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THREE LITTLE SHACKS

An inquiry in technics, tool-making, and invention

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Abstract. The paper is premised upon the notion that tools and techniques have the potential to resist the premature prefiguring of problems and solutions in project-based activity, with particular relevance in collaborative design practices. The architect's métier and mode of knowledge production is marked by the capacity to make artefacts. Because our age is characterized by the imperative to innovate and evolve technically, architectural ideation must now engage an array of computationally-based tools for imaging, information management, simulation and fabrication. This paper, framed within the theoretical and productive context of a research-creation project, investigates the ontological status of process-work, speed, and the notion of failing fast through the prototyping of three small buildings, or shacks. It does this through a strategic choreography of factual and counterfactual investigations that give rise to *fabricative knowledge* incapable of being prescribed conceptually from the outset. It will be claimed that, in the case of architecture, the potential of technics to reflectively and playfully re-work things and ideas is also a participatory mode of ethical engagement.

Keywords. Tools; tool-making; technics; prototyping; architecture.

1. Introduction

The following inquiry considers *technics* as the "master metaphor of our times, the basis of a new theology: a constellation of concepts, models and paradigms" (Vaccari, 2009, p. 1). It argues for the primacy of fabricative knowledge as a profound access to the *unthinkable* and as the configuring force in the invention of technical objects, new practices, and insights into

novel singular propositions. As Erin Manning (2009) states, the presumption that the "project pre-exists the problematic, " or that one can "know in advance what is at stake" within a given design problem, can be challenged through an attentive choreography of investigative strategies and techniques. In other words, conceptually prefiguring a design problem inhibits innovation and the "singular unfolding of the event. " According to Manning (2009, pp. 1-2):

> Techniques … are always immanent to the event in its unfolding. They are not equal to all tasks and must therefore be reinvented each time. … [T]his requires flexibility and the ability to allow a project to fail. Each project creates its own conditions for experimentation and proposes its own techniques. But without attentive development of the potential of these openings, a project can easily fall flat. … Each event is its own fine balance between choreography and improvisation.

By extension, this dynamic between germinal concepts or abstract schema that frame a project on one hand, and the tacit understanding discovered during making on the other, is the "choreography and improvisation" examined through the research-creation project titled *Three Little Shacks*. The Shacks project challenges methodologies that assume design as linear problem solving, for as Brian Massumi (2009, p. 39) suggests, the invention of "technical objects, " including buildings, is not a hylomorphic process in which "the generation of form is reducible to the imposition upon inert matter of a pregiven abstract form. " The invention of technical objects cannot be simply schematized nor reduced to their physical description, use, or functionality nor are they simply the sum total of the various material, functional, technical, vital, and social regimes that the act of invention gathers and by which it is reciprocally organized. Hylomorphic and purely conceptually driven processes foreclose the inexhaustible *real* of the as-yet unknown object.

The inquiry entails the design and fabrication of three iterations of a small building−a shack or cabanon−utilizing a well-stocked, customized computational toolbox. It assumes that technique, in itself, is a mode of questioning and knowledge production relative to dominant models of architectural ideation, such as the biomimetic or parametric. The project interrogates the "constellation of concepts, models and paradigms" of our time that are presumed to be morphogenetically-oriented. The hypothesis is that a flexible and attentive posture toward a strategic set of techniques has a *disinhibiting potential* to delay the prefiguring of problems and solutions in collaborative, project-based activity. These ideas can be extended to a reading of architecture in particular, and fabricative knowledge in general, as a history of *tekhnē*.

2. Technics and the primacy of fabricative knowledge

The design of the Shacks was originally conceived within a framework of parallel theoretical and computational strategies that considered the dominant operative models of our time (parametric, biological, environmental). The notion of technics is situated as the central investigative (critical) agent. Before articulating this structure in more detail, it is important to understand technics as inclusive of the techniques, tools, and conceptual models that constitute the productive realm of architectural ideation, design, and realization. The ability for architects and designers to make project-specific tools through computational processes such as scripting and programming plays an essential role in the research inquiry. The potential of technics to reflectively and playfully re-work things and ideas is constitutive of the inventive process and as a potent modality of knowledge production. In fact, it is argued through the philosophical reflections on technics of Bernard Stiegler that *fabricative knowledge* is the preeminent mode of knowledge production and, in an inversion of a longstanding anthropological model of human development, it is that which defines us as *human qua human*.

Contemporary notions of technics have been defined with various levels of precision since Lewis Mumford popularized the term in his 1934 book, *Technics and Civilization*. Of course the notion stems from to the well-trodden philosophical discourse around the ancient Greek ideas of *tekhnē*, *ēpistēmē*, and *poiēsis*. In his *Existential Technics*, Don Ihde (1983, p. 1) notes that technic "stands between the too abstract ‘technique’ which can refer to any set action with or without a material object, and the sometimes too narrow sense of technology as a collection of tools or machinery. " More recently, in his *Technics and Time*, Stiegler (1998, p. ix) describes our situation as being "caught up in a whirlwind in which decision making (*krisis*) has become increasingly numb, the mechanisms and tendencies of which remain obscure, and which must be made intelligible. " He continues (p. 21):

> Today, we need to understand the process of technical evolution given that we are experiencing the *deep opacity of contemporary technics*; we do not immediately understand what is being played out in technics, nor what is being profoundly transformed therein.

