

# ARCHITECTURAL HOMEOSTASIS THROUGH RECIPROCAL DUALISM

YAN GAO  
ASSISTANT PROFESSOR

Architecture is a discipline that can be re-written and re-interpreted differently depending on the conditions of its time. It needs both evolution and revolution. Architectural practitioners and scholars have never stop upgrading or updating the thinking of architecture. Most -isms so far, have always begun with destabilizing the old in order to establish the new. Architecture reacts to the reality slowly and acts on the reality eventually. It learns from the new reality earlier, but often ignores the reality later for the sake of experimenting utopian ideologies inside the ivory tower. It is perhaps, the most volatile discipline compared with many others, e.g. physics, medicine, business, law, math, etc. It is autonomous, yet also constrained by many external factors and invisible forces. Architectural debates have never ceased. But all reach settlement eventually until different voices break out.

Architectural Homeostasis describes the properties of architecture according to the characteristics above. Homeostasis was initially defined by *Claude Bernard* and later by *Walter Bradford Cannon*, which is the property of a system, either open or closed, that regulates its internal environment and tends to maintain a stable, constant condition. Multiple dynamic equilibrium adjustment and regulation mechanisms make homeostasis possible. It doesn't mean a constant stability, rather the interaction between flux and stability until a new balance is achieved in long term. It does not discourage changes, which leads to a higher degree of stability. Homeostasis is the philosophy for organism. Although architecture is not organism, but it shares a number of properties when we write, think and talk in addition to making architecture. What makes homeostasis possible to architecture is the synthesis of multi-negotiation between two opposites within the architectural discipline, e.g. paradox and conciliation with architecture, complexity and simplicity around architecture, contradiction and consistency of architecture, preciseness and uncertainty to architecture, and so on.

The path to homeostasis is through reciprocal dualism, the state of contrast to create distinguishable duality, upon which individual identity depends. It involves the process of feedback loops and double codifications (encode & decode), through which opposing forces do not counter work to weaken one another, but instead, interplay reciprocally to promote stabilization, i.e. homeostasis, similar to what *Robert Venturi* called "Equilibrium, which must be created out of opposites. Such inner peace as men gain must represent a tension among contradictions and uncertainties..."

The design philosophy of architectural homeostasis evolves architectural organizations that could be engineered into irreducible constructions. The agenda for practice is to develop a kind of architecture that emerges from the game of deterministic concepts and informative operations. This approach channels two opposing design methodologies: implicit global descriptions and explicit local inscriptions.

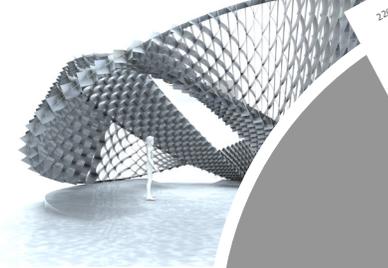
## Subjectivity & Objectivity

One of the most fundamental opposites within architectural discipline is the conciliation between subjectivity and objectivity. Design journeys often run through the synthesis of complexity and multiplicity. Architecture could be understood as the medium that mediates subjectivity and objectivity instead of being an ultimate object detached from subjective contexts (below). This becomes even more evident during globalization and rapid growth in developing countries such as China, where architecture has mutated into consuming products, political icons, financial devices, corruption means, media Hype, social status, etc. Architecture should neither surrender to these mutated forms, nor neglect their existence with a supreme gesture. Instead, she should learn how to coexist with them or even convert them, evolving to a new kind of being. The values of architecture in information era must be different from those in old days. So do criteria when initiatives have changed, conditions are different and, tools are more sophisticated.

## Top-down & Bottom-up

How to transcend the limit of subjectivity in design which relies on prescribed images from empirical visual references. In other word, how to overcome the inertia of style? One of the rudiment natures of human being is creativity, or, the intention to be different from others in order to acknowledge individual values. A creative voyage always starts from learning. It should be evaluated in association with *Novelty, Resolution and Style*.<sup>1</sup> The most challenging part for a practice is, perhaps, *Novelty*, which could be liberated through balancing top-down and bottom-up.

The top-down approach acknowledges conceptual sketches at the beginning and determines design results afterwards. The situation changed when the bottom-up approach became possible as a consequence of computation. However, the development of computational design in the past decade encounters the same problems as Modernism, i.e. universality and obsession of making objects.



The approach of architectural homeostasis in practicing computational design is the mediation of top-down decisions and bottom-up executions that dilute the boundary between subjectivity and objectivity.

