Casting Time: Intention and Temporality

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"How to begin?" That is the fundamental question for those interested in beginning design pedagogy. Is it 2D or 3D? Additive or Subtractive? Prescribed or Open-ended? Simple or Complex? Abstract or Concrete? Answering these questions is pressing, consequential, and relevant. However, the most profound, yet subtle effect on the beginning design student in relation to this question is about the means of production—a process that possesses inherent constraints and opportunities. The means of production can inform designers of the fundamental ways spaces are defined and understanding the pedagogy upholding this is critical. In this paper I describe the pedagogical intentions behind the use of casting as a means of production in introductory design projects. The duration (or lack of immediacy) in the process of casting develops the students' ability to translate/oscillate/switch between positive form and void space, which is fundamental to architectural design.

Pedagogical Context

This paper is born out of the curricular development in the Master of Architecture program's first-year curriculum for students entering the program with no prior architectural education and as such was in response to an existing curriculum. This curriculum, as many curricula are (Klucker, 1996), is derived from Gotfried Semper's seminal work *The Four Elements of Architecture.*

Through the development of his theory of the four elements: the hearth, the mound (earthwork), the roof (frame) and the enclosure (textile wall) there arises an associated operation. Molding is associated with the hearth, stereotomy (cutting solids) is associated with the mound (earthwork or foundation), joinery and carpentry with the roof and weaving and plaiting with the walls. Klucker states:

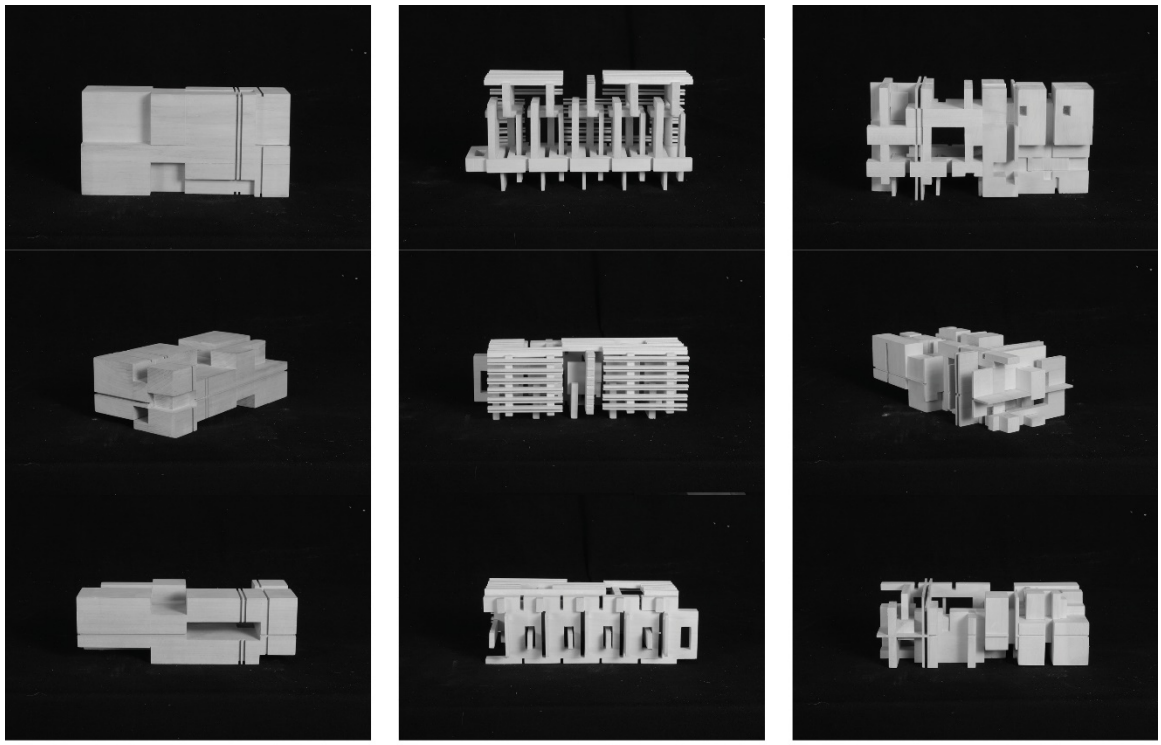
> *Significantly, these four operations can be distilled to two essential and yet, polar material preoccupation's: the tectonic frame and the stereotomic mass. The tectonic frame consists of light stick type members assembled and joined to enclose a spatial field. The stereotomics of compressive mass is achieved through the piling up of units and is further related and elucidated when considering the precise geometrical practice of stone cutting: stereotomy, derived from the Greek word for solid, stereos and -tomia for cutting. (Klucker, 1996, p. 199)*

