Meaningless Form / Formless Meaning: Architecture, Language, and the Computational Turn

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> "Many people would argue that natural languages are much more broadly based than programming languages, a stance that relegates code to the relatively small niche of artificial languages intended for intelligent machines. Recently, however, strong claims have been made for digital algorithms as the language of nature itself. If, as Stephen Wolfram, Edward Fredkin, and Harold Morowitz maintain, the universe is fundamentally computational, code is elevated to the lingua franca not only of computers but of all physical reality."[1] N. Katherine Hayles

> "…computational irreducibility occurs whenever a physical system can act as a computer. The behavior of the system can be found only by direct simulation or observation: no general predictive procedure is possible."[2]

Stephen Wolfram

Computation is poised to become the next dominant paradigm within digital design culture, with the power to influence everything from the organization of cities[3] to the position of masonry units within wall assemblies.[4] Computation can be defined as an iterative process that develops by a series of state transitions that a computer performs on a given input, and was most recently pushed to the fore of popular design conscience by the publication of Stephen Wolfram's A New Kind of Science in 2002. Wolfram's research on the emergent patterns of cellular automata (CA) caused a stir within architecture, inspiring among other things, the creation of The Journal of Architecture and Computation (comparch.org), an online think-tank dedicated to the exploration of computational theory and practice. The creators of this online journal and forum controversially argue that computation will engender the final stage of development in the relationship betweenarchitecture and computers by completely eliminating the concept of form from the architectural equation[5]. The use of language (in this case, the language of computer code) to evade the trappings of form has precedent in the postmodern use of semiotics to free architecture from the formal dogma of Modernism and the Classical tradition. In contrast to the semiotic critique, however, whose analytical methods were defined by the very logo centric system it was attempting to undermine, the use of code in architecture implies a completely different "worldview"[6]; one in which "emergence can be studied as a knowable and quantifiable phenomena, freed both from the mysteries of the Logos and the complexities of discursive explanations dense with ambiguities."[7] Computation may finally fulfill the underlying ambition of the semiotic project to create a completely autonomous architecture freed from Classical notions of past and future, and signal the end of design as we know it. This paper explores the evolution from the semiotic to the computational model in architecture as a way of better understanding the circumstances that made these radical leaps into language both possible, and necessary.

Beginning in the late sixties and arguably culminating in the Deconstructivist Architecture exhibit at the MoMA in 1988, architects systematically interrogated what Mark Wigley dubbed "the dream of pure form"[8], exposing the inherently subjective and arbitrary nature of the Modernist canon. Drawing upon Ferdinand de Saussure's notion of "the arbitrary nature of the sign"[9], architectural form was subjected to a relentless semiotic critique. In his seminal 1984 essay "The End of the Classical, The End of the Beginning, The End of the End," Peter Eisenman dismantled what he referred to as the 'three fictions' of architecture: representation, reason, and history.[10] Eisenman argued that the representational function of architecture had essentially remained unchanged from the time of the Renaissance. The abstraction

associated with Modernism which claimed to liberate itself from the "outward trappings of Classical style" by representing pure function, was for Eisenman merely the replacement of "the message of antiquity" with the "message of utility"[11]. This meant that the underlying 'representational fiction' which placed 'meaning and value' outside of architecture itself was still completely intact.[12] Michael Hays summarized Eisenman's critique as follows:

> "In Eisenman's view, modern architecture was never fully modern. Though it did produce a certain opacity of the architectural sign (most often referred to as its abstractness), modern architecture was never really free of the burden to mean; the referent still survives, albeit problematically, in cherished modernist emblems like the industrial shed, grain silo, and steamship, their workmanlike materials and their social utility."[13]

Instead, Eisenman pursued an autonomous architecture, "…a representation of itself, of its own values and internal experience."[14] This enabled him to pry the discipline from mythical origins, utopist futures, and narratives of meaningful presence, in favor of the "meaning-free, arbitrary, and timeless."[15] Eisenman used the underlying, syntactical structure of language to liberate himself (and many other architects) from form and the semantic entanglements that had thoroughly exhausted it.

