

Intuition by Design: A Comparative Study on the Qualitative Aspects of Designerly Problems

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ABSTRACT

This study intends to discuss qualitative means of architecture on the context of the CAAD in reference to Greg Lynn's paper Calculated Variations. Since familiar examples of CAAD seem largely neglect the qualitative and concentrates on rather closed/autonomous processes resultant of techno-scientific determinism, the study considers intuitive approaches that arise from such processes as anomalies. In order to trace the situation the study concentrates on the use word intuition within the selected cases.

Keywords - Intuition, qualitative aspects of designerly problems, CAAD, techno-scientific determinism

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I. INTRODUCTION

"In painting, auto design or any other field that has an expert discourse about form, meaning and performance, at the moment a new technique arises, it becomes the exclusive subject of discussion for the first few years. Once the ability for that technique to produce effects in a given discipline has been discovered, often through automatic processes and happy accidents, then the next task for the field is to begin to reproduce those effects with rigor accompanied by an aesthetic, social, cultural and technical discourse. This exhibition announces the end of the former and the beginning of the later. Working by happy accident for perpetuity does not work; once you do something by accident then you have to do it by intention the next time" [1].

In his exhibition paper, Calculated Variations Greg Lynn announced that because his technique is now on the verge of a consciousness accompanied by an aesthetic, social, cultural and technical discourse; previously manifested intuitive processes as parts of a learning exercise and a pseudo-scientism was left behind. With this argument, therefore Greg Lynn accepts that architecture is more than a smoothly processed algorithmic conclusion, yet rather it is result of a combination of different qualitative faculties like aesthetic, social, cultural and technical. This study focuses on Greg Lynn's former and latter design phases in parallel with the major shift in his discourse.

In this article, problems of intuition will be discussed as one of the most vital part of the CAAD discourse and design methodology. Then roots of generic algorithmic forms and their contemporary architectural formal responses under the guidance of high-end computer software will be introduced. By

following Lynn's essay Calculated Variations, former and later phases in his design strategy will be clarified. Then, following Alan Colquhoun and Peter Eisenman's critiques dangers of the previous position in design will be exemplified. Consequently, D'Arcy Thompson's scientific variation method [2] and Art Nouveau will be analyzed as the two different cases leading two different mindsets in CAAD design in Lynn.

II. PROBLEMS OF INTUITION IN DESIGN

In Typology and Design Method [3] Alan Colquhoun, maintains that mathematical tools are unable to give designers ready-made solutions to their problems. They only provide the framework, the context within which designers operate. Following Colquhoun this study argues that unlike tamed and well-defined problems of engineering, problems of architecture are untamed, wicked [4] and mostly ill-defined [5] that is they are mainly related to qualities rather than quantities, they are open ended and they should be solved by considering cultural as well as physical contexts. Following Colquhoun, this article examines that, when such designerly [6] qualities are not taken into consideration, traditionally architecture is faced with two types of intuitionism: biotechnical determinism, and free expression.

Intuition can be described as what remains after a vacuum that is created by the absence of the qualitative cultural constraints in the design processes. It happens when design process selectively ignore such qualities simply on behalf of following the scientific method. Colquhoun underlines that "in spite of the scientific method, we (Architects) must still attribute social or iconic

values to the products of technology and recognize that they play an essential role in the generation and development of the physical tools of our environment” [3].

For a designerly process, biotechnical determinism is one of the first indicators that designers should pay attention and be cautious. It is the main motivation behind the scientific method of analysis and classification. It explains human production as connected to the Spencerian evolutionary theory by emphasizing unconscious teleological processes. In architecture, biotechnical determinism was boldly represented by the functional doctrine of the modern architecture. Following this line of thought, Functionalism sees “architectural form as something, which was achieved without the conscious interference of the designer, but as something, which nonetheless was postulated as his ultimate purpose”.

Free expression (as the second indicator of intuitionism in design) is on the other hand simply described as what settles where the scientific method vacuumed/emptied out previously. It refers to the design moment in which the designer is unable to break through or pass beyond the possibilities in hand by following purely teleological scientific method. It is the moment when the scientific method left the designer all alone.