It is upon these two material preoccupations or conditions, the tectonic and the stereotomic, that many beginning design curricula are based and they typically manifest in terms of Subtractive and Additive design.

In addition to these two categories many curricula attempt to address a third condition that arises in Semper's work: the transition from the stereotomic base to the tectonic frame. "The Semperian model holds these transitions as the critical essence of all architectural making." (Klucker, 1996, p.199) This

transmission is essential to Semper because it is within this realm that we live. As stated by Klucker, Kenneth Frampton understands "the polarities of the aerial frame which seeks the lightness of the sky and the stereotomic mass embedding itself deeper into the earth, are still largely considered the experiential limits of our lives." (Klucker, 1996, p.199) This third condition typically manifest as an operation of integration or hybridization of the products of the other two operations. It is with this operation that students are asked to occupy the design and understand the form and space through the lens of a simple program.

The existing curriculum that was being redeveloped sat firmly in this approach to beginning design pedagogy. It consisted of three phases: The Subtractive, The Additive, and The Hybrid. In the subtractive phase students were asked to operate on a solid block of wood. They were asked to produce hierarchy and express organizational systems and principles through the act of cutting and shearing the block. In the Additive phase students were asked to develop a single unit expressing similar principles as in the Subtractive through the process of aggregating multiple elements into a single assembly. This single unit was then repeated along a single axis to produce a larger tectonic assembly. Throughout the process students were asked to focus on the expressive potential of the joints between the elements within the unit and between them. Through this process the students produced two studies of the same size, both without scale. In the Hybrid phase students are asked to take the two previous studies and integrate them together in such a way that they express opposition and integration. One end of the model must privilege the Subtractive operations and the other end privilege the Additive operations and the middle third of the model functioned as the zone of complete hybridization.



Subtractive **Additive** **Hybrid**

Fig 1

Curricular Deficiencies

Though this curriculum effectively addresses the three Semperian operations there are three primary ways in which this curriculum falls short of delivering a productive education to the beginning design student. First, this form of curriculum over operationalizes the design process. Through this type of curriculum students become overly reliant on such operations as sheering or repeating. This process fetishizes the operation as an end to its own means—sheer for sheer's sake. For example, the potential affects of sheering such as hierarchy, axiality, separation, etc. are subjugated by the act itself.

Second, this type of curriculum overly privileges the formal qualities of design at the expense of spatial exploration and development. The products or artifacts of this type of curriculum lack interiority and as such are resistant to spatial analysis and design. This inhibits the student from developing a robust understanding of the relationship between form and space.

Third and most importantly, the students' actions produce an immediate effect decreasing the need to develop an abstract intent and to project that intent into an indeterminate future. This immediacy is inherent in the previous two criticisms and further reifies them. For example, if a student sheers a block of wood there is an immediate formal and organizational effect on the block. With a single cut and shift the block has been given an axis, a hierarchy, and an organizational scheme. The object that is produced is immediately ascertained and analyzed using formal criteria. Due to the immediacy of the operations there is no need for the student to understand the effects of an operation in terms of space. I short the students are not required to develop an understanding of one of the most fundamental tenants of architecture—the relationship between form and space.

