I think that's probably going to be the most profound change for architecture in the future. And it's something that isn't captured when we're talking about stylistic outputs of architecture. They're all just really frivolous in comparison to these fundamental changes in how architecture is going to be practiced in the near future.

LV: To follow up on this idea of capturing the entire design process, we are already witnessing a few examples of how computational tools enable the architect to decrease the gap between the conception of a project and the execution of a project. SHoP is a prime example, but then there is also a firm like CASE, trying to decrease the gap between the software

developer and the end user. Somehow, there is a symbiosis, or a blurring of boundaries between previously compartmentalized disciplines. Is it possible for the architect to cover all the various specialties which are currently closed to her or him?

DD: It's kind of an open question as to where architecture's going to go with this. One future would be having specialists within architecture firms. There are going to be the people who code, and there will be someone else within the firm who designs, and they'll work together. The question that I have about that is, if computation is making us more efficient, and if computation is changing the design process in this really profound way, will there be space for anyone who doesn't know how to do it? And that sounds horribly elitist, and I would say that as someone who knows how to use the computer, "The most valuable skill is using a computer. I'm gonna have a job, and all you guys are fucked!" [laughter]

DD: I don't know, and no one knows. It's not even for us to sit here and discuss: it's going to happen regardless.
LV: We've been having many discussions about these divisions, especially in a school like ours, between those "who can code" and those who can't. We've been wondering whether coding is something that we really need to know, not in order to be competitive, but to be able to say something in the future within our own discourse. It seems that not being a specialist, but at least being able to read is vital. It's a language at the end of the day. If you don't know English, then you're cut out of the market. If you're not able to speak to computers, it seems to be headed down the same path.

CB: It's interesting, almost like computational tools and techniques have allowed architects, designers, and many other professionals to capture the knowledge of many other professions and go beyond their traditional boundaries. But the larger industries have not yet caught up with what's happening. Although software has allowed an expansion of roles across various fields, larger market forces are still compartmentalizing industries and professions. It will be interesting to see how will that play out in ten years' time.

DD: Another question I have is, is scripting an artifact of software being crap at the moment? Maybe software is going to become much easier to use in twenty years' time, and you're not going to have to become a software programmer to use it. You'll just be a person that uses software.

LV: That's true, but at the same time, I would argue that if you're not able to either read or write this kind of language, you will always be depending on someone else that writes for you. Being able to hack digital platforms gives you the freedom to emancipate yourself from the constraints you have been given. In that sense, it seems almost necessary to know how to build your own custom tools. We are currently working

on a project that aims to create an open source platform for students to upload their codes and tools where you will be able to hack and build upon someone else's tool. Following from this, though, is an increasingly accepted notion that there is an authorless condition of the architect within computational design, because the same project can be hacked or built upon by other people. Do you think that there will be the possibility for architecture to reach such a radical point where the layman or the non-expert will be able to control the process by just moving sliders that someone else has built?

CB: As in Delanda's essay on algorithmic design, in which he proposes an evolution in the role of the designer, where the designer only sets up a rule set or a process.

DD: I think you have to look at what the designer does in the design process. The job of the designer isn't so much to come up with a design, but to discover why the design is needed. This whole scenario has already played out in mass customization. You can go on to Nike's website and get a shoe in any color or design and customize it to your heart's content. But no one wants to do that, because they don't know what they want. The job of the designer is to work out what the customer wants. I don't really see that ever being an option. It's the paradox of choice, it's just too much for people to go and design their own place. So, I 100% don't think that will ever happen.

LV: Do you think the architect as the sole author will always be there?

DD: Yes, definitely. Whether or not they're called an architect is a different story. It might be that the architect's authority is eroded by so many other things happening in the building industry, with jobs like designers or project managers. But there is always going to be someone in charge of what has to happen and why.

LV: Given your experience teaching at RMIT, do you see a necessary shift in the way schools of architecture are organized due to the role of computational design? Does this imply a new pedagogy?

DD: This is another question with which I struggle a lot. I'm not sure what we should be doing. One philosophy holds that computation will be a really big thing in the future and that every student who comes in to the school should be taught programming. That's what happens at RMIT. I was teaching at Melbourne University, and we taught them in 3rd year how to program.

LV: Was it like a core class?

