GENERATIVE DESIGN AND THE REDUCTION OF PRESENCE

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Abstract. The universe of digital fabrication does not only allow buildings to be produced as quick, precise, multiply-generated objects (prototypes) but also reduces, in a very specific way, their presence as original entities. This implies a radical disjunction between the past and the future of the building industry, with all the intrinsic changes and transformations that might affect both the architectural product and the maker.

1. Prototypes and Digital Fabrication

One would recognize in the recent developments in the realm of digital fabrication a new change at work, a change that seems to challenge the assumption that the concept of architectural production has a kind of quaint immutability about it. For the universe of digital fabrication does not only allow buildings to be produced as quick, precise, multiply-generated objects (prototypes) but also reduces, in a very specific way, their presence as original entities. This implies a radical division between the past and the future of the building industry, with all the inherent changes and transformations that might affect both the built environment and the designer.

Now, prototypes include small as well as large objects. Small prototypes are often displayed in architectural exhibitions in the form of models of buildings, that is as miniscule manufactured products, sharp and nicely rendered. These models are made in advanced modeling-labs where the latest cutting-edge technologies (Laser, CNC and rapid prototyping) are used. The ensuing aesthetics is inherently digital in its accurate presentation and goes further than the expression of the traditional model-maker's skills. One specific instance of this technology is Selective Laser Sintering (SLS), which is often used by the office of Zaha Hadid to build models of complex

museums, such as the Guggenheim Museum Taichung in Taiwan, or the recently-designed Abu-Dhabi Performing Arts Centre (figure 1).

Figure1. Abu-Dhabi Performing Arts Centre/UAE, by Zaha Hadid.

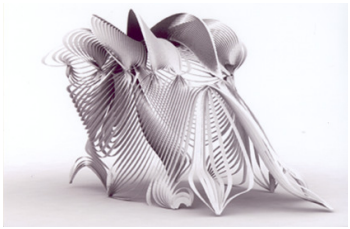

Figure 2. "Cocoon" (Biothing)

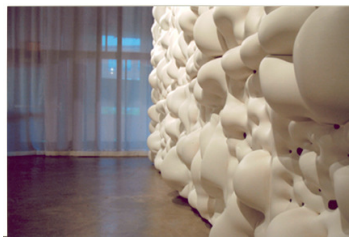

Figure 3. "Pwall_03" (Matsys)

The use of these advanced technologies inside digital fabrication labs parallels the use of larger robotic systems in the automobile, aerospace, and shipbuilding industries. More efforts are also made to start testing their possible applications in the building industry. At the purely experimental level, we might point here to the tooled formal explorations led by Greg Lynn and Marcelyn Gow, for example, where computer-numerically-controlled (CNC) milling processes are used. Such rapid processing experiments demonstrate a form of modeling that is surely to be adopted more widely within the construction industry. Here the computer is used not only to calculate and 'tool' up individual building components, as happened with the Guggenheim Museum in Bilbao, but also to help fabricate individual formal studies that feed into stage one of the design process (Leach, 2002). An emerging generation of experimental designers (such as Ocean north, 4-pli, Softlab, Akt, Biothing, Proxy, Theverymany, Mesne, etc.) is also disseminating this trend by producing new environments

through "scripting" and the manipulation of digital codes (figures 2 , 3, 4, 5) (Scriptedbypurpose, 2007) and definitions (such as Grasshopper's).

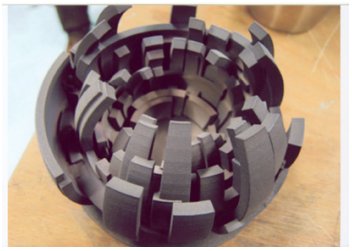

Figure 4. "Object_1-rp" (Marius Watz)

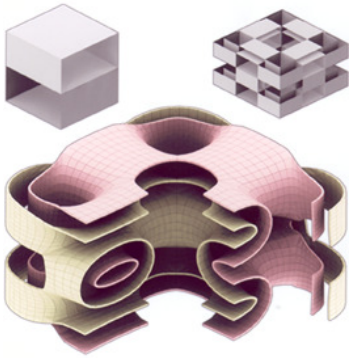

Figure 5. "Topological_house" (Proxy)

Further, some firms in the shipbuilding industry use very large cutting tables, similar in principle to CNC routers, which could be of relevance to building construction applications. Robot laser welders are found these days in shipyards where they can crawl about inside the double bottoms of ships, and could be adapted to the building construction site (figure 6). In fact, many strategies adopted by shipbuilders are highly applicable to buildings and range from specific layout and forming techniques for curved metal or composite shapes to the development of customizable "product models." Other techniques such as water cutting are also used to tackle cutting routines at a large scale.