Cut to the mid-nineties. With the 'Decon' show at the MoMA now history and the digital revolution lurking on the horizon, architecture occupied a tenuous position between a recent past that relieved it of "the burden to mean"[16] and a future where new technologies promised to make the expression of almost anything possible. It is at this moment when, in the vacuum created by the postmodern project, and for the first time in history, a form was created that appeared to be completely a-signifying. This meaningless form became known as the "blob."[17] Jorge Silvetti, in his 2002 Gropius Lecture at Harvard dramatically described the moment of the blob's first appearance on the architectural scene:

> "And what a sudden, frightening abyss it opened up in front of us as the computer certainly intimated that it could produce forms that not only do not have precedent, but, more perplexing, may not even have referents! Freedom from semantics, history, and culture was perhaps made possible for the first time in civilization."[18]

Gregg Lynn, who introduced the term 'blob' into architectural discourse, summarized it as follows:

> "The term blob was first used in architecture in an essay of the same title in Any Magazine in reference to both popular culture, like the Blob films and the latex special effects of James Carpenter, as well as to the modeling techniques in software at the time such as Softimage's "Metaclay" and Wavefront's "MetaBlobs." These software programs used the term BLOB as an acronym for "binary large objects." The principle for this modeling technique is that primitive polygon spheres are given a zone of influence and a zone of deflection. These two halos of inner and outer deformation interact with one another pulling and fusing the surfaces into larger collective meshes. In this way, one surface can be modeled by sticking many individual elements together. The entire surface will subtly adapt by small changes in the scale and position of any of its constituent elements."[19]

This was the historical re-emergence of form in the guise of the formless. The blob's formlessness is what allowed it to escape conventional signification but is also paradoxically what stripped it down to nothing but form. Like its cinematic counterpart, the power of the blob was its ability to absorb into its surface everything around it. Blobs consumed architectural context, 'invisible forces', and discourse. In the 1996 essay that introduced the new paradigm to the world, Greg Lynn's blob completely assimilated the platonic, eliminating any vestige of the referential that the originary "MetaBlob", in being purely spherical, may have possessed: "In this regard, even what seems to be a sphere is actually a blob without influence: an inexact form that merely masquerades as an exact form because it is isolated from adjacent forces."[20] According to Silvetti, this radical instability of meaning became unbearable and was quickly filled in by organic, biological, and process based analogues.

> "Since as creatures that may wish to produce a form without meaning also harbor the even more compelling and contrary impulse to be repulsed by that which we cannot name or understand, we began to invest Blobs with the meaning of whatever we could associate with them."[21]

This ultimately led to what Silvetti considers the dominant trend of contemporary architectural representation, something he labeled "Literalism."[22] The formlessness and inherent immateriality of the blob exposed it to multiple readings, allowing for a limitless variety of material attributes to be projected against it. For Silvetti, the blob gave birth to the contemporary practice of making

buildings that look like the metaphors upon which they are based, permanently fusing language and form. The blob was to architecture what according to Danto, Warhol's Brillo Boxes were to art.[23] Each brought about in its own way and in relation to its own discipline, the collapse of signifier and signified and the end of historical categories. The blob paved the way for the eventual replacement of the semiotic language model with the computational one.

