The Orthographic Void X-Y-Z

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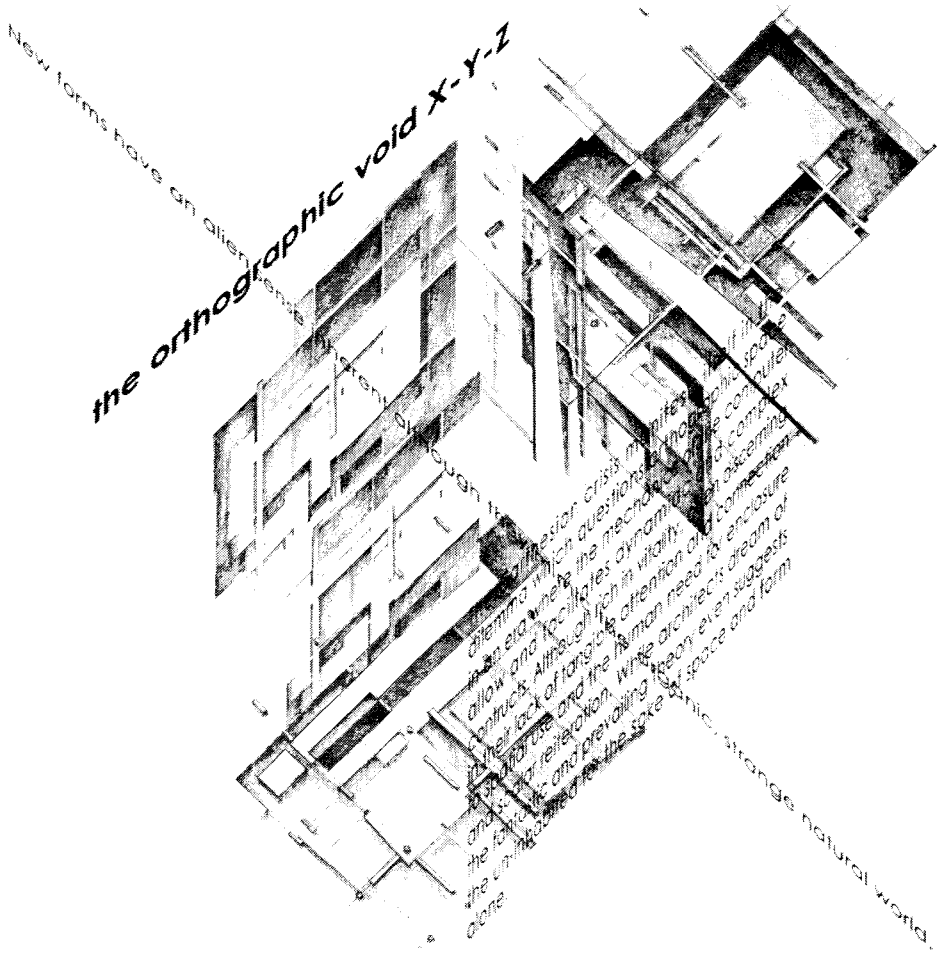
A Cartesian crisis manifests itself in a dilemma that questions the traditional reading of space within the orthographic realm. This predicament involves a debate between the computer's facility to create dynamic and complex forms and the traditional means of orthographic projection and their inherent property for describing spatial reference. This dilemma exists for two significant reasons. First, the flexibility within the computer allows for the exploration of increasingly more complex and fluid forms.

> *"The future of architecture will without a doubt be centered around notions of digitally augmented environments and mutable territories that will inevitably lead the way to new architecture"*[1]

Forms, but not space, can first be sculpted as three-dimensional models physically or in the computer, which are then scanned and finally converted into orthographic depictions. This process inverts the simultaneity of viewing space within the orthograph-



ic realm. The drawing conventions of plan, section and elevation beginning with a two-dimensional parti sketch and then develops as a three dimensional model result from a codependent reading of space and form, figure and field, at the same time.

