Designing Matter: An Introduction to Architectural Design For First Year Graduate Students

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Animals, vegetables, minerals and pixels partake of the world of architecture. The architect's imaginary includes the simplest found substances—copper, aluminum, wood, water, air, light, bytes[1] , plastics, concrete, dirt and clay. Inspired by their physical, chemical, digital and biological possibilities, design could be understood as the aesthetic organization of animate matter into form and composition. [Celant, Arte Povera] The initial act of design is a comprehension and exhibition of a given substance's behavior, from growth to decay, from chemical reaction to movement, deflection and failure.

A process of design that starts with matter "moves away from emphasizing the subject, representation, and interpretation, which characterized [the] 20th century [...] toward focusing instead on the object, material process and expression." [Skylar Tibbits, Active Matter] Focusing on material experimentation provides insight in how designing through innovation - at the scale of matter - can make architecture a site of production "where theory - in the form of a contemplative observation - and experiment [are] inseparably interconnected." [Moravánszky, Ákos, Metamorphism: material change in architecture] For theory and experimentation of a material to co-exist, design requires one to start at the level of matter that is not yet materialized.

Therefore, in order to innovate, one would question the status quo and design at the scale of matter that is not yet a materialized product. As Sheila Kennedy states in Material Presence, "It may seem counter-intuitive for a critical practice of material research to examine the material predicaments inherent in the culture of production as a source of inspiration. But it is precisely here that the greatest challenges to the imagination lie."

With this the students set out their architectural career with a notion that architecture is an inherent part of the material environment that surrounds them. Providing the students with a notion that architectural design requires engaging the social and environmental conditions that are so pertinent for our built environment.

Designing MATTER

AN INTRODUCTION TO ARCHITECTURAL DESIGN
FOR FIRST YEAR GRADUATE STUDENTS

INTRO
Animals, vegetables, minerals and pixels partake of the world of architecture. The architect's imaginary includes the simplest found substances—copper, aluminum, wood, water, air, light, bytes[1] , plastics, concrete, dirt and clay. Inspired by their physical, chemical, digital and biological possibilities, design could be understood as the aesthetic organization of animate matter into form and composition. [Celant, Arte Povera] The initial act of design is a comprehension and exhibition of a given substance's behavior, from growth to decay, from chemical reaction to movement, deflection and failure.

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BACKGROUND
The course forms the introduction to the first year design semester of a three year graduate program and is addressed to a student body that is diverse in its academic and professional backgrounds. The course aims to introduce students to basic design tools, while simultaneously frame architecture as a discourse that lives between the tension of the virtual and the physical, being the constant translator between them.

What interests us in introductory design studio at the graduate level is the expression of form as the unfolding of processes and the application of forces. (This introductory design studio begins not with idealized, pure and abstract form, but with matter, material and forces. [D'arcy Thompson, Growth and Form] Keeping in mind that today the immaterial, the digital and the simulated are material conditions, as well. [Flusser, Immaterialism]

The course begins from a povera perspective: encouraging students to instrumentalize and experiment with the behavior of the base materials, substances and environments that they have experienced over their lives. Most of us already have an innate sense of the properties of matter; but in this course we aspire to learn to experiment with those properties and to control them as a means of investigating the dialectic between form and space; between matter and atmosphere.

METHODOLOGY
Moving back and forth between the computer and hands-on experimentation, students in this studio experiment with forms of matter and learn to express and control the behavior, while simultaneously speculating on how to simulate that behavior and its effects. The materials from which architecture is made have their own structural and behavioral logics, and are subject to entropy, which demands the invention of modes of representing material transformation over time. [Bois and Krauss, Formless] To recognize the vibrant life of matter and materials in their use, disuse and misuse allows us to treat drawing, modeling, and fabricating as inventive exercises.

STRUCTURE
The course is co-taught and closely coordinated with the media course that teaches the same group of students the fundamentals of representation. The course is organized around three parts. The first and second one form an introduction of basic principles, design methodologies and tools that in the third part are tested out through the design of a small spatial construct that is driven by a focus on one material system.