Amidst this atmosphere of post-blob 'literalism' architecture is once again turning inward. Focus is shifting from the dynamic outer appearance of form to the underlying genetic code that makes it possible; from meaningless form to formless meaning. Karl Chu, Haresh Lalvani, Michael Silver, and a host of other architects, each inspired in their own way by the kind of CA simulations that Wolfram has been conducting, have developed their own strategies for exploring the potential of computation in architecture. Karl Chu, one of the originators of the new paradigm, employs what are known as "L Systems" to create fractal-like, self-similar morphologies where the whole and its parts have the same structure. In a 2004 essay, "Metaphysics of Genetic Architecture and Computation," Chu divided contemporary architectural discourse into two divergent trends, the "morphodynamical" and the "morphogenetic".[24] According to Chu, morphogenetic systems contain an "…internal principle that generates architectural form and organization"[25] that morphodynamical systems such as Gregg Lynn's do not. "L Systems" are recursive, which means that objects are defined in terms of previously defined objects of the same class. This is what makes them 'generative' in a way that the parametric constraints of animation software are not. Chu characterized the dynamic 'soft morphology' of the blob and its progeny as nothing more than a placeholder for numerical values.[26] These values

> "…map changes in time, density and space: the frequency of a gene, the concentration of a chemical, the position and velocity of an aircraft, the pressure of a gas, the rate of change in interest rates, the fluctuations of the dollar, the density of population, the earnings of a firm, the rise and fall of stocks, the diagrammatic flow of traffic, etc."[27]

This characterization confirms Silvetti's diagnosis and twenty years later echoes Eisenman's in its claim that architecture is still trapped within a referential system. Instead of columns as "surrogates of trees," however, and windows that "resemble the portholes of ships,"[28] blobs morphologically (and according to Chu, 'spuriously') describe frequencies, velocities, pressures, and other dynamic conditions in nature that otherwise lack formal embodiment. Computational architects such as Chu seek to halt the endless profusion of smooth, computer generated forms that have once again done nothing more than replace one 'representational fiction' with another. No less controversially, Haresh Lalvani is seeking to map what he calls "the architectural genome," "…a universal code for all morphologies."[29] Once mapped, he argues that the pairs past and future as well as natural and artificial will cease to be dialectically opposed and will fuse into one. Michael Silver's project Automason 1.0 uses generative codes to address real problems associated with building construction. Silver was inspired by the emergent properties of CA, which "…[consist] of a field of discrete cells divided into small groups of neighborhoods [that are] defined in terms of finite states, on or off, transparent or opaque, white or black,"[30] and evolve from a simple set of rules to achieve an astonishing level of complexity. He identified a similar potential in masonry technology, which is also based on a step-by-step process following principles of adjacency and iteration. Silver is proposing a teleonomic architecture, where building construction would remain a goal-oriented process with the one exception that the mason would be unconscious of the goal. A builder would receive instructions in the field from a hand-held device, with a brick being laid in accordance with each new cell of the evolving CA pattern that appeared on the screen. Silver controversially argued that:

> "The patterns created in the process [would be] entirely natural to both the craftsman and the mathematics. With simple programs building details obtain their complexity for free; no external agent, author or extraneous system is needed to design them."[31]

In contrast to "…the deconstructive architect [who] puts the pure forms of the architectural tradition on the couch and identifies the symptoms of a repressed impurity,"[32] the computational architect has no psychoanalytic agenda. Computation does not critique form; it replaces it. According to N. Katherine Hayles, the use of code in what is now being called the post-human era marks a radical departure from the postmodern use of natural language in at least two important ways. First, the

postmodern critique of "the metaphysics of presence"[33] was only possible against the background of an "originary Logos"[34]; something that computation, in its reduction of "…ontological requirements to a bare minimum,"[35] has done away with completely. The second important distinction that Hayles makes between these two language models is that the emergent characteristics of computation imply a radical "disjunction between surface and interior,"[35] where what is manifested at a global scale can in no way be deciphered (or therefore, destabilized) by recourse to the zeros and ones of the code that created it. Digital languages produce a surface transparency which only disguises a highly abstract and impenetrable opacity; for "[u]nlike the depth model of meaningful interiority in the analogue subject, the further down into the coding levels the programmer goes, the less intuitive is the code and the more obscure the meaning."[33] Because of this, code cannot be used as a language of or for interpretation. By extension, buildings which result from code writing escape the circularity of metaphysical or hermeneutical arguments by irreconcilably severing the origin from the outcome, and by paradoxically placing all of their complexity on the surface.

