

STUDIO 48-400 / 2013

DIFFICULT SYNTHESIS

Jeremy Ficca / Carnegie Mellon University / Alcoa sponsored computational design studio

Course Information

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Office hours: Monday 9:00-11:00AM MMCH 201 (please schedule appointment via email)

"Today, thanks in part to the new theories of self-organization that have revealed the potential complexity of behavior of even the humbler forms of matter-energy, we are beginning to recover a certain philosophical respect for the inherent morphogenetic potential of all materials. And we may now be in a position to think about the origin of form and structure, not as something imposed from the outside on an inert matter, not as a hierarchical command from above as in an assembly line, but as something that may come from within the materials, a form that we tease out of those materials as we allow them to have their say in the structures we create." -Manuel De Landa

"Given the complexities required by hybrid programs and typologies that characterize today's architectural patronage, one of the currents that challenge architects is the formal preoccupation with synthesis in general, as each tradition attempts to overcome classical organicism on the one hand, and collage techniques that tend to produce fragmentation, blunt juxtaposition, and simultaneity on the other. It is perhaps in this area of "difficult synthesis" where the detail is put to its ultimate test, where systems fall apart, where technologies overlap, where geometries intertwine, and where easy solutions no longer suffice." -Nader Tehrani

Studio Position

Computational processes coupled with hardware and software advancements continue to have profound and far-reaching consequences upon the discipline of architecture and have driven much of the current theoretical discourse. These methods offer new possibilities for advancing architectural design while recasting traditional practices and collaborations. While architecture has historically responded to moments of great economic, social, political and technical change, there is a shared sense that the current technological shifts underway are significantly recasting the profession, presenting new opportunities and challenges. These advancements offer the potential to better understand and explore complex issues related to the built environment and translate the resulting design decisions through methods of digital fabrication. As contemporary designers utilize increasingly sophisticated workflows to understand and work with complex information, the design process has shifted focus from "figuration", in which the designer is pre-occupied with architectural form, to "configuration" in which the designer "scripts" relationships between various factors to establish a process of form finding. While this is not strictly a computational process, software and hardware are making it more accessible and iterative, providing the designer with a set of potent tools to address and explore complexity. While much contemporary architecture associated with this methodology shares a formal language, one must resist the temptation to associate a specific "style" with the process, as it is essentially an extension of how architects have worked for generations. Parametric thinking predates software and is essentially a process in which the connections between things are foregrounded. The difference today lies in the degree of complexity addressed, the speed with which it is addressed, and the resulting ability to iterate.

As the discipline of architecture moves beyond the utilization of digital media as an instrument of efficiency and representation, the longstanding deployment of software for image and drawing production has been supplanted with computational methods that are utilized throughout the entire design process and through digital fabrication, extend into construction process. Digital fabrication processes coupled with an interest in material science on behalf of designers has led to a fertile material discourse within architecture. This has allowed computational design processes to move beyond paperless, materially inert methodologies and extend into materially informed and infused modes of operation. Recent noteworthy built work and research reveals this material agency, the associated computational design methods and the alternative models of practice and building delivery it demands. In these instances, the domain of the architect can be broadened and brought closer to the act of building, resulting in an empowered, yet increasingly accountable position of the architect. Digital fabrication processes have emerged as an indispensable tool in the realization of much of this work and are calling into question the traditional scope of architectural deliverables.

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This studio will investigate how materially invested computational design and fabrication methods transform the design process through a reciprocal process of design and prototyping. It will serve as a lab to explore design as a synthetic process and will utilize prototyping to establish a form finding feedback loop that is informed by material properties and behavior. The overarching aspects of rule based design strategies will be explored in relationship to the specific architectural requirements of a given program and site. The projects will be developed through analog and digital processes and will rely heavily upon algorithmic processes to establish rule sets for the development of architectural design strategies.