DD: Yes. It comes back to that question, what is programming going to be in the future inside the architecture firm? It might

just be that programming is a skill like rendering. It's just something that you send off to a dude, and he does it and it comes back to you. In which case, we've just trained a whole lot of people for a menial job within an architecture firm. To be honest with you, if I was to say how I thought it should go, I don't think programming is that important for students to learn in an academic context. I think they should it learn it outside of it. I think the skill of learning to think like a designer, learning how to question and interrogate things, and how to reflect on your own practice are the real core of the education. They are what make architects special and good at what they do. But programming isn't a defining characteristic, it's something students can pick up on the side if it interests them.

CB: I read that you're a fan of Delanda. Thinking about his materialist philosophy and approach, (i.e. the way he discusses the evolution of civilization alongside material process, which he derives from the sciences of dynamics) do you think that you could apply a metric to all phenomena? Another way to put it is, do you think most things can be quantified?

DD: I feel like this is going to trap me in some way… [laughter] Yes, I guess I do. Maybe in my personal philosophy it would be kind of a hard determinism, like the world is pre-ordained in some way. I guess that erodes the idea of some kind of agency within that. I don't know. Where is this heading?

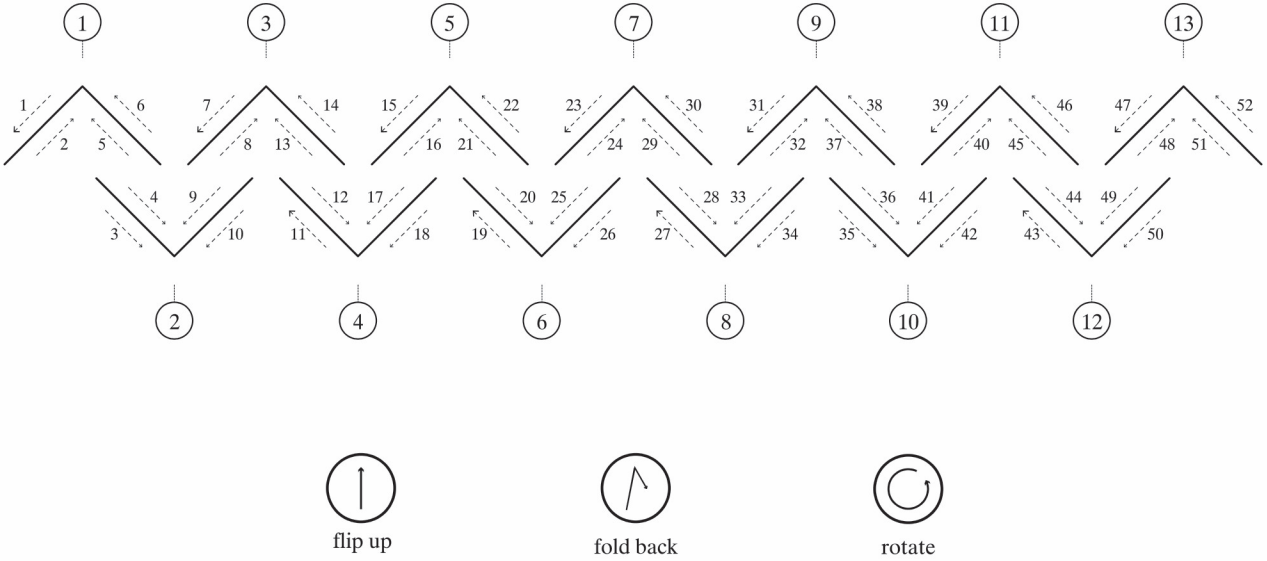
CB: It's more of a general question. As you know, the offset to this issue is phenomenology, so you could say that they are two opposite ends of the spectrum. And I'm sure a phenomenologist would say, "things cannot be quantified."

LV: It's actually interesting, because we're currently in an experimental studio at GSAPP that works through CATIA. Mark Wigley defines it as in line with what David Benjamin has called "post-parametric," in the sense that we don't seek the Schumacher style output. But in order to achieve a desired goal, what inputs do we need in order to achieve that? Most of the time we arrive at a point where we need to understand what is quantifiable and what is not. It seems like that's when a designer takes a position in the design process and interprets objective and quantifiable data, and says, for example, "For me, this is public space." There probably aren't quantifiable sets of data that can say, "Okay, this is public space." You as a designer interpret it, and for someone else it could be a different range. But for me, it's in this range.

DD: I feel like that's a similar problem but not quite related. That's a problem of what you can quantify practically versus what is quantifiable in a theoretical sense. What we can quantify today isn't necessarily what is quantifiable in the world.

1 Davis, Daniel. "Patrik Schumacher - Parametricism." 25 September, 2010. www.danieldavis.com

2 Davis, Daniel. "A History of Parametric." 6 August, 2013. www.danieldavis.com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