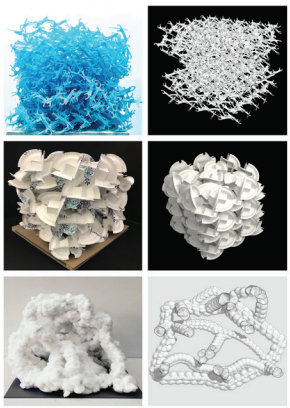
PART I - PILES - FROM PHYSICAL TO DIGITAL

At first piles, or accumulations, emerge from stacking, collecting, pouring and assembling material. Gravity and friction hold the pile in place. The form of the pile arises from the properties of the material, the manner in which it is assembled and the way the individual elements connect with each other. Piles may be dense and compact or loose and spread out, and spaces within them may be tight or may contain more volume than the mass of the material. In this assignment, students will assemble a pile. You will select a material and a mode of connection. The composition of the pile is a resultant of these choices.

PART II - GAPS - FROM DIGITAL TO PHYSICAL
Gaps emerge when materials are not perfectly aligned, when they crack or shift. The form of the gap is an inner function of the material and forces from the outside. They can be static or they can be dynamic and change over time due to the changing environment. Sometimes they are intended to appear intentional while other times they are seen as flaws. Regardless, they always follow an underlying structure, whether explicit or implicit. Gaps suggests spaces where bodies, wind and light enter, and even where things can be stuck. Gaps can join together to create paths, leading from one side of an assemblage to the other, not as a "corridor" but as a space that allows for an experience of a material condition.

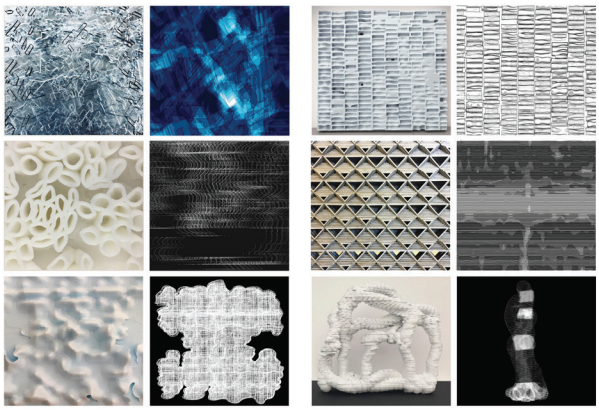
PART III - MATERIAL CONSTRUCT
The final task for this semester is to use the work you have done so far and translate it into the design of a small architectural structure that relates in a dynamic way to its surrounding environment. The site for your structure is Storm King Sculpture Park. The program for your structure is a space for informal gatherings of visitors to the park. Your design should also facilitate informal cultural events, such as small concerts, poetry readings, debates, discussions and jam sessions. You should select a site that will maximize the environmental and material behavior of your structure. Lastly, given that your site is a sculpture park, your design should question the tension and differences between architecture and sculpture.

PART I



figures: initial pile models and explorative drawings, (Adam Jakes and Yiwen Dai, Jing Hengyang and Victoria Fisher, Ashley Nowicki and Juntao Huang).

PART II



figures: digitally fabricated models and drawings that were derived from studying the gaps in Part I model, (Yiwen Dai, Tara Pearson, Adam Jakes).

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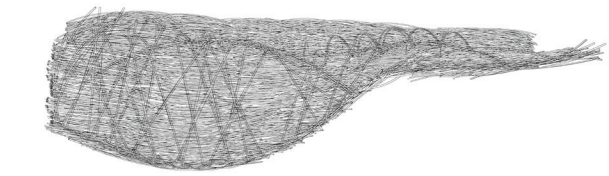
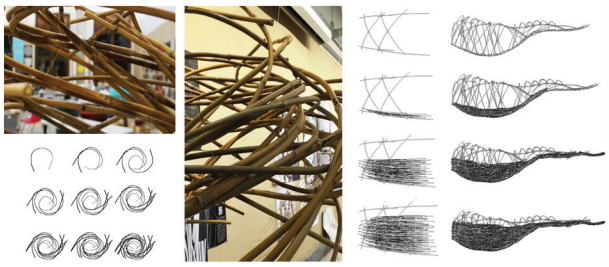
PART III