Based on these two indicators (biotechnical determinism and free expression) the study focuses on the three interrelated aspects. First, it rereads the design process of Greg Lynn’s Embryological Houses as it was presented by Lynn; second, it reconsiders Peter Eisenman’s critique in continuation of Colquhoun; and the third, in light of these it focuses on the discursive changes in Greg Lynn’s design methodology.

III. CURVED SPACE

Curved space of non-Euclidean geometry has greatly affected CAAD based architectural form creation; it mainly replaces the forms derived from discrete Euclidean geometry [7]. The term non-Euclidean geometry describes both hyperbolic and elliptic geometry, which is contrasted with Euclidean geometry. The essential difference between Euclidean and non-Euclidean geometry is the nature of parallel lines. As in (Fig. 1), in Euclidean geometry, the two lines are constantly parallel, while in non-Euclidean geometry, however, they either curve away [hyperbolic] from each other or curve toward [elliptic] each other and eventually intersect [8].

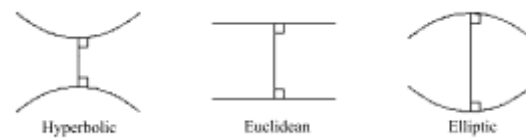


Fig. :1 Representation of Hyperbolic, Euclidean and Elliptic Geometry

In the first pages of her book *The Fourth Dimension: and Non-Euclidean Geometry* Henderson mentions liberating effect of the invention of the curved space onto the early twentieth century modern art:

“The two types of non-Euclidean geometry (deriving either from alternatives to the parallel postulate or from questions of congruence) shared a critical and provocative idea: the possibility of curved space. The suggestions that space beyond our immediate perceptions might be curved or that the appearance of objects moving about in an irregularly curved space might change had a natural appeal to early modern artists. The existence of curved space would necessarily invalidate the linear perspective system, whose dominance since the Renaissance was being challenged by the end of the nineteenth century” [9].

The first alternative to Euclid’s fifth postulate which is called parallel postulate leads to the hyperboloid geometry [negative curvature] developed by the Russian N. I. Lobachevsky in 1826 independently by the Hungarian Janos Bolyai in 1832. The second alternative leads to the elliptic geometry [positive curvature] developed by the German Bernhard Riemann in 1854(Fig. 2).

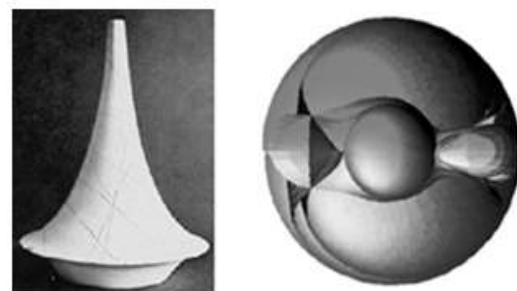


Fig. :2 From Left to Right, Beltrami Pseudosphere, as a Hyperboloid Model of Non-Euclidean Geometry, and Riemannian Sphere, as an Elliptic Model of Non-Euclidean Geometry (Banchoff,1990; Berger & Gostiaux, 1988)

The effects of these two types of curvatures, which were defined and modeled in the early 19th century, on the computerized gestaltic organizations are clear. In addition to the mathematical openings of curved space, the term curvilinearity also seems to be important for the emerging discourse of the CAAD design. The term

refers certain formal characteristics seen in the vast majority of studies in this field. The characteristics can also be traced from the definition of the term “curvilinear”:

“Curvilinear: Consisting of, or contained by, a curved line or lines; having the form of a curved line. (Opposed to rectilinear and in Gothic Archit. to perpendicular, as applied to window-tracery.) Hence curvilinearity is the state of being curvilinear” [10].

Since state of being curvilinear seems to be the most critical architectural quality in creating generic algorithmic forms in CAAD design in general and in Greg Lynn’s design specifically, in the next part, the role of curvilinearity in Lynn’s specific works will be examined.