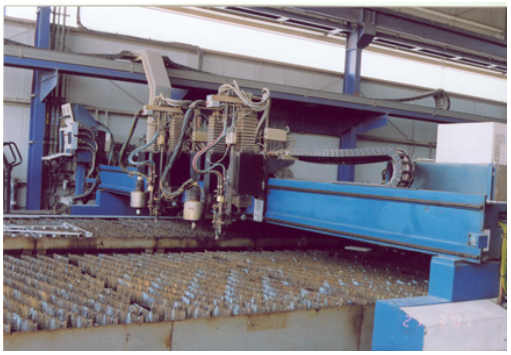

Figure 6. Plasma cutting unit (Abu-Dhabi Ship-Building)

Developing on-site factories to implement some of these technologies is on the rise. From the 1980's, the fabrication of building members and the on-site assembly and infill operations have been implemented automatically in several countries like Japan (Hasegawa, 2006). The introduction of digital technology has reinforced this orientation. The Yokohama Ferry Terminal in Japan by Foreign Office Architects (Farshid Moussavi and Alejandro Zaera Polo), for example, is a revealing case in that its building depended crucially on the interface between digital technologies and architecture (figures 7-1 and 7-2). Throughout this project, sophisticated modeling and drafting software enabled designers to shape surfaces and forms from various types of information. The design for the ferry terminal folds programmatic, constructional and structural concerns into a single formal expression. "Yet in order to resolve the complex interplay between these concerns, the profile of the building needed to be explored on the computer through an ever more finely calibrated series of sections. This project was not only born of the digital – it was realized through the digital" (Leach, 2002).

Figure 7-1. Yokohama Ferry Terminal in Japan,

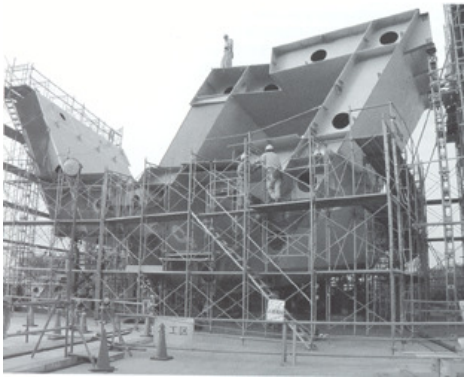

Figure 7-2. Yokohama Ferry Terminal in Japan, by Foreign Office Architects.

The flexibility offered by these new developments is to be stressed. As André Chaszar pointed out years ago, one of the more intriguing directions being explored by some architects is mass-customization for buildings (Chaszar, 2003). In these scenarios, basic building shells or frames are outfitted –inside, outside, or both – with elements selected by their prospective occupants. These may be along the lines of built-in furniture and fixtures, or larger elements such as additional rooms, alcoves, mezzanines, penthouses and so forth. The basic shell or frame may also be modified within some parameters. This kind of design concept is aided by CAD tools, but even more powerfully by parametric modeling and associative geometry capabilities. When linked to engineering analysis and a construction system, standardized but tailored buildings may finally be realized after decades of experimentation. Flexible building prototypes would also respond to varying site conditions or other external constraints (for example environmental factors, sightlines and zoning envelopes). Advanced technologies seem to allow the crystallization of every possible design, no matter how complex the form might be.

2. Flexibility

This implies, among other things, that buildings, like any other prototypes, will soon be produced quickly, precisely, at any scale, at any time, in any desired number and with as many variations and transformations as the designer wishes to get. A few entailments of this scenario are worth highlighting.

