Pre-cast School: Bernard Tschumi’s Dialectic Diagrams

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Bernard Tschumi utilized a pre-cast concrete system at the School of Architecture Building at Florida International University (FIU) to present a paradigm for education. Tschumi achieves this model by continuing campus-planning traditions and by presenting the interactions of contrasting entities. He sets up dialectic relationships through the manipulation of both form and space to create a complete setting for the study of architecture.

A Model School

To create a legible academic model, Tschumi continues the prevalent American campus planning tradition of placing buildings around open fields. The School of Architecture building is a mini-campus of five distinct structures: wood shop, studio, faculty office wing, gallery hall, and lecture hall. The structures are grouped together to form a main courtyard. At FIU, the open space is not a typical American campus lawn but rather a concrete plaza. Tschumi has urbanized the American campus model and in so doing evokes the plan of the school he served as dean, Columbia University. By employing the Columbia University plan, Tschumi brings to FIU a well-known precedent and a legible academic typology.

Tschumi’s familiarity with the plan of Columbia University is based both on his personal daily experience as a teacher and as the architect of the school’s student center, Lerner Hall. In his book, Event Cities 2, Tschumi includes McKim, Mead and White’s plan in his description of Lerner Hall.1 The selection of this plan as a model for FIU may have been one based on familiarity but ultimately, picking the Columbia plan unites the FIU plan with one of the most significant beaux-arts American models for an academic institution. McKim, Mead and White designed Columbia University in 1893. The plan is organized on two city blocks with classroom buildings defining a central plaza area that contains Low Library and University Hall. Columbia is well rooted in American campus planning tradition as it echoes Jefferson’s “popular” 2 plan for the University of Virginia.3 The Low Library has often been cited as a version of Jefferson’s Rotunda itself 4, modeled on the Pantheon in Rome imbuing the Columbia plan with layered meaning and legible iconography.

A comparison of the Columbia and the FIU plans reveals that Tschumi maintains a variety of organizations and motifs for the School of Architecture (figure 1). The two plans are shown edited and simplified: in the FIU plan, four principal buildings define the courtyard and the Columbia plan is defined within the limits of 120th and 116th streets and Broadway and Amsterdam Avenue. Seen together, the overall layouts are strikingly similar. The diagram of the Columbia campus groups the small flanking blocks of classroom buildings into one mass while the studio and faculty wings of the FIU plan are shown with the organization of their internal circulation. Viewed together, both plans are organized in a tripartite grouping with flanking structures defining a central campus space, which contain two programmatically significant structures.

Tschumi further maintains continuity with the Columbia plan through the development of the gallery hall. The eastern façade of this structure reveals a tripartite organization. It has a clear base, middle and top. Seen in context with Jefferson’s Rotunda and the Low Library, the canted base of the structure approximates a stairway, the three vertical windows create a vertically sliced deep shadow much like a colonnade, and the canted top is reminiscent of an entablature (figure 2).
In addition to appropriating the overall layout, Tschumi exploits the spatial slippage embedded in the McKim, Mead and White plan. While the Low Library is axially strapped into the plan of the campus with buildings centered on its two axes there is a certain planned slippage that occurs both formally and visually. The protagonist in this slippage is the apse end of the University Hall. The apse slides past the two flanking classroom structures to exert itself as an object in the upper quadrangle. In contrast, the Low Library is embedded within the flanking classrooms structures but has a visual tendency to emerge as free from them and dominate the main campus plaza. Tschumi understands this dynamic and in the final plan for the School of Architecture, pulls the wood shop structure away from the cluster of the four main structures to extend the slot of space between the studio and the gallery hall. The development of this interstitial space is maintained throughout the mini campus as the lecture hall, walkways, and gallery hall all contort and twist to accommodate a series of intended slippages.

**Tschumi’s Diagram**

Once Tschumi established a legible paradigm, he is free to develop an architectural language and context for the school of architecture. Tschumi’s stated thesis for the school is a Hegelian dialectic between static and dynamic elements. Again, as in his attempts to create a model school, Tschumi is preoccupied with the legibility of his design. To avoid any misinterpretations, he makes his static elements white and the dynamic elements colorful. Tschumi names the static elements “Sober Wings” and the dynamic elements “Exuberant Generators.” The "Sober Wings” are the studio and faculty office wings. The “Exuberant Generators” are the lecture and gallery halls. He organizes these two building typologies in the same manner as McKim, Mead and White. The “Exuberant Generators” become animated versions of University Hall and Low Library. According to Tschumi, the generators contain the most public and dynamic programs, the gallery and the lecture hall, and as a result are the most formally complex of school of architecture buildings. The “Sober Wings” are less programatically dynamic and Tschumi treats them as simple volumes. The establishment of these two distinct elements is not superficial. The economic reality of the project dictated that the structure be highly efficient and built within a tight budget. Pre-cast concrete was selected as it unites structure and enclosure into one inexpensive building system. As a system, its efficiencies are gained through the use of as few pre-cast panels and floor types as possible. The fewer molds that are made, the less expensive the building will be. The frequency in which these panels are used also affects price.
The larger the building, the greater the economic benefit.