IV. FORMER PHASE

In his essay *The Folded, The Pliant and The Supple* Greg Lynn seems to set up a glossary of the curvilinearity by giving the definitions of the fold, pliable, plexus, smooth space, supple, viscosity: as well as introducing some important figures like Edmund Husserl, D’Arcy Thompson, Gilles Deleuze, Spinoza, and Rene Thom [11]. In this way, he explains scientific and philosophical base of non-Euclidean curvilinear geometry behind his architecture. On the other hand, it is seen that, zoologist D’Arcy Thompson has a privileged over other names by means of a direct application of his variation methods into Lynn’s architectural design processes.

At the Conference of Growth and Form: the Engineering of Nature, about the more recent influences of D’Arcy Thompson on science and contemporary aesthetics Ryszard Sliwka states that: “D’Arcy Thompson’s explorations in *On Growth and Form* was influential in the positivistic debates crucial to the birth of the early modernism. However it can also be seen as a pivotal bridge between the nineteenth century attempts to establish a unity between scientific, aesthetic and spiritual life, and the more recent developments in science, biology and mathematics” [12].

D’Arcy Thompson examines curve of frequency or bell curve which explains for example variations in height among 10-year-old schoolboys, the florets of a daisy, the distribution of darts on a cork board, the thickness of stripes along a zebra’s flanks, or the shape of mountain ranges and sand dunes. As shown in (Fig. 3), studies exemplify variations between X (in this case, geometry of prototype baboon skull) and Y (in this case, geometry of other primate skulls. Here we even see variations between the frog and Apollo).



Fig. :3 D’Arcy Thompson, variations between the frog and Apollo.

D’Arcy Thompson and the variation method can be described as main motivations behind the embodiment of the curved space in Greg Lynn’s design terminology. Yet although technically they are the same, it is not proper to say that Lynn’s computer generated algorithmic form variation processes may easily be classified as in the same category as D’Arcy Thompson’s attempt to reduce biological phenomena to mathematics. It is seen that D’Arcy Thompson’s variations are from biological phenomenon to mathematics, whereas Greg Lynn’s are from architectural/cultural phenomenon to mathematics.

Shifting point in Lynn’s design strategy is mainly grounded onto this difference. Although in the *Calculated Variations* Lynn indicates that architectural design is more than a variation process and criticizes design as such; his earlier works operates in exactly the opposite direction. At this point, it will be useful to remember a discussion about *Embryologic Houses* (1998) (Fig. 4) between Greg Lynn and Peter Eisenman.

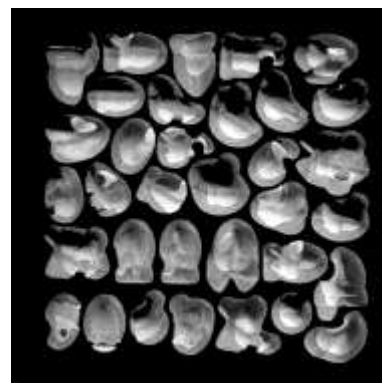


Fig. :4 Embryologic Houses, represented as series, [13]

Embryologic Houses project is important for two reasons: first, it significantly exemplifies Greg Lynn’s former phase design approach, which is borrowed mainly from Henri Bergson and D’Arcy Thompson; and second, the project provides a context, which makes us rethink the relationship between intuition and scientific method in design this time in CAAD design. Following Greg Lynn’s words:

“The Embryologic Houses employ a rigorous system of geometrical limits that liberate models of endless variations [...] This [variation] marks a shift from a modernist, mechanical technique to a more vital, evolving, biological model of embryological design and construction” [13].

V. THE 6TH DISCUSSION

As the final meeting of the ANY Conference, the 6th discussion held at the Solomon Guggenheim Museum in New York City on June 2000. The reason that this study links to this discussion section is that it helps to clarify Lynn’s recent position and underlines one of the crucial problematic between CAD design and Architecture. At the conference, after Lynn’s presentation, the following conversation took place between Eisenman and Lynn:

“- (Eisenman) In this profession we don’t talk to one another anymore...When Greg presents his work, I want to know what the design principles are that operate in his work so that we can have a critical debate.

- (Lynn) I am resistant to talking here.

- (Eisenman) I’m just asking you a question. I’ve asked it in private; I asked it in public. How do you chose the one out of 169; how do you know when you’ve gotten there, and what makes it more than just an illustration of architecture? What kind of interiority of the discourse does it have? Just because it shelters does that make it architecture?