The fact that the same digital data can now be conceived, modified, refined, and sent to a machine in order to become a physical object that could be produced in an infinite number and variations, brings a new and radical dimension to the definition of architectural project. In opposition to the classical isomorphism between drawings and buildings, wherein the second stand as translations of the first, the new design scenario does not strictly fall within a semiotic frame of resemblance as much as within a quasi biological context, reminiscent of the Aristotelian notion of entelechy. The digital data does not represent the building as much it actively works to become the building itself (only upon sending a given file to a machine does the building begin to materialize as an empirical reality). And until the digital data actualizes itself, the building qua building is no more than one single, potential possibility/interpretation among many others. Within this new generative context the digital does not need to be translated but produced. Several buildings could thus be parametrically and algorithmically generated, not as copies or replicas, but as ‘instances’ of a discrete, immaterial notion. Within this new design context, individual

expression and creativity are so closely accommodated that no two forms are the same. And just as the human genetic code permits each of us to be unique, so too this new algorithmic technology can generate a wide range of unique forms from a master code (figure 8).

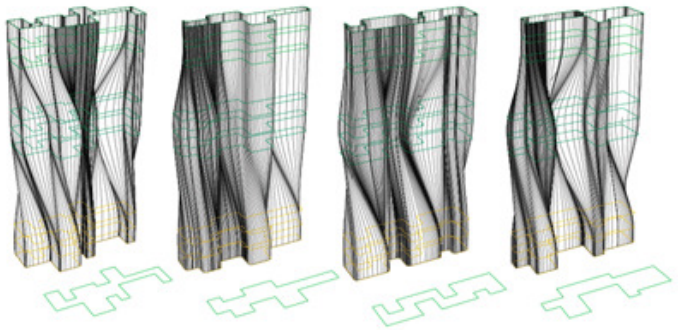

Figure 8. "Aggregate" (f-u-r)

Like cars and fashion items, buildings can now be manufactured as routinely-consumed items that would look original only through the subtle mechanisms of flexibility: frequent alteration of prototype design (Style 2007, Style 2008) and "perpetual profiling" (mine, yours, hers). The generic takes over the circumstantial, but this truth is veiled. The "abundance of sameness", to repeat Hal Foster's expression, is presented not as a defiance to subjectivity, or its loss, but as a flexible process of "customized prototypes," produced or altered to individual or personal specifications (Foster, 2002). Certain "myths" have to be generated to stimulate excessive use and to lock people into a continuous system which can generate and speed up consumption through a vocabulary of interchangeable, layered and repeatable functions. Samples (sms messages, on-line ads, posters, catalogues, brochures) of "next season's buildings" are displayed and disseminated to enforce this strategy of stimulating and channeling desire. A degree of manipulation is involved, and the consumer is flattered into believing that his or her own free assessment of and choice between the options on offer will lead him or her to select the product the advertiser is seeking to sell.

Barthes's theorization of the role of the 'fashion system', in his 1967 book of that name, provides here a useful reference if it is read as an interpretation of the function of fashion production and advertising in the capitalist market economy. Barthes argues that calculating, industrial society is obliged to form consumers who don't calculate, because if consumption

was based merely on the calculation of need, the economic system as we know it would break down. A system of signification is therefore created, an image-system constituted with desire as its goal, to stimulate and channel desires, in order to force the consumer to disregard calculated needs as a basis for consumption in favor of uncalculated desires. Specialized groups (accelerators), intervene to implement this strategy (Barthes, 1990).

If the production of architectural prototypes takes on meaning mainly in terms of a specific context of functionality, similar to the one governing the fashion industry, then the pure exhibition value and critical distancing of the observer that are characteristic of artworks become here secondary. Importantly, the politicization of this new architecture seems to take on meaning essentially in terms of the market value generated within a given community of users, with all the calculations and manipulations involved.

3. Loss of corporeal thought

From the standpoint of the architect as a maker, this time, the upsurge of digital design and fabrication could only leave us witnessing the loss of what has been a personal stomping ground, namely the intensity of the directly lived experiences of design and building. The direct, sensuous contact with drawings, models and materials is now being lost to a (digital) realm whose attributes refer to physical reality only remotely. Unlike physical drawings and buildings, digital manipulations and prototypes tend to denote a loss of immediacy and a withering of embodied thinking, a loss that is similar to the devaluation of experience that led to the disappearance of the art of storytelling.