The “Sober Wings” are built with few panel types. These wings absorb the majority of the programmed square footages and allowed the remaining portions of the project to be developed with more freedom. As a result, the “Exuberant Generators” are diametrically opposed in attitude to the sober wings. The economic efficiencies gained by the restraint of the “Sober Wings” allowed Tschumi budgetary room to develop the generators. In these two smaller structures, panel size, variation, configuration, geometry and interaction are at their greatest. While the panels in the “Sober Wings” are typically rectangular and plumb, the panels for the generators are angled and tipped. It is in the generators that Tschumi is his most willful and it is where his thesis “Warped Solids” is explored and executed.

**Tradition: “Sober Wings”**

The “Sober Wings,” through their adherence to the established norms and building practices of the pre-cast concrete system to achieve an inexpensive building, represent an unequivocal embrace of tradition. Tschumi worked closely within the norms of pre-cast concrete to deliver the building on budget. This acquiescence produces forms that contain traditional architectural elements. The “Sober” faculty office wing is treated with vertical windows and a colonnade with vertical bays (figure 3). These two traditional building forms arise out of the construction logic of typical load-bearing pre-cast wall panels. The verticality of the panels is the result of a limitation of width due to transportation. Their 12-½ foot width is the maximum width that will pass under highway overpasses and overhead lines. The proportion and placement of the windows in the panel also adheres to the logic of pre-cast concrete. The maximum design loads the panel will typically undertake are those associated with the lifting and moving of the panels into place. Tremendous shear occurs during this activity and panels need to be able to resist tremendous lateral forces. A solid wall panel with no openings or thin extremities is the most desirable form to resist these forces. The faculty wing is composed of solid panels with openings embedded well within its mass and only one thick extremity, which forms a column for the colonnade. The adherence to the logic of the pre-cast panel does produce one non-traditional anomaly. Rather than have all the openings in the wall surface align, the colonnade openings are shifted out of alignment from the windows above. This misalignment highlights the logic of openings in a pre-cast wall.
From pre-cast panel to pre-cast panel, there exists a substantial movement that results in a visible sealant joint. As the colonnade openings contain no windows, the potential movement of panels has little ramifications. If, however, a window spanned independent panels, there would most likely be movement issues. As a result, the glazed openings are located well within a single pre-cast concrete panel.

**Innovation: “Exuberant Generators”**

The lecture hall and the gallery structure achieve their outward visual exuberance through the many colored tiles placed on their surfaces. While this veneer acts to entertain the eye, it does distract from the subtle manipulation of form that slyly exploits the structural potential of pre-cast concrete. Tschumi’s stated design process for the determination of these forms is “Warped Solids.” This process entails the development of a shape through a series of actions on a simple form. Tschumi illustrates these actions in a series of diagrams that begin with a simple form, which is “warped” into a more complex form. These diagrams are reminiscent of those of made by Peter Eisenman for his early houses. Like those early house diagrams, the “warping” diagrams are devoid of any tectonic reality, yet the tectonics of the pre-cast concrete wall panels allow walls to act as beams.

As stated before, the greatest loads that the pre-cast concrete wall panels incur are those associated with the lifting and positioning of the panels into place. That these elements are called “panels” reflects the fact that they are not just walls that can assume vertical loads. These panels are fortified with pre-stressed reinforcing to resist lateral forces. As a result, pre-cast concrete wall panels can be tipped, rotated and flipped without structural damage. Tschumi’s generators display this potential with angled walls and tipped beams. The acrobatics of pre-cast wall panels moving through space is held mid-flight for all to see at the generators (figure 4). The three pre-cast wall panels that form the eastern façade of the lecture hall best exemplify this suspended state. These wall panels, structurally acting as beams, are cantilevered off the main structure with concealed steel brackets. Visually floating in the courtyard space, they exhibit the potential of pre-stressed concrete.
Rereading Tschumi’s Diagram: Wall Space and Floor Space

Tschumi’s adherence to execution of the contrast of “Exuberant Generators” and “Somber Wings” is primarily based on the need to present a clear hierarchy of the program for the School of Architecture. The building simply becomes the manifestation of this diagram. Yet, if one examines the program, one realizes that the “Exuberant Generators” are not more public or more programmatically dynamic than the wings. The location of the studio space is at odds with Tschumi’s stated diagram for the building. This most public and dynamic space resides in the so-called “sober” studio wing. The second floor double-story studio space extends the full length of the building making it one of the largest rooms at the university. Its north face is a full glass curtain wall, which affords views of a campus lake, the main entry to the university and off in the distance, a view of airplanes arriving at Miami International Airport. The studio space is the programmatic and pedagogic center of the school. It is in this levitated glazed vessel that the dynamic of the school resides. Students work, develop, and make architecture in this space.