The immediacy is further exacerbated by the properties of the materials used in the studio and the means by which they are manipulated. Students are asked to use chip board, foamcore, and basswood. All of these materials are manipulated in the same way. They are cut, torn, bent, glued, and joined. All of which produce immediate results—there is no delay in the process.

Criteria for a New Beginning Design Studio

Based on these reflections on and criticisms of this type of beginning studio I developed the following criteria for the design of a new studio curriculum for beginning design students.

The studio should remain in the Semperian paradigm. By remaining in this realm, the means of making form and defining space can easily be connected to cultural and temporal discourses through such authors as Gottfried Semper and Kenneth Frampton. This allows the students to understand how the means by which they make something carry with it larger cultural implications beyond the thing in itself.

The studio should not have phases that are defined by the Semperian operations—defining space stereotomically should not be isolated from those that do so tectonically. It is important for students to understand how these two means of defining space are in constant relationship with one another—constantly reacting to one another. Phasing should be defined by the complexity of the relationship between the two.

The studio should not operationalize the design process. Though formal operations are necessary for any design process, the operationalizing of the overall design process does not require the student to develop an intent or evaluative criteria for any given design. They don't know why they are doing what they are doing.

The studio must devise a way to inject time into the design process, removing the immediacy between action and outcome. By removing this immediacy, it forces the student to develop a desired outcome and then devise and develop ways and means to achieve that outcome. The lack of immediacy also injects indeterminacy into the design process allowing for greater exploration.

The studio must above all else emphasize the relationship between formal manipulation and spatial definition. This must be understood as a bidirectional relationship. A student must understand that space is defined through formal manipulation. Likewise, the student must be able to intentionally define a space and know what formal manipulations are required to achieve it.

Etymological Foundation

In response to the above criteria, I propose a curriculum for a new designed studio for the beginning design studio based on the use of casting as its primary means of investigating and manifesting the architectural object. Prior to getting into the description of the studio and its processes it is necessary to look at how the multiple definitions of casting set the foundation for its development and highlight how this method of making can inherently respond to the stated criteria.

The first definition and the most obvious or pertinent one is "to give a shape to (a substance) by pouring in liquid or plastic form into a mold and letting harden without pressure." (Merriam-Webster). This definition of casting addresses multiple criteria due to the introduction of the intermediate artifact of the mold. The mold must be treated with as much attention and care as an end product and as a means to an end. The mold unlike the object that it will produce is constructed through an additive process of assembly. Through this process it is necessary to understand the relationship between the constructed space of the form and the product that it will produce. Likewise it is necessary to have intent when constructing the mold that is other than the mold. One must know what the intended product will be, though it has never been seen when one sets out to construct the mold.

The definition of casting as a process addresses and fulfills many of the stated criteria. It remains within the Semperian realm in that it necessarily possesses both a tectonic and a stereotomic component. The process of casting resists the segmentation of the studio defined by the stereotomic (subtractive) and tectonic creation of space. It necessarily collapses them into the same process through the tectonic construction of the mold and the stereotomic product of the mold. Likewise the process injects time into the design process through the distancing of the end product, the cast object, which is the opposite of the means that were constructed to produce it. This distancing both extends the timeline of production and injects indeterminacy into the process as one must move from form (final cast object) to space (the mold). This oscillation between form and space and the conflation of what is object and which is space fulfills the final and most important criteria to emphasize the relationship between form and space.

The second definition of casting is to cause to move or send forth by throwing or to put forth. (Merriam-Webster) This definition highlights the inherent separation from the means and the end. In both aspects of this definition there is the sense of direction in which something is to move, a potential target. There is also the component of propulsion moving something toward that end or target. However, there is a gap between the propelling idea and the receiving target, which is filled with contingent forces. There is no guarantee that one will translate to the other—a shadow is not a direct translation of the body casting it or the light that makes it possible. It is always imperfect. This definition highlights and reaffirms that casting necessarily requires temporal separation from the act and the output fulfilling the criteria for such a need in the design curriculum.

