Team Totemics

Peter Wong, Assoc. Professor; David Thaddeus, FAIA, Professor; Frances Hsu, Visiting Assoc. Professor
University of North Carolina Charlotte

Abstract

Team Totemics integrates the Surrealist *cadavre exquis* as a design strategy to advance remote learning and as a pedagogical tool for cultivating fellowship amongst students in the wake of the COVID-19 pandemic. Despite the immense significance of the integration of computational methods in design education, there remains a need for theorization and critical exposition of the interaction between building technology and digital making in online design pedagogy. *Team Totemics* creates materials for discussing, exhibiting, and demonstrating pedagogies based on the principle of multiple origins suggested by the exquisite corpse. The outcomes inform student learning and faculty research at the nexus of digital composition, social collectivity and structural empathy.

Keywords: Computation, Digital Representation, Structures, Pedagogy, 3D Printing.

Preamble

The exquisite corpse shall drink the new wine.[1]

The promise of digital and computational tools in architecture continues the push of modernism in providing design innovation. This drive is invited by computation's ability to process information and graphics in rapid and complex ways. As modes of interface change, so do the resulting products of design and construction. It is clear these new methods in architecture have reached a point where our representations are knit closely to the means by which we produce buildings.

As a corollary of these developments, as intention and project meaning navigate among old and new methods,

Fig. 1. Cadavre exquis by Andre Breton, Yves Tanguy, and Jacqueline Lamba, 1938.

design decision making is altered. We can think of this middle ground as a tangle between conceptual modalities in architecture. Ideas from pre-digital thinking (e.g., the use of metaphors, analogies, and descriptive narratives) find themselves choreographed with data sets, machine-learning, and parametric possibilities. Form is assigned meaning in the first case and uncovered *a posteriori* or from observation in the second.

Team Totemics is a third-year undergraduate studio project that uses computational methods and narratives

of structural action to introduce fundamental ideas about structural technology. The assignment establishes a sequential set of digital file shares that break from the norms of the typical individualized design project. Given life under COVID-19, and the necessary use of isolating communication platforms, the assignment aimed to bring class members together through: 1) sharing digital model files; 2) encouraging open dialogue and critique of the results of their accumulated design actions; and 3) assembling a set of individual parts generated by 3D printing.[2] By modeling the exercise after the Surrealists' exquisite corpse play we hoped that students would discover the value of collaborative and interpretive team interactions (Fig. 1).[3] Unexpected lateral investigations in form and structural action also arose, which bridged means, skills, and diverse learning orientations, as well as the unexpected consequences afforded by these multiple design actions.

Pedagogy and Set Up

The specific assignment objectives sought to: 1) help students understand Rhino 6 software commands for generating form; 2) initiate a design process involving multiple authors; and 3) create debate amongst team members regarding the application of different structural strategies. To do this we set up a three-fold problem where students formed teams of three. Each team designed three towers composed of three segments, with each segment designed by a different team member (Fig. 2).

The first phase of the problem involved form-making only. The three Rhino operations used to form each totem were restricted to an extrusion, a sweep, and/or a loft command. One member of each team started the first segment with one of these three operations in mind, then passed their digital files off to another team member who continued the Rhino command into the next segment. The second-stage digital file was passed to the last member of the group who finalized the tower with a concluding segment. The process was repeated twice, with the students changing their order of influence. Each of the three completed totems was thus designed by all members of the team, and each team member had a hand at designing a base condition, a middle piece, and a final segment.

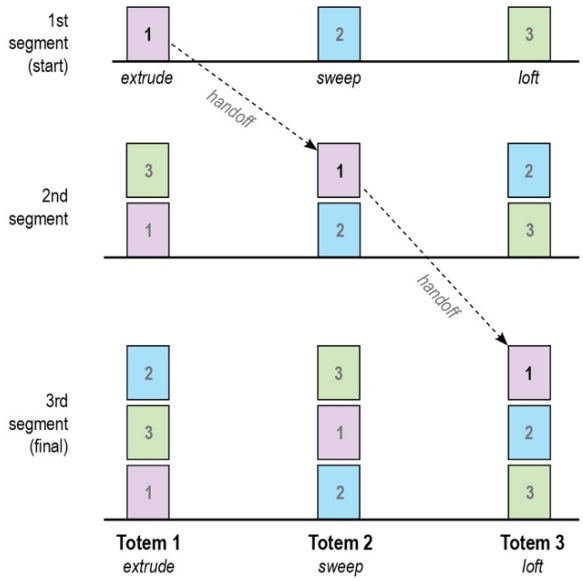

Fig. 2 Diagram of the exquisite corpse team process.