Second, parallel investigations in related sciences, particularly Physics, describe non-communicative geometries, which move beyond point coordinates of four dimensions and explore multi-dimensional systems. These understandings of the universe, macro and micro, have advanced our understanding of the space-time continuum beyond fixed and static Euclidean geometries to more dynamic realms of anti-space, chaos theories and a universe where eleven dimensions may exist.[2] In these complicated understandings of space, computer generated forms share the curvilinear and organic characteristics found in the natural world as opposed to the orthographic projections, which resonate with the platonic ordered world of the manmade. The Cartesian ordering systems inherited from Descartes and more ancient, Platonic forms, still resound by their descriptive means for conveying space. They provide communicative geometry necessary for building form and, thus providing spatial containment.[3] As architecture is still bound by gravity and fixed by the physical three-dimensional realm, the making of space and its contemplation regarding its physical properties is the more critical question in this debate. Spatial depiction is the first concern for the design process. Space described within the Cartesian dimensions x, y, z coordinates, whether drawn by hand or on the computer is the generator of form. The redundant questioning of how the computer is integrated into architectural education occludes this spatial understanding as the primary prerequisite. The design process as critical thinking towards a logical resolution of spatial concerns and how forms articulate the readings of space is more essential regardless of whether analog or digital drawing conventions are employed. This is the orthographic void as spatial signifier.

Dimensionality and referential drawings reveal through their juxtaposition and dismantling, furthering the understanding of parts, sections, and details. These devices slowly piece together a holistic comprehension of space within the Cartesian matrix. The means of orthographic projection, also in their own way, portray a conceptualization regarding space, not necessarily witnessed in the physical realm. Plans and sections are imagined, constructed in the mind's eye and represented in drawings. The plan is a spatial abstraction, witnessed during construction or in a building's demise as a ruin. The section similarly, is visible through literal transparency or again through the theatre of construction. The orderings of an elevation is realized through frontal viewing at 90 degrees, usually staged through formal axial approach. Likewise each of these orthographic projections, plan, section and elevation, has lent themselves to specific theoretical investigations and analyses. Each may be realized through analysis individually as design exercises, yet they all describe space and its enclosure. They are however dissected views of a comprehensive spatial construct. Together with the sketch, the orthographic projections serve to explain space to others and ourselves. They are indispensable drawings for they describe not only form but also more importantly space. Whether they are drawn by hand or in the computer is a mute point, the descriptive means of thinking spatially is the essential component in teaching Architecture. Space, not just form, is the critical lesson.

THE DRAWING CONSTRUCTED

Drawing is the means for architectural thinking. The drawing conventions, one selects for conveying spatial ideas, impact that thinking process. Drawings are within themselves both physical artifacts of a particular history and contextual embodiments reflective of that society's attitudes regarding space. They are representatives of their unique place and time.

> *"The perspective was more than a representational device or method of craft-it incorporated a unified concept of design, integrated painting, architecture, and the structure of society, to embrace the complete image of the Renaissance man."*[4]

A perspective focuses on a particular vignette, whereas isometrics and axonometric projections convey precisely measured mass-form studies.[5] Similarly, the media for a drawing influences our spatial perception. A watercolor allows for the examination of spatial and literal transparency, whereas a collage explores the phenomenal transparency through opaque readings. Both conventions and media are employed as representatives of architectural space. When the media become the message and divorces itself from the solution of spatial reference and ultimately spatial inhabitance, the crisis evolves into one of formal obsessions, disregarding the problem.

[A] VOID FORM
THINK SPACE

Preoccupation with a computer program and not its use towards spatial conveyance removes the thinking about space and what role the design of space serves. Without specifically adhering to either analog or digital convention, the selection of drawing conventions and media must conform to the spatial problem at hand. The question must focus on which facilitates the thinking process, the solving of space, without deterring away from the critical objectives of the problem. Drawing by any means will always be part of the design process, where convention and media reinforce spatial and formal concerns. The media is the messenger, space is the message.