The third definition of casting that highlights this process's ability to meet the stated criteria for the studio is "to dispose or arrange into parts or into a suitable form or order." (Merriam-Webster) This definition highlights how casting entomologically embodies the desire to put things in place in an attempt to produce a desired outcome. Understanding casting from this perspective highlights the role of intention in casting. It is not an open ended, arbitrary or whimsical process. Rather it is a process or set of events that is defined or guided by conditions set in the hopes of guiding or affecting the outcome. This definition highlights how casting fulfills the criteria for the need for the development of an intent that defines an end that sits at a distance from its inception. It also accepts the need for contingency and indeterminacy in the process. Additionally, the development of intent with recognition and acceptance of contingency in the design process resist the operationalizing of the design process—there is no prescribed set of processes that lead to the intended outcome.

The forth definition of casting is "to make (a knot or stitch) by looping or catching up." (Merriam-Webster) This definition captures the interconnection between the stereotomic and the tectonic for Semper as Klucker paraphrases Frampton's discussion of Semper in his article *Rappel a l'ordre, the Case for the Tectonic*: "Semper's archetypal emphasis on the knot or joint has deeply rooted significance in the fundamental syntactical transition that occurs in architectural space and form when rising from the stereotomic base to the tectonic frame." (Klucker, 1996, p. 199) What is most significant in this quote is the recognition that both the stereotomic and the tectonic are simultaneously spatial and formal and that casting relies upon and leverages the knot or the joint between both pairs: form and space and stereotomic and tectonic.

The new curriculum for beginning students was developed to incorporate these definitions of casting as the foundation for fulfilling the stated criteria as will be highlighted in the description of the studio.