BOW<sup>2</sup> is a pavilion generated by the adaptation of local connections with top-down geometrical rules. Three elliptical curves intersect as the result of cutting three cylinders (extruded from the min/max circular constraints of the site) with rotating planes according to orientation, accessibility, vista, and component assembling logic, to form a system of three grid-type twisty-surface beams supporting each other to ensure the overall structural stability. The global decisions are mostly made according to the properties of local connections with a bottom-up approach, which was initiated for the stiffness and overall strength of laminated materials to create a pre-stressed structural unit, which can resist stresses to maintain structural integrity. By changing widths of the bended aluminum sheets to fit the local surface curvatures, we achieved continuous folded 3D twisting surfaces globally. BOW is a complex 3D assembly made out of simple 2D-based components by design intelligence rather than machinery processing..

## From Function & Form to System & Effect

What is the alternative of function and form if they are not valid any longer in the fast changing time?

From "form follows function", to "function follows form", or "form defines function", or "form is function", all statements are based on the fact that form and function are the basic characters of architecture. Form can be understood as the visible appearance, shape, or configuration of an object described by physical materials. What if it is not an object but other beings? What if it cannot be presented with any physical materials? Now comes function. In *Max Bill's* essay, *Function and Gestalt* (1958), he understood function as the relation between a minimum of two variables that are dependent on each other. He distinguished two groups of functions. The first one reveals the relations between the object and people. The second one reveals the relations between the components that make up the object and its production process.

Form arises as the harmonious expression of the sum of all functions.

Today, when functions are flexible and changeable, when form is increasingly complex as consequence of new urban conditions, what will be the alternative intrinsic characters of architecture? I propose system and effect, the former reflects relationships and mechanisms forming an integrated whole, the latter indicates artificial results of architectural operations that is not limited to physical forms.

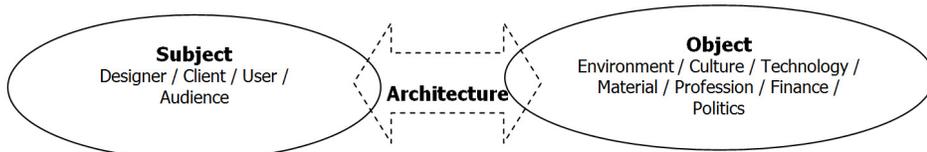
Real Vino Bar<sup>3</sup> was inspired by the concept of a system for storing red wine bottles while maximizing relationships with other elements inside the bar. A perforated panel system was set up for establishing an interesting relationship between the sizes of apertures and the profile of bottles. As a result, this system created a topographical field defined by the displacement of bottles, which will further denote a genuine constellation effect when light refracts through and reflects on the curvy glasses of the bottles (below). This system also incorporated acoustic functions as well as the Spanish Map which determined the perforated pattern.



<sup>1</sup> Creative Product Analysis Model by Besemer & Treffinger 1981

<sup>2</sup> Project: BOW, REPEAT digital fabrication competition by tex-fab, 2010

<sup>3</sup> Project: Real Vino, Spanish Red Wine Bar, Beijing, 2011



## Description & Inscription

How to streamline a smooth connection between two separated parts while distinguishing the identity of each side?

The concept of ATI<sup>4</sup> was inspired by the intrinsic qualities of Chinese calligraphy, which is a perfect example of reciprocal dualism for description and inscription. Described by *Zong Baihua*, an aesthetics of Chinese calligraphy, "Variations in density of composition, light and heavy strokes, slow and fast brushwork all affect form and content. It is like picking out notes from the myriad sounds of nature in musical or artistic creations, developing laws of combining those notes, and using variations in volume, pitch, rhythm, and melody to express images in nature and society and the feelings in one's heart." It immerses subjective feeling into the objective presence of ink and void on paper through movements in time and space. The most important feature of Chinese Calligraphy is the negotiation between positive shape - ink, and the negative space - void. Emotion is inscribed into the movement of brush onto a blank paper, then described by the calligraphy as a whole. Based upon this interpretation, the crossing facilities were inscribed as



a collection of multiple strokes, each of which is classified into different movements (stationary strokes for office, slow strokes for passenger crossing and, fast strokes for vehicle crossing) to describe the concepts, which is manifested through the following three aspects:

**Connection and Division:** A lot of territorial divisions require physical connection while maintaining their distinct identities. For many, crossing a border has become a daily event from the experience of once a year or even once a life. A purely functional border crossing facility now needs a more significant architectural link. A discontinuous continuum is the effect that we aimed to achieve for the ATI Project. Instead of concealing all movements into an enclosed box like the current border crossing building type, the key idea is the emphasis on the connection between passengers and surrounding environment to re-establish the perception of spatial

changes through time. Thus, architectural form (representation of objectivity) becomes the medium to bridge individual perception (representation of subjectivity) with surrounding nature. Three methods were used to re-establish the connection: Firstly, offices were squeezed above the passenger crossing to either side of the building in order to bring roof light into the deep plan. Secondly, a series of evolving sections were torn apart as slits on the first floor which enabled the ground floor to have direct connection to sky as well. Lastly, greeneries were introduced between the office extrusions along either side.