Examining the design process though drawing conventions reveals how one begins to communicate the spatial intention. The parti sketch as an organization scheme compresses information to larger critical issues, editing out details and resolving the greater ideas.[6] The parti sketch is to an architectural idea as the thesis statement is to an essay. In the design process, the sketch serves to bring ideas forward. Thinking architecturally means through the drawing process itself and no mean is quicker than through the dexterity of the human hand on a piece of paper. The sketch serves as the most direct link to the mind's eye. The freedom of the sketch means that it is unencumbered by technical barriers either mechanical drafting or setting up perimeter in the computer. These detriments impede left-brain operations when the sketch facilitates exploring many possibilities for a design solution. The sketch possesses spatial ideas, producing a myriad of architectural arrangements. The parti is then the embryonic plan, solving the design task by examining overall encompassing arrangements, a graphic thesis. Specifics realized in the sequential drawings of plan, section and elevation result later yet are in themselves critical parts of the design process. These drawings reinforce the graphic thesis.

The three conventions of plan, section and elevation serve as devices for which spatial constructs may be realized, contemplated and ultimately conveyed to others. Thinking in plan, section and elevation means that space is being viewed from varying orthographic positions, but that the space is being considered *in terms of order, volume and sign.* By *being* orthographic, the projection of drawing is by the very nature one of a measurable abstraction of space. Plan, section and elevation attend to critical architectural principles. "The plan as the generator" [7] of order becomes the singularly most important drawing for it is here that section and elevation are first anticipated. Plan, which depicts true spatial definition, advances beyond diagrams, conveys thickness or thinness of material and walls, reveals volume, exemplifies order and stages sequences of designed spatial events. The plan informs all other drawings. It is not a question of how the plan is constructed but what the plan communicates. As a device for spatial information, the plan's role of relaying space and the architectural promenade is one where mediating between the facility of the sketch to resolve and retain quicker refinements and the computer's meticulous means of measure and production.

The section as the expression of volume completes the third dimension anticipated in plan. The section is then the manifestation of those spatial volumetric readings. Three-dimensional space as represented in section has compressed the plan emphasizing the z-axis, where we dwell. Whereas plan is an abstraction of space, a higher ordering, God's eye, section begins to communicate how we are to inhabit and move through space. In addition, section proceeds to address scale as it relates to the human body.

Elevation and thus façade address internal or external spatial readings. Just as all of the orthographic projections may be designed and held to architectural principles, the façade is the first to communicate those organizational devices. We read a building by its face. Whereas plan is much more difficult to realize physically, viewing the facade of a building causes initial reaction. The façade as a spatial signifier complete the orthographic void. The wrapper of space is contained. Internal readings express volume whereas external masks may relate to surrounding urban space and context. The façade as mediator between inside and outside provides spatial communication.

Drawing as a contemplative act suggests how one drawing generates another. Thinking spatially through the simultaneity of orthographic projection suggest a multi-dimensional means of thinking versus a linear thinking process. One drawing informs the other or provides a shift in position for which the details of space might be resolved. Where as plan seeks to order space, section defines its volume and elevation completes the space as signifier.

THINKING INSIDE THE BOX

Thinking inside the box provides a spatial reference, a matrix within the x-y-z coordinates. The orthographic void is thus spatial. In the modern mandate of form following function, the older and ancient, Vitruvian term of *utilitas* is hierarchically recalled as the function. The *utilitas* is the program, the building's purpose and is the first order of business. This initial focus on function reiterates the importance of the parti as the organization sketch. The function then is a spatial arrangement for the plan is generator "from within to without; the exterior is the result of the interior."[8] Form suggests the second Vitruvian dictate of *firmitas*, strength of structure and consequently the materiality of the building. Thus FORM FOLLOWS SPACE and SPACE IS THE FUNCTION. We design and draw space. Delight, the *venustas*, is how well we capture light, define space, provide spatial experience and articulate details and materials. The drawing constructed is the eventual manifestation of what we call "architecture"; the orthographic void is how we think about space. It is not so much a matter of what media we employ to convey spatial intentions, but what those intentions are. And while computers in the studio are not new anymore, they are not however the only means to the end. They like other methods of drawing are tools capable of tremendous spatial leaps and depictions. Those who draw well by hand must always see with their eyes into the computer just as we see into a drawing. And as we all learn to see, the digital media allows us to visualize space radically, if we choose. But computers are neither designers nor can they sketch that is to say they cannot think. Drawing is thinking, and sketching is the quick rapid exchanges of ideas, spatial explorations without the confines of measure and detail. Orthographic projection, whether by hand or in the computer, conveys spatial descriptions. The computer