It was anticipated (as in the original exquisite corpse process practiced by the Surrealists) that subsequent segments would start with a smooth transition at the seam, respecting the plan section profile of the previous piece but with the freedom of varying the operation as it rose from the connection. Different attitudes emerged within the teams, ranging from smooth and respectful transitions to radical and deviant translations of the respective program operation. A post-process team video discussion via Zoom was required for each of the three totems with the final analysis and critique functioning as an agreement as to how the concluding work should be interpreted.

The second phase of the assignment introduced three different structural types and actions that would be applied to each of the three totems resulting from the first stage. These three structural ideas included: 1) a strong

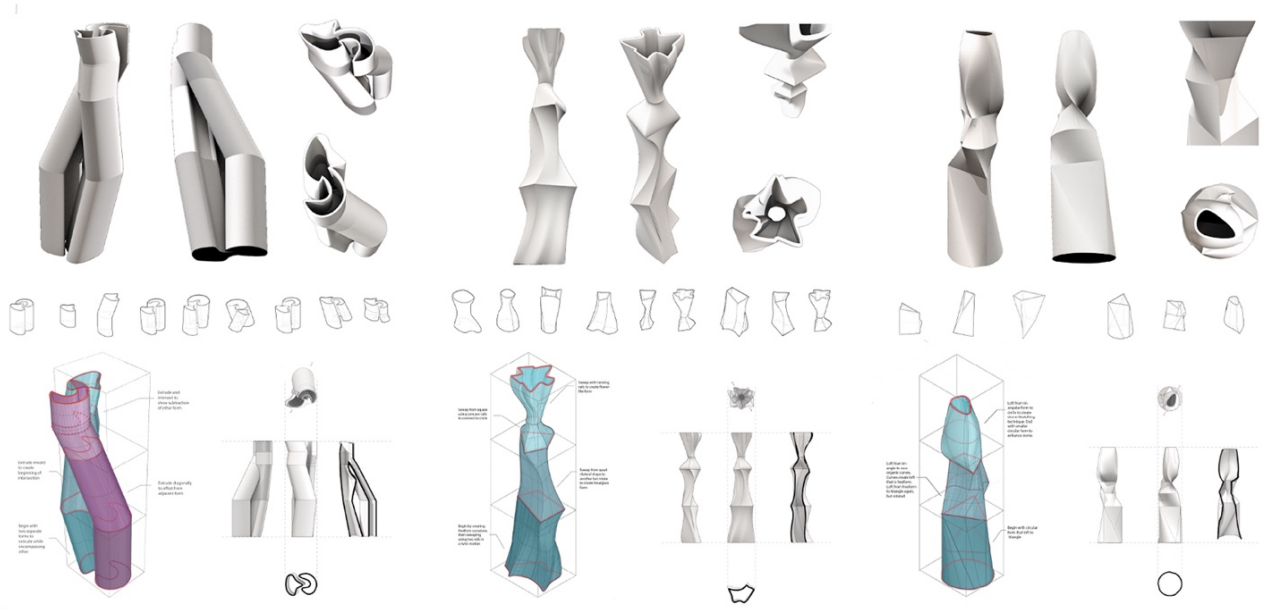

Fig. 3 First stage of the totem assignment with examples demonstrating the three Rhino commands that were used for each tower form (extrusion, sweep, and loft) Student team: XXX, XXX, and XXX.

skin or bearing membrane strategy; 2) a tectonic or frame strategy; and 3) a wall or planar arrangement with a focus on waffle or coffered supports. Each team selected one member to apply one of these structural types to one of the formal totems (Fig. 3). By debating the different forms and Rhino operations, the team agreed on which structural strategy should be applied to each of the three totems. All three structural ideas were used by the team resulting in one structural solution for each totem (Fig. 4 and Fig. 5).