Physical models and prototypes, along with virtual simulations will allow us to evaluate design intent at scale and in material. By introducing a material presence into the design process, the prototypes help to collapse the distance between accepted methods of digital design on one hand and physical production on the other. The prototype, as an instrument of the design process, offers the potential to establish more subtle and complex understandings of architecture's material and experiential domains. In this sense, material will be explored in relationship to the performance of the envelope as well as its poetic and cultural capacities.

Studio Projects

The studio will be divided into two distinct stages that are immersed in material design practices. Stage One will consist of two material-based projects that culminate in the fabrication of a reduced-scale envelope condition. The ambition of this first stage is to explore envelope as an architectural threshold and environmental membrane. These two projects will explore the convergence between structure and skin in an attempt to establish a hybridized condition that addresses a specific environmental condition while serving as a spatial mediator. This initial material phase will begin with plywood and culminate with cold rolled sheet steel. Digital fabrication, including the use of industrial robotic arms, will serve as the primary means to "process" material. Attention will be focused on the development of rule-based design systems and their localized transformations in response to architectural requirements. By requiring a direct engagement of materials and fabrication processes these projects will foreground material characteristics and the potential for material transformation through the use of digital fabrication tools.

The two initial projects will establish a way of working within the studio and inform Stage Two, a competitive rowing facility and boathouse located on the Allegheny River in Pittsburgh. The methodologies, technical skills and sensibilities established by the preceding projects will lay the groundwork for the final project and establish a body of research and knowledge relating to plywood and steel and their associated fabrication techniques. It will necessitate a reconciliation of the systemic and the specific and require moving beyond the limits of an abstract and self-referential design process toward one that addresses the complexities found in the particularities of a multifaceted architectural project.

Considerations

- Move beyond self expressionism, make your work about more than you
- Tenacity is greater than talent
- Allow the rich discourse of architecture to infect your work
- Don't ponder without activity
- Don't work without thinking
- Spatial and material complexity is greater than Visual Complexity
- Allow formation (what) and implementation (how) to inform each other
- Know the current state of your project by knowing its past
- Respect your studio and recognize the impact your work environment has upon your process
- Recognize that the instruments of process affect your understanding of your work
- Invent and adopt design strategies
- Record and know the evolution of your work

Projects and Assignments

1A / 1B Material Formations

2 Competitive Rowing Center

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Design Process

As a young architect, it is essential to understand the evolution of your projects on a DAILY basis. This is particularly critical through the use of digital media, which can ironically; make a chronological documentation more difficult by privileging a constant state of the present. At issue is your ability to “know” your project and the past decisions that have led you to the current state of your project. You will be expected to concisely document your project on a daily basis. This should include all forms of relevant media (sketches, drawings, model photos, renderings, etc.) for where your project is at that point in time. Tabloid (11x17) sized paper will serve as the format.

Readings

Various readings will be distributed over the semester. Your time is well spent not letting them collect dust. Invest in a three-ring binder and keep the readings for future reference.

Course Organization

Studio Discussions and Involvement

An important component of studio culture is lively discourse. We will regularly meet as a studio to discuss historical and contemporary issues pertinent to work within studio. Everyone is expected to engage in these discussions and contribute material in support of their own interests.

Reference Material

Readings, articles and other reference material covered in studio can be found through Blackboard. You are expected to become familiar with this material over the course of the semester. **Additionally, each student is expected to have a different relevant library book on his or her desk each week.**

Studio Pin-Up Discussions

We will regularly meet to discuss all of the work in the studio. Students are expected to explain the current status of their work and engage in discussion about the work. On average this will occur about once a week for a few hours.