- (Lynn) No.

- (Eisenman) And I’ve asked you in many occasions to tell me how I would know that what you do could better or worse.

-(Lynn)[...] In terms of evaluating and picking which one is best, the whole point is that I don’t want to have to do that” [14].

Here, Eisenman criticizes Lynn’s presentation (high-end technology-driven smooth design process) by using Colquhoun’s framework. According to this: if D’Arcy Thompson’s systematic variation method is used to reflect an architectural process under the guidance of a software program, this surely indicates existence of a highly autonomous and smooth process in reaching the architectural end product that Lynn proudly presents. On the other hand, as discussed previously, it is clear that because of their very nature such processes (the processes that Lynn derived from D’Arcy Thompson) cannot support a decision-making until “one” of the alternatives/variations can be identified as “better.” By following such processes how the designer reaches an end product and how the selection and decision processes worked until finding the last “better” piece is a mystery. Lynn’s presented last piece is not the “better” one (the one which is able to satisfy successively all the

constraints imposed by the design) it is a self-appointed (freely expressed) piece resulted from digitally delayed simultaneous gestalt formations [15]. On below (Fig. 5) see Lynn’s chosen piece.

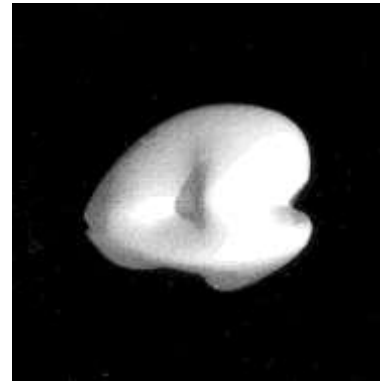


Fig. :5 Embryologic Houses, final piece, [13]

Lynn’s expressionist attitudes (which were fueled by the discourses of non-Euclidean geometry as combined with freedom and intuition) surely cause a vacuum through which eventually the free expression occurs. The situation described by Colquhoun as:

“By insisting on the use of analytical and inductive methods of design, functionalism leaves a vacuum in the form-making process. This it fills with its own reductionist aesthetic-the aesthetic that claims that intuition, with no historical dimension, can arrive spontaneously at forms which are the equivalent of fundamental operations”[3].

In Calculated Variations Lynn calls the design approach, which we analyzed here, as former and made a sharp difference between his former and the later phases of design. Here he points out that: First, Architecture is more than a smoothly processed algorithmic conclusion. Second, there is already an existent non-Euclidean shape class. Third, the former phase of the design provides skills for mastering over the software based formal variation techniques to reproduce these effects more smoothly. Fourth, the later phase he is studying on provides the CAAD designer new challenges for advancing the field via focusing on aesthetic, social, cultural and technical issues.

VI. LATER PHASE

“Lynn’s exploration of the harmonics and proportion of new geometries is combined with the variation and mutation possible with forms defined by calculus. These two qualities, mutation and proportion, gives the work decidedly organic, animistic appearance. The new technologies of undulating surfaces are developed with rigor and precision along with a keen awareness of history, including Art Nouveau, Secessionist and Jugendstil design and architecture.” [16].

In the Official web page of Greg Lynn, it is underlined that for Lynn awareness of history of form is as important as the calculated form definition process. According to the Oxford English Dictionary Art Nouveau effect is characterized by “the organic or foliate forms and by its flowing (i.e. non-Euclidean) lines and curves”. It flourished between 1890 and 1910 throughout Europe and United States. It was employed most often in architecture, interior design, jewelry, and glass design, posters and illustrations. Art Nouveau developed first in England and soon spread to the European continent, where it was called Jugendstil in Germany, Sezessionstil in Austria, Stille Floreale (or stile Liberty) in Italy, and Modernismo (or Modernista) in Spain. Based on these, it can be stated that, Art Nouveau provides both a supportive atmosphere, and also an aesthetic, social, cultural and technical discourse for the curvilinear class of shapes. In Calculated Variations Lynn discusses curved space and curvilinearity as belong to the new class of shapes.