Casting Exercises

Phase One

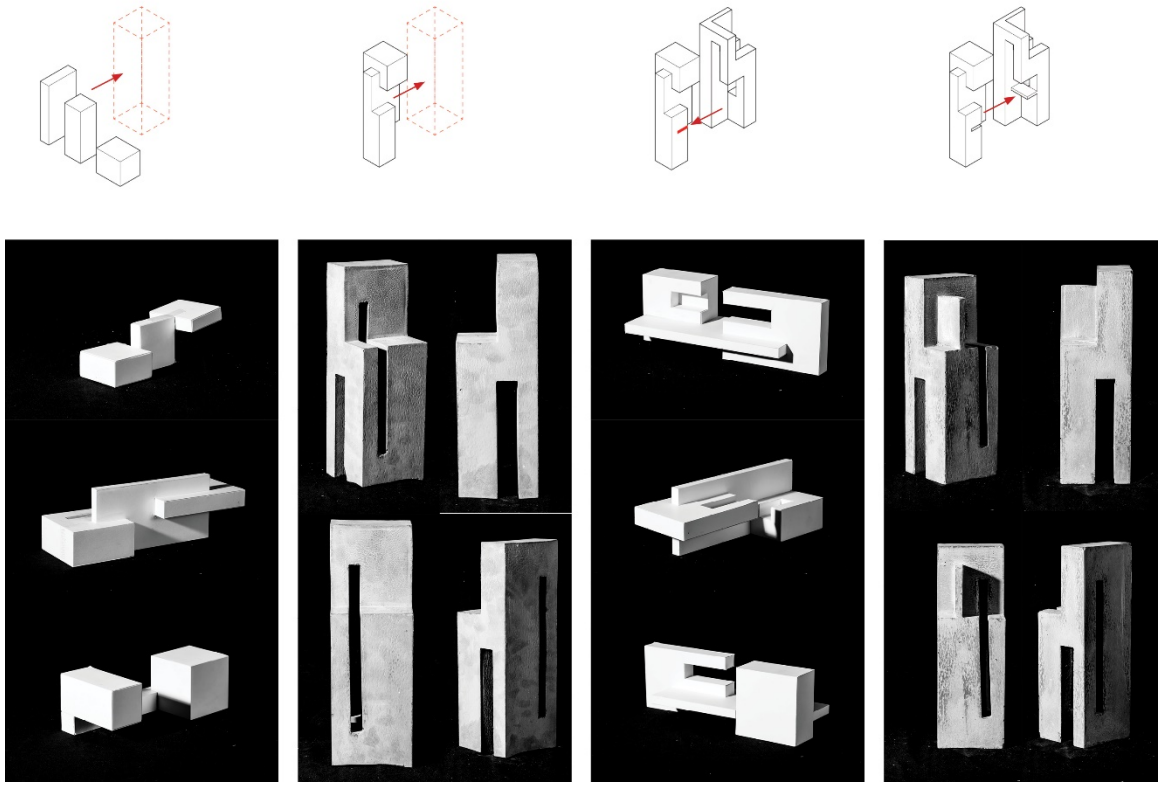


Fig 2

In the new studio curriculum, students are asked to develop specific spatial relationships and organizational schemes in an incrementally expanding site through a series of castings over three phases. These phases are defined not by the means of formal or spatial construction but by the elements that are required to produce defined spatial relationships. Phase one of this project is confined to an abstract site with the dimension 12”x4”x4”. Students are asked to develop prescribed spatial relationships (radial, linear, cluster, etc.) using three platonic orthogonal volumes (primary, secondary and tertiary). Once a clear scheme has been developed the students cast these volumes as voids in the enclosing volume of the site. It is at this point that the students get their first understanding of the spatial implications of their formal manipulations.

As the second step in the first phase students must reverse the process by adding a positive form to the cast model. This requires the students to add a voiding volume to their original three-volume scheme, which produces the positive form in the next casting. The addition of the positive form is used to add a new scale and spatial relationship to the cast model.

In the second phase of the studio, the students respond to the spatial configuration of the result of the first series. The abstract site is expanded into a nine-square grid with a dimension of 12”x12”x12” and the final model from the first phase is situated in one of the four corners. The students are asked to develop the two adjacent corner of the grid. The students must develop a hierarchy of spatial

relationships between the three corners of the grid using the logic of the first phase. However, in this phase the process is reversed. They start by defining the desired spaces and the spatial relationships that they want to create (they develop an intention) and then must work backwards to develop the necessary mold that will produce the cast model that defines the spatial relationships. In this phase there is much trial and error—many models cast backwards or in the inverse due to the reversed process.