CONCLUSION

Cellular automata have been used to study a baffling number of subjects including but not limited to ethnography, signaling networks, the human uterus, chaos, concrete structures, ecologies, fluid dynamics, forest insect infestations, red blood cells, crystals, bacteria, jigsaw puzzles, genetically modified plants, snowflakes, sand mandalas, weather, drainage networks, urban sprawl, computer games, heat transfer, artificial life, combat, painting, debris flow, the immune system, education, traffic, hormones, smallpox, artificial morphogenesis, SARS, yeast proteins, musical composition, intracellular ion migration, sand piles, stock markets, geophysics, grazing, limb growth, and not least of all, architecture.[36] The fact that all of these systems can be simulated using CA makes a pretty strong argument in favor of Wolfram's thesis that nature itself may in fact be computational. However, a simulation is by definition not the real thing. So if the ultimate ambition of computational architecture is to get as close as possible to the unmediated production of structure and space, to an architecture that is purely itself, then there is clearly a missing link between simulations like CA and their architectural manifestation. If life itself remains the ultimate model of emergence, then, according to Elizabeth Grosz, CA still fall short of the kind of Bergsonian duration that would produce genuine novelty.[37] Grosz, in her recent book The Nick of Time: Politics, Evolution, and the Untimely, argued that "…algorithmic models share the same philosophical or ontological problems" as mathematical ones, and that in simulations like CA, "time becomes merely the neutral, regulatable background in which objects or relations change, rather than an inherent ingredient in such research."[38] Grosz made the keen observation that the 'duration of steps' within a CA simulation could be sped up or slowed down without in any way affecting the outcome.[39] A New Kind of Science confirms this where Wolfram made it clear that his most crucial discoveries could only have been made once the computer sped up the computational process.[40] So while CA evolve in real-time, their duration is dependent upon the limits of technology. The more crucial question arises, however, when we take a minute to actually imagine a world in the not-too-distant-future where Grosz' demands are satisfied and architecture is self-organizing, unmediated, and possesses true duration. In this world, which according to Haresh Lalvani, is quite possible,

> "[b]uildings would grow, respond, adapt and recycle, they would self-assemble and self organize, they would remember and be self-aware, they would evolve, and they would reproduce and die. Organic architecture, were it to attain biology, would design itself. It would also perpetuate itself. Architecture would then become "life", and paradoxically, buildings would no longer need architects. Organic architecture, in this limit case scenario, would also define the end of architecture (as we define it now)."[41]

The "End" that Eisenman's essay 'ended' was the representation of an ultimate point in the future that functioned "…as a value laden effect of the progress or direction of history."[42] While this perception of a break in historical continuity is exactly what freed Eisenman to treat every project as its own origin with its own arbitrary set of rules and tactics, it wasn't until the appearance of the blob a decade later that historical categories would actually come to an end; making a truly emergent architecture possible. While computational architecture is informed on a theoretical level by the "non-dialectical, "non-directional," "non-goal oriented"[43] program that Eisenman's work initiated, one crucial place where it contra-

dicts the postmodern semiotic paradigm is in its tendency toward the transcendental, in the form of the technological telos that has ultimately come to define it. So while CA may not exhibit goal-oriented behavior, computational architects do. For invariably their work circles around a desire to reach that almost utopist point in the future where all barriers will finally be broken down. Karl Chu sees the "convergence of computation and biogenetics", for example, as leading to what he dramatically calls "…the unmasking of the primordial veil of reality."[44] So while the postmodern use of semiotics enabled architecture to escape from the future, the post-human use of computer code may be turning architecture once again into one of its dependents. The closer architecture gets to science the more inevitable it seems that that future, which we have successfully managed to evade for almost three decades, will return to cast a shadow on the present.

ENDNOTES

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