In spite of the conflicts with the stated diagram there does exist a clear spatial dialectic: “Wall Space” and “Floor Space.” “Wall Space” is vertically disposed space that is defined by a preponderance of walls, while its opposite,

Fig. 5. Exterior space between faculty wing and lecture hall, Interior of studio (photos by author)
"Floor Space" is horizontally disposed space that is largely defined by the overarching presence of floors. This spatial distinction was made in Colin Rowe's 1961 article entitled La Tourette. In his article, Rowe identifies these two spatial types as preoccupations of Le Corbusier. The first spatial type, Rowe explains, represented by the main church space, is "one of Le Corbusier's megaron volumes, one of those tunnel spaces compressed between vertical planes which, deriving from the Maison Citrohan have persisted in his work..." 

The second spatial type, Le Corbusier's Maison Domino, "pancakes supported by pins" is best represented in the refectory. These two spatial types along with variations in-between produce a complete set of spatial possibilities for Le Corbusier's monastery. This monastery, isolated from society, becomes a complete world unto itself. As both a model and a context for the teaching of architecture, Tschumi's school aspires to create this complete set of spatial possibilities. By creating a campus of highly legible "Wall Spaces" and "Floor Spaces" he pursues Le Corbusier's interest in the "cross-fertilization of the megaron and sandwich concepts."

Tschumi's selection of the pre-cast concrete system seamlessly supports a dynamic interaction between "Wall Spaces" and "Floor Spaces." This construction system is inextricably bound to all the building's spatial interpretations and expressions. The pre-cast concrete system used for this structure is a combination of load bearing wall panels and double-T beams. Wall panels act as both vertical structure and enclosure while double-T beams act a both horizontal structure and complete floor surface. The spatial relationship between these two elements can be manipulated with the use of pre-cast columns, shelf beams and non-load bearing block walls.

"Wall Spaces," made by pre-cast wall panels are most prevalent on the exterior of the school and vertically dominates the interstitial spaces between the generators and the wings (figure 5). These spaces exist as the residual space in-between objects and are the result of the normative use of pre-cast wall panels acting as liners to double-T beam interiors. The structural realities of load bearing wall panels ensure verticality for the school's exterior spaces. The interior, on the other hand, is dominated by the presence of double-T beams and aids in the establishment of "Floor Spaces." This structurally determined reality however has been manipulated to produce a series of interior "Wall Spaces." This has been achieved through the use of non-load bearing concrete block units (cmu). In the faculty wing, there are three double-story spaces; one is a stairwell and the other two are light wells. These spaces are the result of cantilevering double-T beams with concrete block parapet walls. These void spaces are narrow and vertically disposed as they are lined with the stacked cmu surfaces and topped with a series of skylights.

"Floor Space" is most clearly represented in the diagrammatically troublesome studio. As stated before, a glass curtain wall defines the north façade of the studio wing. This surface is achieved through the use of pre-cast columns and shelf beams. Eliminating a major solid wall for the studio allows the floors the opportunity to act as the chief spatial definers. Solid sidewalls define the short ends of the space, leaving the definition of the studio to the ceiling, third floor balcony and the floor. This long and narrow double story space is dominated by a concrete balcony edge. This structural beam supports the third floor and allows the space to be horizontally disposed (figure 5).

**Dialectic Diagrams**

In the central courtyard of the school of architecture, the presentation of "Exuberant Generators" and "Sober Wings" coexists with the presentation of "Wall Space" and "Floor Space." The corners of the courtyard are formed with the merging of generators and wings. The exposed elevations of the two wings present contrasting openings reflecting their internal spatial dispositions: the faculty wing exhibits vertical openings while the studio wing presents horizontal openings (figure 3). The latent and explicit contrasts of "Exuberant Generators" versus "Sober Wings," and "Wall Space" versus "Floor Space" are not at odds with one another. They both coexist as prevalent Hegelian models for the teaching of architecture. Tschumi's School of Architecture ultimately resides as a model for discourse. By avoiding a single architectonic solution, Tschumi lets the embedded contrasts at the FIU School of Architecture embrace a pluralistic view of education leaving pedagogy to its inhabitants.

**Notes**


8. Ibid., p. 196.