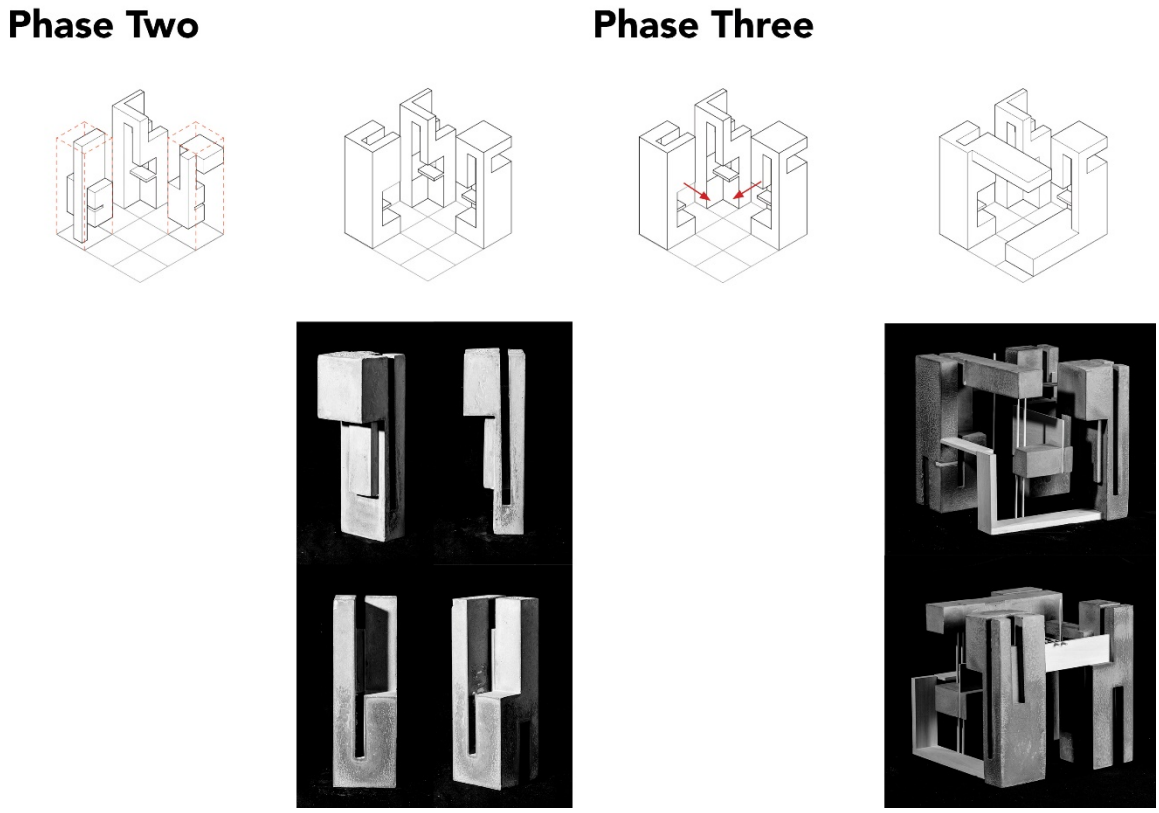


Fig 3

Once the corners of the grid are defined the students enter the third phase of the studio in which the students are asked to define the forth corner of the grid using extrusions from the existing adjacent corners. These extrusions should extend the spatial relationships developed in the first three corners. Unlike the previous two phases where the cast object possessed space within it as voids, this phase requires the use of the stereotomic elements to function as positive elements within an already existing space, thus expanding the potential role stereotomc elements can play in design.

To complete the third phase students were asked to investigate how thin additive elements that up until this point were only used to define the spaces within the molds could be incorporated into the spatial arrangement. These elements are allowed to span the gaps between the cast corners. It was necessary for the students to develop a logic of how this new system was going to work with or against the existing spatial logic. Additionally, the students had to develop a means by which this system was going to connect to the existing system. Through this process it became evident that this new system was going to have an impact upon the cast pieces in the model—not only is the additive system

reacting to the space of the cast elements, they are now acting upon them. These thin elements required that they be embedded in the cast pieces, which opened up the discussion concerning the joint. The students had to contemplate and define not only how two thin elements come together, but also how a thin and a massive element come together and what the spatial implications are for of both.

Conclusion

In conclusion, the bidirectional process of casting in this studio used to develop this new curriculum for beginning design students has had multiple productive effects on the students' education. The predominant effect is that the students become aware of the reciprocity and plasticity of the relationship between form and space. Prior to casting, the compositional and organizational qualities of a design were legible while the spatial relationships remained elusive. Through casting students come to understand a space as a result of formal manipulations. Subsequently, students develop the facility to derive formal requirements and produce physical forms to support the intended spatial configuration. Most importantly the students develop an increased dexterity to move back and forth between the two directions of casting—between solid and void, space and form.

The casting process with its inherent inverse and intermediary artifact (the mold) creates a temporal separation between the student's intent and the final architectonic outcome. This separation shapes the student's ability to comprehend and manipulate the relationship between form and space. This fundamental ability will serves as a foundation for the ongoing development of the students' design process.

References

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