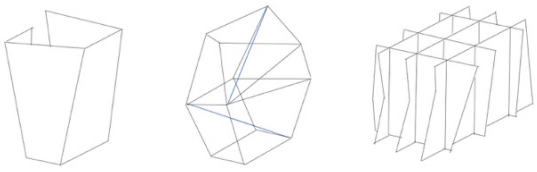

Fig. 4 Three structural types: strong skin, tectonic frame, and planar.

Lateral vs. Vertical

Since the 1950s, the design pedagogy typically employed in architectural design, and most fruitful in terms of product, has been the *transformation project*. It has proven useful in foundation education for some time, perhaps inspired most by the cube problems of John Hejduk and Robert Slutzky (their 9-square transformation problem) of the early 1970s for students at The Cooper Union, and also practiced by many designers of the era (Peter Eisenman, Richard Meier, et. al).[4] The implementation of such an exercise is seemingly foolproof, starting with simple forms sequenced by operations that involve subdivision, rotation, fragmentation, layering (collaging) and other formal syntactical moves. Its allegorical approach is linear, step-by-step, and serial. At the conclusion of this sequence of steps, the end product is typically complex, rich, and traceable to all steps making it an operative process that helps the beginning student become emboldened with a

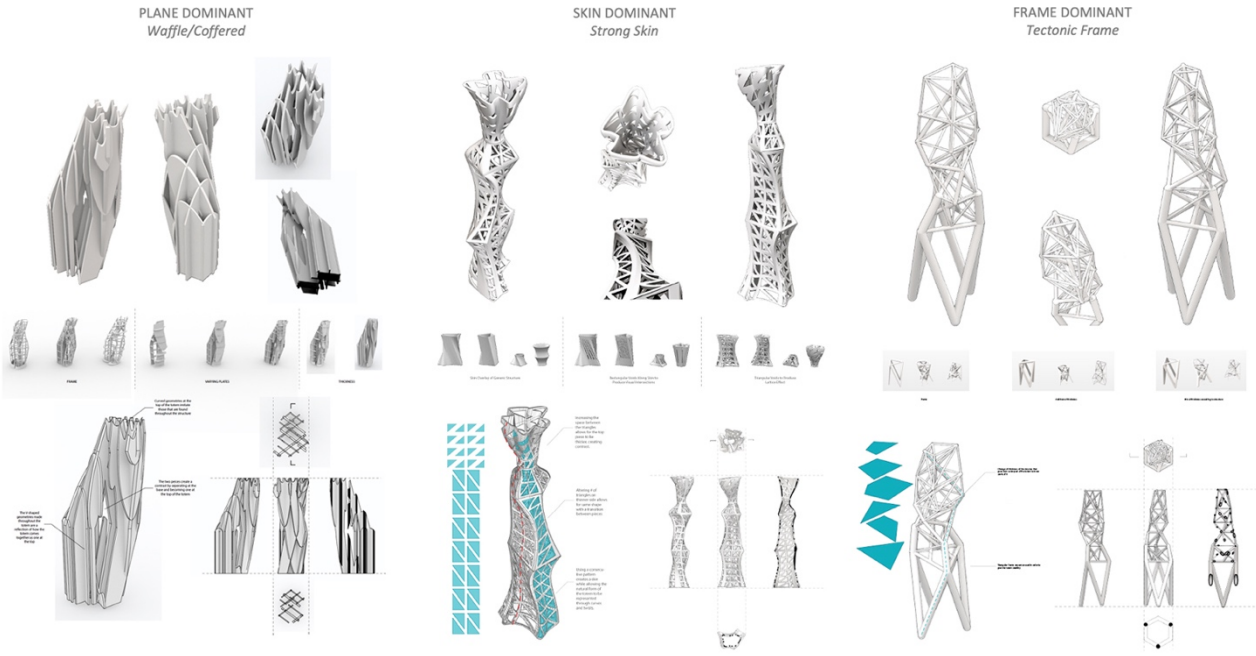

Fig. 5 Second phase of the totem assignment (using the forms shown in Figure 3), demonstrating the three structural types used for each tower (planar or coffered, strong skin, and tectonic frame) Student team: XXX, XXX, and XXX.

sense of accomplishment and confidence, as well as a convincing object.