In The Storyteller essay, let us recall, Benjamin highlights a process within literature similar to that of the withering of aura in the visual arts. Storytelling, he wrote, was disappearing because "experience has fallen in value. And it looks as if it is continuing to fall into bottomlessness" (Benjamin, 1968). War and inflation had been the real causes of this devaluation of experience but, over the longer term the newspapers, as a new form of information, has exerted a deep influence and brought about a crisis in both storytelling and the novel. For in the newspapers, "no event any longer comes to us without already being shot through with explanation. Whereas the value of a story, deeply embedded in oral tradition, depends upon its leaving events unexplained and thus allowing readers to interpret it over time, "the value of information does not survive the moment in which it was new. It lives only at that moment; it has to surrender to it completely and explain itself to it without losing any time" (Benjamin, 1968). Like mechanically reproduced art, the information media shatter tradition and create new, mass-produced cultural forms that replace not only the old, pre-

modern forms (storytelling as a craft, comparable to the work of art in the service of ritual) but also the modern forms characteristic of the age of the ascendant bourgeoisie (the novel, whose birthplace is the solitary individual, comparable to putatively autonomous art) (Lewis, 2003).

In both the Storyteller and the Artwork essays, Benjamin sees the present status of art or communication as a result of its emancipation from tradition, its increasingly abstract character, symbolized by the reduction of the role of the "hand" and craftsmanship in its reproduction, and its mass audience. In the specific case of storytelling this reduction followed the decline of the oldest forms of craftsmanship. "For the storytelling is always the art of repeating stories, and this art is lost when the stories are no longer retained. It is lost because there is no more weaving and spinning to go on while they are listened to" (Benjamin, 1968). In point of fact, "The storytelling that thrives for a long time in the milieu of work— the rural, the maritime, and the urban— is itself an artisan form of communication, as it were. It does not aim to convey the pure essence of the thing, like information or a report. It sinks the thing into the life of the storyteller, in order to bring it out of him again. Thus traces of the storyteller cling to the story the way the handprints of the potter cling to the clay vessel"(Benjamin, 1968).

But we are no longer familiar with this practice since "the role of the hand in production has become more modest, and the place it filled in storytelling lies waste. (After all, storytelling, in its sensory aspect, is by no means a job for the voice alone. Rather, in genuine storytelling the hand plays a part which supports what is expressed in a hundred ways with its gestures trained by work.) In fact, one can go on and ask oneself whether the relationship of the storyteller to his material, human life, is not in itself a craftsman's relationship, whether it is not his very task to fashion the raw material of experience, his own and that of others, in a solid, useful, and unique way" (Benjamin, 1968).

For centuries, what has been architecturally brought-forth – the quick line, the practical gesture— comes to be through the power of a physical organ, namely the hand. The architect has developed not only the technique of the mind but of the hand. In the hands, the designer's fate as a maker has resided. With the advent of digital design and fabrication, conditions for the promotion of this embodied thinking are becoming less favorable. The digital shifts away from traditional architecture's multiple expressions its participation in the rhythms and meaning of physical life, toward a remote mode of designing. Designers are forced to reflectively seek in the digital world of their workstations, in the remote and lifeless sphere of virtual suggestions and algorithms, a sense of a lived experience of construction in which they no longer participate directly. In this realm of infinitely fast, automatised and highly suggestive images, design and fabrication are becoming as vacillating as a dream, the interpretation and fixation of which

may not be always warranted by the standard means of architectural judgment. And when the role of the hand, and of practical memory, is thus reduced, the rising prototypes read, rather, as the product of a detached memory, a memory that bears little relation to architecture as a craft, and as a lived experience.

Whereas traditional design appears closer to the lived experience of material life and, therefore, contains within it the seeds of a particular forgetfulness needed to set off the essence of an architectural impulse, the world of digital design and fabrication reveals itself as the product of attentiveness and reflection. Such a difference seems to have some effects on the concept of originality. For in order to be attractive to customers, prototypes must pretend to be forever new and original; but this anonymous and detached originality has little to do with so-called individual style, the demise of which ironically is being deplored by digital enthusiasts themselves today. To the extent to which individual style crops up in digital formats – where it is introduced only as a formal pretext to meet the demands of the market– it tends to look like a blemish, a defect, and a compromise.

And yet, does all this imply that a design emptied of corporal thought and the conditions to foster individual styles, lacks the propensity to yield original contents? In truth, what digital design and fabrication lacks is the kind of originality associated with craftsmanship, and with the notion of the métier in general, but not with the force to move the compositional forces of production toward the terms of complexity, newness and the channeling of desire. Like novel-writing (a phenomenon of post print culture), what an architecture of prototypes denotes is the withering of embodied thinking and experiential knowledge, and would have to be conceived from this angle as the complete adjustment of architecture to the advanced technical standards of production, however un-corporeal this path may be.

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