Below, (Fig. 6) shows aesthetic, social, cultural and technical continuity in Lynn’s later design phase. In the figure, we see a set of randomly selected Art Nouveau objects (selected for representing class of shapes that addresses Art Nouveau) and Lynn’s “new” class of shapes as compared with each other. It is clearly seen that, although two groups of object are belong to the completely different production processes, they highlight similar principles of gestalt.

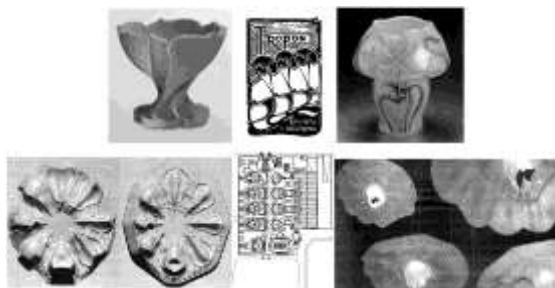


Fig. :6 Art Nouveau class of shapes: upper figures from left to right Art Nouveau Tropon Poster - Henry Van de Velde 1898, Art Nouveau style Louis Comfort Tiffany vase; Art Nouveau silver stamp detail, 1908.

Below figures from left to right: Art Nouveau porcelain vase, 1900; detail of Hotel Solvay, Brussels, Victor Horta, 1895-1900; detail of Hotel Solvay; Louis Comfort Tiffany vase, 1896; Art Nouveau glass vase, 1901. (Schmutzler, 1977; Selz & Constantine, 1975; Miller, 2004.)

VII. CONCLUSION

The idea that Architecture is not only an exercise about fine calculation of function and form but it is also an investigation of the role of

qualitative aspects (such as culture and context) is neither new nor fully investigated [17][18][19][20][21]. This study intends to discuss qualitative means of architecture on the context of the CAAD in reference to Greg Lynn’s specific works. Since familiar examples of CAAD seem largely neglect the qualitative and concentrates on rather closed/autonomous processes resultant of techno-scientific determinism, the study considers intuitive approaches that arise from such processes as anomalies. In order to trace the situation the study concentrates on the use word intuition within the selected cases.

Following the critique of intuition as developed by Alan Colquhoun, the study then focuses on one of the significant discursive transformations within the CAAD culture. In this context the main objective of this study can be summarized as rereading Greg Lynn’s exhibition paper Calculated Variations with reference to his former discourses.

Contrary to the former assertions of Lynn, Calculated Variations announces that architecture is a cultural product. Although Lynn transforms his previous terminology and seems to develop a sensibility towards accepting an architectural culture, he still uses revolutionary tones in his language and seems to ignore the two hundred years of non-Euclidean formal tradition, which precedes him. He refers non-Euclidean geometry as a system in mathematics but he ignores the fact that in the 19th century, this system has generated a new class of shapes (new gestalt entities) and changed the perception as well. In this regard, this study argues that Lynn’s new class of shapes, which is appointed to his series of production for Alessi is not new. From the point of view of the Gestalt psychology, new class of shapes is a calculus based gestaltic organization. Since they still follow 19th century non-Euclidean organizational principles, no matter how they were produced differently [i.e. produced by the digital programs or fabricated by the CNC machines], they can be classified under the same principles of Gestalt psychology: those are mainly law of continuation, simultaneous figure and ground reversal, and pragnanz. Furthermore, functional precedents of Lynn’s productions can be recollected from Art Nouveau movement. What makes Lynn’s production different or new is then not in their gestalt formation, or in their function, but in the production process itself.

On the bases of these, it can be underlined that an involuntary decision, which is created by technologically deterministic processes, legitimizes Eisenman’s question of how one can decide to choose and freeze a particular object with such processes. Following Kurt Koffka [22], Alan Colquhoun states that even though all artifacts have

the power of becoming icons or gestalt entities, linking these entities directly with the closed loops of scientific processes [the idea of one big gestalt] can be described as dogmatism. In representing the surrounding phenomenal world, science by its nature has always tended to support objectification, reductionism, oversimplification, and therefore dogmatism. Since it has powerful relations with science and technology, an unassisted/free CAAD approach will always have a tendency to support architectural design experience under these direction.

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