WEAVE
Ashley Nowicki

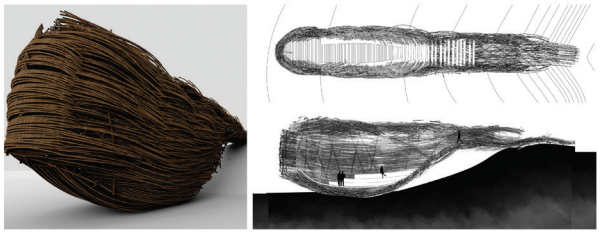
Student Project Description - *"The material constructs study took a tectonic approach to architecture in order to investigate materials, construction methods and digital simulations. From this investigation arose issues of form and tectonic aesthetics, as function follows form. The last project encompasses all of the previous material properties experienced, as it strives to create space between the topology of the ground and the linear, hast-bent qualities of bamboo. This pavilion is designed to create multiple different spaces as you walk around it, underneath it and through it and experience the density and qualities of bamboo."*





figures: diagrams of bamboo bending studies, exploring the behavior of the nodes during bending of bamboo.

figures: assembly logic of the woven cocoon.

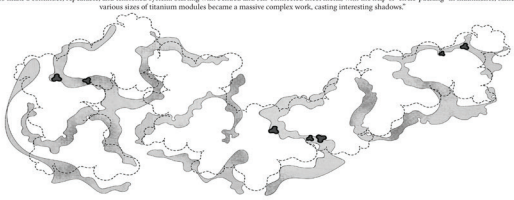


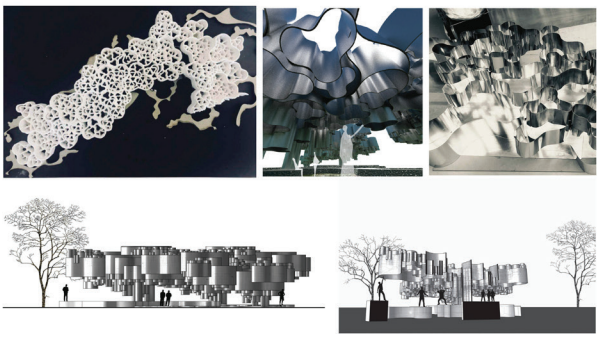
figures: exterior and interior perspective and a digital drawing exploration of different densities.

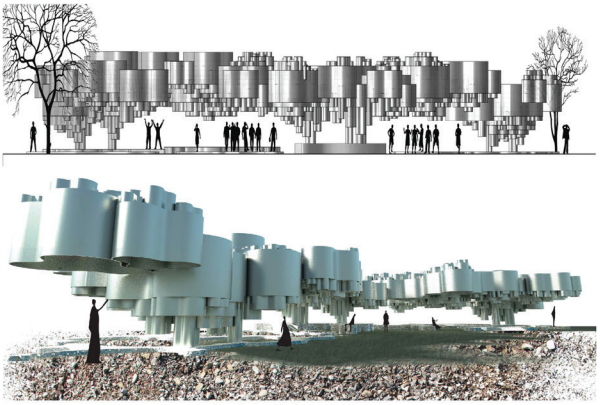
figures: plan, section and exterior view of entrance.

BEND
Yiwen Dai

Student Project Description - "Metal is strong in tension, flexibility, ductility, and is able to be bended or formed into certain shapes, which is the reason why it is widely used in construction. In this part of the project, metal sheets are bended in to a certain shape which is designed to be able to connect with each other using its tension, then the elements are forced into one another to make a continues, repeatable, and tensioned system. Starting with bended and self-connected sheet metal, with the help of "circle-packing" in mathmatics, same shape but various sizes of titanium modules became a massive complex work, casting interesting shadows."







figures: elevations and section, perspective.