End of Project Final Review

At the completion of studio projects there will be a final review. Other faculty members from within the College and guests from outside the University will act as critics. Students are expected to clearly and concisely present their work and respond to comments initiated by the critics. Take care to layout and plan your presentation. **Move beyond plotter limits and do not simply plot one sheet and hang it on the wall.**

Studio Culture and Policy

Design studio is the core of architectural education and provides the venue through which students synthesize course work in the context of design problems. Studio based learning is increasingly recognized and adopted by other disciplines due to its effectiveness as a instrument of collaboration and hub of learning. Architectural education has long relied upon this educational model to foster discourse, create a vibrant learning environment and energize the collective identity of a school. While higher education continues to evolve in light of technological advancements, the existence of the studio remains as important as ever. It does not stand in opposition to an increasingly ever present online world, but rather has the potential to evolve, extend and take on more relevance through these tools. Our aim is to create a vibrant, experimental and respectful studio culture. All students are expected to uphold the highest standards of behavior and academic discipline.

Work Environment

The orderly appearance and functional effectiveness of the physical environment of the studio are essential to a pleasant and productive studio experience. Good circulation and working space should be available for all students. Isolated enclosures are not appropriate. **You can't effectively work if your desk and surrounding area are a mess.** You will need to equip yourself with proper drawing and model building tools, which should be in place by the second studio meeting. These would

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include, such things as: parallel bars, triangles, scales, drawing pencils, cutting bases, mat knives, and a straight edge for cutting mat board.

Working in Studio

To benefit the most from our guidance, you should take the time to be organized and prepared for desk crits. Have a clean work surface; have the artifacts (models and drawings) you wish to discuss readily at hand; do not rely only on digital displays on a monitor to convey your design ideas. Prepare a list of questions or issues you would like to address; have a roll of trace, relevant scales, and any relevant references available. But most importantly, undertake your design process as one of constant making. **Architectural ideas only become real and available for exploration and discussion once they have become manifest. The production of artifacts that record your thought process IS the design process. If you are not producing drawings, models and prototypes you are not designing.** This process requires continuity and repetition to be successful; therefore we expect to see substantial amounts of new work at each studio meeting. A student's work pace varies widely from one individual to the next; you know best how much time you need. However, in order to meet the goals of this studio each person should plan to devote a **minimum** of 20 hours per week in addition to required studio meeting times to the development of his or her studio work.

Attendance

Scheduled studio time is critical. We expect that each student be in studio during the scheduled class time. Inherent to the nature of studio are impromptu meetings and discussions; therefore, students **must** plan on being in studio from 1:30pm – 4:20pm. A visit to the nurse or doctor is considered an absence. **MORE THAN THREE UNEXCUSED ATTENDANCES CAN RESULT IN AUTOMATIC FAILURE OF THE COURSE. EACH STUDENT IS REQUIRED TO PRESENT AT PROJECT FINAL REVIEWS. FAILURE TO DO SO WILL RESULT IN A FAILING GRADE FOR THAT PROJECT.** Attendance for the entire duration of all pin-ups and reviews is required unless excused by your instructors. This may occasionally run past 4:20pm. Your attention during classmates' presentations shows common courtesy to your peers and often yields fresh ideas and methods applicable to your own work. You are strongly encouraged to do all after-hours project work in the studio. It is well established that almost all students benefit from this practice. Esprit de corps is enhanced and much is gained from interactions with, and insights of, classmates. **Lastly, you should enjoy studio, look forward to our time together and appreciate the interaction with your colleagues, this is what you are going to school for.**

Studio Rules

Use of cell phones, pagers and all other communication devices is prohibited during scheduled studio time. Overhearing other desk crits can be useful. However, if you must listen to music please respect those around you and wear headphones during scheduled studio time. Respect your collective studio space and refrain from using spray paint and spray adhesive in the studio.

Personal Responsibility

Each instructor will see students on a weekly basis in the context of pin-ups, reviews, or through desk crits. However, it is your responsibility to ensure you are receiving the attention you need, and to bring to the attention of one of the instructors any specific problem or issue you wish to discuss.