The additive totemic techniques in our assignment follow this clear means of pedagogical precision. The end product, with its three rising pieces and smooth transition lines, aids in the students' formation and ultimate completion of each step of the assignment. Like indigenous totemic art itself, the process is additive, emerging as a narrative work as each piece is derived from the rules of the game.

The exquisite corpse process that entertained the Surrealists is sequential in the same way, with the final work revealing itself in a similarly linear manner. The final interpretation however is more open-ended, with all contributors entering a debate over the final work's meaning and aesthetic value in the concluding analysis.

In architecture, this linear process is deterministic in several key ways. Moving from simple to complex development of an object helps students attain increasing levels of articulation and complexity. Furthermore, the accumulation of forms adds credence to the object since it becomes the measure of a traceable process. Lastly, the pathway is singular, as it attempts to forge a trajectory towards correctness. This process relies on a linear pedagogy, from design inception through the final presentation and critique.

Edward de Bono characterizes this process as vertical thinking, a path that excludes other directions or possibilities in order to narrow the search for the final outcome.[5] Built into vertical thinking is the most promising approach to the problem, free of ambiguous routes common to problem solving.

Alternatively, de Bono critiques vertical thinking through alternate means: lateral thinking. In a lateral process the results are rich compared to correct, many as opposed to singular, and horizontal rather than vertical. In approaching a problem laterally the steps to a final solution present all possible routes as a discursive process that must be evaluated, judged, and scrutinized. With vertical thinking one is on a trajectory towards a

solution; in contrast, with lateral thinking the approach generates several possible approaches.

Our aim was to give Team Totemics the qualities of a linear and vertical process so that all steps were clear and precise. However, we also sought to instill the lateral attributes of de Bono's creative theory in order to widen and add criticality to the process in a horizontal manner.

Fig. 6 Detail of first and second phases of the project (totem form adjacent to its tectonic cousin). Student: XXX.

From Model to Print

The intentions at the outset of this assignment were to maintain as much physical modeling as possible during the process, especially because access to school laboratories and workshops was limited. To do so all 45 students were asked to purchase a designated (and inexpensive) 3D filament printer for use in their home studio environment.[6]

The process of physical model making (and the practice of making architecture) places additional emphasis on the nature of computation and the layers of geometric and dimensional description hidden in our devices. Today, we see information imbued in our digital models as seamlessly tied to the way we produce physical objects. The collaborative nature of Team Totemics afforded students an opportunity to inspect and compare their formal and structural digital models within the context of the output process. Having each totem composed of three segments allowed the students to move back and forth between what is possible visually and what can be produced in material terms. The reciprocal notion of modeling which leads to printing portrays this back and forth process in explicit ways.

The implied structural systems used for the totems allowed students to play with surface treatments (skin dominated structural type), frame and trabeated connections (tectonic system), and the layering of materials to make planar surfaces (coffered and waffle system). The project aimed to reveal what could be achieved by the press of a button (the myth of instant architecture) and the realities of logical planning – locating joints, connections, and segments – due to the totems' structural integrity, limitations of the 3D printer's output dimensions, and/or the opportunities and constraints of the filament media (Fig. 6).

Pop-Up Exhibition

The resulting digital models, drawings, and printed objects were displayed outside the School of Architecture's entrance as a two-hour pop-up installation and exhibition. This was performed at the conclusion of the work, and for some students it was the first time that team members had met face-to-face during the project

Each team signed up for a specific time to deliver, install, and photograph their work. Teams had ten minutes to install their work before exiting the installation site.

Pedestals, 24” high by 6” x 6” of foamcore, were created for each of the three totems designed and constructed by the teams. They were delivered to the walkway and spaced randomly at no less than six (6) foot distances from one another, simulating an arrangement of bodies situated with respect to social distancing measures required under the pandemic conditions (Fig. 7). Over the two-hour period an array of 45 totems and pedestals were mapped across the walk as a field condition leading to the entry of the building. Upon completion of the installation the professors relocated the entire set to the lobby of the building where drawings and models were displayed for two weeks (Fig. 8).