has the advantage of meticulous measure and allows incredible advancement in thinking about complex spaces and forms. It is a natural evolution in the thinking process we call design just as the perspective provided not only the technical means for depicting space as the eye sees but released spatial volume by establishing depth. Similarly the collage and cubism conveyed the fourth dimension of time and movement advancing our understanding of space. Not fixed in one time and place, not one view, but realized by experience through the space-time continuum. The devices of the plan oblique, axonometric and isometric provided and focused on this critical spatial understanding. The computer provides the means of that next accelerated spatial understanding, and possibly other dimensions, where the natural world has existed from the very beginning and we are still trying to decipher its mysteries!

The challenge of visualizing and communicating space within the computer test these known orthographic projections, even though the computer aids their depiction and ultimate production. What prevails in the use of the computer within a design studio are the possibilities to further an understanding of space, a new sense of space and its more inclusive viewing. How can the virtual realms of the computer, inform the built environment in much the same way that the last significant drawing devices, the perspective and cubism, influence spatial readings? How can specific design principles inherited from classical and modern theory be further advanced in this new understanding of the virtual realm or are these destined to be abandoned for a new set of rules?

In teaching Architecture, the computer becomes yet another, and powerful, media required for students and instructors to utilize in the making and graphic depiction of space. For beginning students, conventions of drawing through orthographic projection are likewise required objectives for any school of Architecture. Traditional principles of ordering devices and drawing can be further reinforced in the computer throughout the design process, which expounds on the use of the orthographic void. The pedagogy should focus on questions of what is an architectural idea? From where do these ideas originate? How are they developed and articulated?[9] The process, though, still begins with a sketch.

Drawings are stories, narratives about Space, but not yet realized Architecture. The making of three-dimensional space, to be revealed in a space-time experience, depends upon the conceptualization through the known drawing constructions of the orthographic means. Space is then, **the orthographic void**, only truly realized in physical experience, but designed in methods of both analog and digital drawing. Space is not the exclusive realm mapped in the Cartesian grid, but the domain of stranger, more complex forms in the physical universe: the fold of a flower, the curve of a jellyfish, the distortion of time and space. The Cartesian matrix is the means to understand this world in dimensional space. This is the first undertaking of a multi-dimensional world.

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[1] Lynn, Greg and Rashid, Hani. *Architectural Laboratories*. Rotterdam: NAi Publishers, New York, NY: Available in North, South and Central America through D.A.P., Distributed Art Pubs., 2002.

[2] Greene, Brian, "The Future of String Theory-A Conversation with Brian Greene" in *Scientific American*, November 2003, vol. 289, no. 5, p 72-73.

[3] Peterson, Steven Kent, "Space and Anti-Space" in *The Harvard Architectural Review: Beyond the Modern Movement*. Ed. Harvard University. Graduate School of Design. Cambridge, Mass.: MIT Press, 1980, p.91.

[4] Ibid. p. 96

[5] Pérez Gómez, Alberto, *Architectural Representation and the Perspective Hinge*. Cambridge, Mass.: MIT Press, 1997,p. 312.

[6] Graves, Michael, "The Necessity fro Drawing: Tangible Speculation". *Architectural Design*, June 1977, p. 386.

[7] Le Corbusier, *Towards a New Architecture*. London, Architectural Press; New York, Praeger, 1959, p. 2.

[8] Ibid. p.5.

[9] Hoesli, Bernard *Teaching Architecture-Bernard Hoesli at the Department of Architecture at the ETH Zurich*, editors: Jurg Jansen, Hansueli Jorg, Luca Maraini, Hanspeter Stockli, 1989, p. 27.