Work Ethic and Completion of Work

In addition to class time, each student is expected to devote at least 20 hours a week towards studio **AT A MINIMUM**. The amount of time put forth toward each project is most often directly related to the quality and thoughtfulness of that which is produced. Students should be prepared to discuss some facet of their work at any given time and are expected to regularly produce new work. Final reviews mark the formal endpoint for each project. They are the forums for students to develop presentation skills and engage in critical discourse. All students are expected to bring their work to a documented level of completion for final reviews.

Syllabus and Course Schedule

The nature of studio-based education at times requires adjustments to project scope and schedules. While every effort has been made to establish a semester schedule, the instructor reserves the right to adjust as necessary.

Communication

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Students should use email to set appointments for discussion rather than as a forum to complain. In-person communication is preferable to email to discuss and resolve problems. You are an adult enrolled in a professional degree program. As such, we expect all students will conduct themselves professionally and think before speaking or writing emails. Concerns and problems regarding studio should be first addressed to your studio instructor and secondarily the coordinator.

Special Needs

Students with any documented medical, psychological, or learning conditions that require special classroom accommodations should see the coordinator as soon as possible. If an emergency arises, please also contact the coordinator as soon as the situation allows.

Code of Conduct

Students are responsible for familiarizing themselves with Carnegie Mellon's academic policies. Misconduct, dishonesty, plagiarism, and cheating will not be tolerated and will lead to failure of the course as well as reporting to the head of the department.

Evaluation and Grading

Grades will be assigned based on each student's comprehension, self-direction in response to criticism, commitment to imaginative exploration and problem solving, dedication to refinement and completion, and excellence in communication in terms of graphic, written, and verbal resolution.

Grading Considerations

Design Rigor

- Have the range of design issues appropriate to the level of the studio and project duration effectively been addressed?
- Do the project and the student's defense of the project show the results of a rigorous design process?
- Did the student tap into and reference the discourse of architecture through their work?

Presentation

- Did the student recognize and communicate the essential aspects of their project?
- Is the presentation consistent? Is it clear and understandable?
- Can the drawings be read from 10 feet away? Is the amount of detail appropriate for the scale?
- Were media used effectively?
- Does the presentation convey the experiential aspects of the project?
- Does the presentation challenge conventions of representation?

Effort

- Did the student work to his/her potential?
- Did the student take initiative to seek out resources, images and ideas?
- Was the student willing to challenge stereotypes and consider fresh alternatives?
- Was the student ambitious with the design, reaching far and grasping a solution?
- Did the student contribute to class discussions, class activities, and the general studio environment?
- Did the student engage in discussion on course readings?

Quality

- The final **product** is also very important. It represents your insight, your judgment, your commitment, and your craft. It also represents your ability to make decisions and bring things to closure. No architect can function without the ability to document high quality concepts through high quality artifacts.

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Grading Standards

- A** Superior design process and product. Student has far exceeded requirements and expectations for the studio. Self-motivation, breadth of knowledge relating to architectural design issues, and ability to create inspired design solutions is clearly evident. Contribution to the studio environment is in a leadership capacity. Ability to present ideas through drawing, modeling, and verbal means exhibit the highest level of achievement commensurate with a final project. The hallmark of an A student is the passion to question and critique him or herself and to pursue new ideas and/or technical skills. Given the emphasis in this studio, excellence regarding conceptual rigor and design strategies must be evident.
- B** Better than satisfactory design process and product. Student has met the requirements and expectations of the studio with distinction. Drawing and modeling skills are highly developed. Student is a positive and active member in the studio environment.
- C** Adequate competence relative to design process and product. Satisfactorily meets the stated requirements of the course; all work is complete and on time. This grade represents the average solution.
- D** Marginally meets the stated requirements of the project or course; work is incomplete and/or late. Work fails to sufficiently demonstrate understanding and execution of the concepts and skills required for the studio.
- R** Work is unsatisfactory and fails to meet stated requirements of the project or studio.

Grading Distribution

Project 1a	20%
Project 1b	20%
Project 2	50%
Studio participation	10%