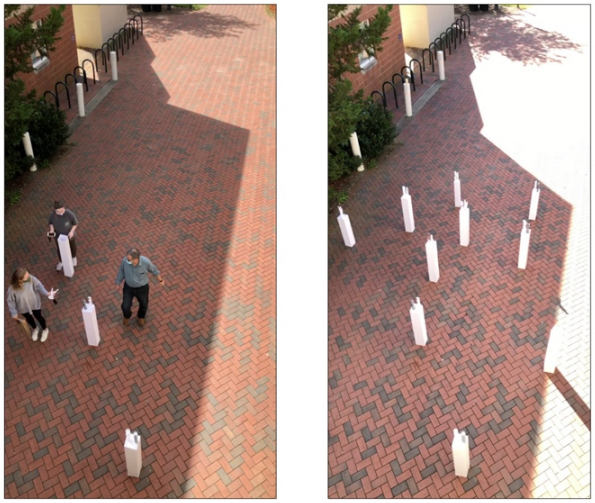

Fig. 7 Temporary Pop-Up Exhibit being installed at the entry of the Architecture Building according to social distancing requirements.

Final Thoughts and Questions

Team Totemics provides lessons in group collaboration, digital modeling, and 3D printing, as well as an introduction to alternative structural strategies and actions that bring reason to form and shape. Of importance are the parallel and lateral ways in which solution sets create discursive alternatives and at the same time healthy dialogue in the design process. The result is left as a range of architectural possibilities rather than a single solution, designed to keep creativity in play long after filament strands harden and printer heads cool.

The original exquisite corpse exercise strove to bring unconscious thought to the surface of our conscious world through the act of collaborative interpretation. Today, our growing infatuation with the collection of evidence and the sorting of data (e.g., tabulating urban measures, mapping cultural information, or mining social media) enables us to answer immediate effects by directing creativity in similar, responsive ways. The difference however lies in the methods of our analyses, the way we initiate the design process as we pick and choose which particles are most urgent to answer. While the exquisite corpse bears some resemblance to these new contemporary processes, it also permits us to pause and question the hierarchical demand for superlatives or “best practices” that computational methods often promote. This is particularly cogent in a climate where young designers are less patient about questioning and being critical about the paths they take in their decision

Fig. 8 School of Architecture gallery installation of the Team Totemic assignment (opening exhibit of the Fall 2020 semester).

making. The exquiste corpse avoids such hasty conclusions, as it lies idle for us to dissect its intentions.

Acknowledgements

The authors would like to acknowledge the perseverance and hard work of the Fall 2020 Third Year undergraduate design students. They would like to thank graduate assistants XXX, XXX, and XXX for their help with 3D printer assistance and set up. In addition, the authors thank Director XXX of the School of Architecture for providing necessary funding for the purchase of loaner 3D printers for some members of the 45 student class.

Notes:

1 Phrase by André Breton from the first written exquisite corpse paper game that coined the name of the artistic exercise. From "André Breton Remembers," *Le Cadavre Exquis: Son Exaltation* (Paris: Galerie Nina Dausset, 1948).

2 The studio was taught primarily as an online course. Professors used a web-based whiteboard (MIRO) and virtual meeting spaces (Zoom) for regular class critiques, team meetings, and presentation reviews.

3 The studio project aimed to recapture this collective sense of design found in this parlor game of the 1920s based on the accumulation of words or images on a folded piece of paper. Instructors adapted this Surrealist technique to demonstrate how one might find the latent meaning of form.

4 John Hejduk, *Education of an Architect: A Point of View*, (New York: The Cooper Union for the Advancement of Science and the Museum of Modern Art, 1971). Also see Reto Geiser, "The Afterlife of an Exhibition: John Hejduk and the Education of an Architect," *Ra.Revita de Arquitectura: Architecture for Museums*, vol. 21, 2019.

5 Edward de Bono, *Lateral Thinking: A Textbook of Creativity* (Middlesex, England: Penguin, 1977), 37.

6 Anticipating online instruction due to the COVID-19 pandemic, students purchased an affordable 3D filament printer/prototype device. The School of Architecture provided loaner machines for those who could not afford one.