**Time vs. Space:** *Baruch Spinoza* rejected the distinction between space and time with the belief that such distinction was meaningless to God. "The illusion that a thing called time existed was the result of mankind having made the thing called space independent."<sup>5</sup> Instead of contradicting against each other, time and space are never separated in Universe, as for human the experience of moving through space bridges perception of time with the substances around. Speed of movement echoes the reciprocal dualism of space and time.

The changing speeds of movement during the whole border-crossing experience follow the pattern of fast (entrance), slow (queue for departure customs), fast (river crossing), slow (arrival customs) and, fast (exit). The pattern was inscribed into the generation of sectional series by intersecting the "strokes" with plans that were arrayed in differentiated spacing and rotating angles. Herein, the formal operation is the incarnation of speed of movement. Time melted into space.

**Natural Artefact vs. Artificial Nature:** How to merge the dichotomy characteristics of the border location where natural landscape of Hong Kong meets the artificial urban-scape of Shenzhen into one entity? A green network at the podium level was proposed to organize staff circulation and vehicle flow, as well as greenery and water recycle systems along the crossing trajectory, i.e. Artificial Nature. The main BCP<sup>6</sup> Building with simple outer boundaries while complex inner boundaries, strikes cross the border as one porous strand torn apart to absorb the surrounding nature into the building, i.e. Natural Artefact.

## Sustainability and Development

How to, within a given short period of time, achieve the equal quality of collective buildings as those which evolve through a long time? Or in a simple version, how to customize and automate non-standard design products according to complex site topographies?

Economic development has become the irresistible force sweeping all over China. Internationalism clashes with regionalism. The tension between cities and villages intensifies at suburbs. How to sustain the culture merits which are beneficial to the local majority, meanwhile favoring the political and commercial interests of the local minorities, is one of our focuses. The lack of sustainability as most vernacular architecture has is because, as we believe, essentially the rapid speed of development. Consequently, in order to meet the deadline, it has to erase the architectural diversity and adaptability, which can only be achieved through evolution after a long time before computational design. Can we design one-off developments with the same sustainable qualities as vernacular architecture offers?<sup>7</sup> Intelligent computation in line with subjective design interference makes it possible.

Instead of taking for granted the conventional way of doing master plan in 2D, we started Kaili Project<sup>7</sup> with a new way of 3D planning, i.e. computing the gradients of the site topography locally for the most appropriate building platforms which then generate individual houses in vernacular style. The techniques for intelligent massing was explored in real time. As a result, no single house was identical and all adapted to the topography perfectly. According to the design brief, a series of evolutionary design strategies were made for further teething out both the buildings in different shapes and public spaces in various scales on top of the massing outcomes. A massive, automated and valid customization conveys collective buildings with similar qualities of the local architectural typology, i.e. both genuine and diversified, sustainable in the cultural and economic dimensions beyond the ecological dimension.

## Both... And...

I would like to quote *Robert Venturi's* words in his early book *Complexity and Contradiction in Architecture* at the end of this essay: "I am for richness of meaning rather than clarity of meaning; for the implicit function as well as the explicit function. I prefer 'both-and' to 'either-or', black and white, and sometimes gray, to black or white. A valid architecture evokes many levels of meaning and combinations of focus: its space and its elements become readable and Workable in several ways at once."

"Both...And..." reflects the dualism in architecture, but not yet reciprocal dualism, which needs some chemical reactions, i.e. effective architectural operations, between the two opposites instead of accepting the initial status of the opposites, within and beyond the scope of architecture, towards the architectural homeostasis. The short time revolution would be absorbed into the long time evolution. What keeps the architectural evolution moving is the faith of truths governing architecture as all the -isms have tried with either retrospective or forward thinking. However, the question is, are there indeed such truths? Perhaps the answer itself is not important. What matters is the exploration for the answer. We need both thinking and acting to continue the architectural pilgrim.



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<sup>5</sup> Flowing Out: "Water/Glass", Atami, Shizuoka 1992-95, *Anti-Object* by Kengo Kuma, AA Publications

<sup>6</sup> Border Crossing Point

<sup>7</sup> Project: Leisure and Cultural Complex, Kai Li City, Gui Zhou Province, 2010