A key feature of Stiegler’s analysis of technics is the notion of *exteriorization.* Van Camp (2009, p. 6) states "in technical life … the human is not constituted through its opposition to the animal, but rather through its relationship with technics." It is in this relationship with tools and the technical consciousness (arriving prior to symbolic consciousness in this account) that

the "human is constituted through its exteriorisation in technical objects" and by which "memory is grafted onto the non-living (matter) " (p. 7).

3. The ontogenetic character of invention

Now we must turn our attention to the relationship between technics and the process of invention of the technical object as the leading catalyst of The Shacks project. For the philosopher Gilbert Simondon, the "technical mentality" participates in the unthinkable potentialities of the reticular network of things, apparatuses, devices, and relations. It requires a mode of (fabricative) engagement with the world in which techniques and tools play a primary role. Simondon refers to the development, synthesis, and refinement of a technical object as *concretization,* which, as Paul Dumouchel (2008, p. 416) states, is "a form of technical judgment and intuition which cannot be equated with theoretical knowledge. " At the heart of Simondon's understanding of the technical mentality and its inventive prowess is the idea that there exists "a sort of immanent intelligence of 'know-how', what Polani called 'tacit knowledge', which cannot be reduced to discursive forms of knowledge" (Debaise, 2012). Reason and abstract schema are a necessary but insufficient condition for invention. In his analysis of Simondon's philosophy of technology, Dumouchel (2008, p. 413) states:

> Through concretization, the abstract mental representation of a technical object is progressively embodied in a definite structure of materials and physical processes. [I]t is best thought of as a teleological process, but its end-point should not be seen as the conscious goal pursued by scientists and engineers in the refinement of technical objects. … [C]oncretization is the result of human actions but not necessarily of human design.

Concretization is an ontogenetic process in which various forces and regimes (technical, social, vital) dynamically play out within the technics of a designer who fulfills the role of the "the helpmate to emergence" (Massumi, 2008). Architects and designers are fully immersed in a complex technical milieu of analog and computationally-based devices, equipment and codes, modes of representation and manifestation, all of which exacerbates the ontogenetic complexity of our objects.

4. Collective technics and Shack emergence

To reiterate, The Shacks project questions the current alignment of specific theoretical constructs with computational design strategies through an investigation in technics as potentially subversive to linear, conceptually-driven design strategies. In turn, the project is also an investigation of the status of

fabricative knowledge relative to predominant models of thought in architecture. From the beginning, it was set up as a collaborative, improvisational choreography of technics and tool-making that oscillated between real-world building constraints and fantastic counterfactual investigations. The structure of this research-creation project is predicated upon the respective pairing of biomimetic, parametric, and sustainable design theories with computer applications including Rhinoceros, Grasshopper, and Revit (to name a few). Biomimetic theories propose an interpretation of the natural world to be emulated as a means in resolving issues faced in the built environment. Parametric theory strongly asserts that a building and the act of building functions as a machine-system conceived and fabricated within imitation of that analogue. Sustainable design theory largely defines the relationship between world and built environment relative to uses of resources that have a minimal impact on given climatological criteria. Each theory has exemplars of best practices and methods in architecture; however, the notion that practice follows from theory ignores the possibility of architectural practice—the design, fabrication, and installation of the built environment—as a form of inquiry in its own right.

4.1. DISPLACED INTO THE COUNTERFACTUAL

As a collaborative research-creation project, it was necessary to locate a common ground from which to proceed with the theoretically-informed but decidedly practical research into the foundations of making, subjectivity, and working together. In his essay "Non-Relationality for Philosophers and Architects," Graham Harman advocates the *counterfactual* as a critical site of inquiry. For Harman (2013, p. 216), the counterfactual opens towards "what is disturbing, strange, or in excess of current knowledge and social practice. " The Shacks project originates from this counterfactual approach intertwined with self-imposed "real-world" construction, performance, and programmatic constraints. Its initial investigations thread together elements from surrealist and science-fiction literature—appropriating "dream-readings" of triceratops skulls for example—with critical reinterpretations of Le Corbusier's *cabanon* at Cap Matin and Greg Lynn's *Embryological House*. These critical-imaginative fictions catalysed the interrogations of biomimeticism, biomorphicism, and parametricism *through* the array of computational design tools to which these paradigms are so closely associated. The second order strategy entails the re-integration of these carefully crafted fantasies back into an architectural craft of material construction, or shack-making.

The Shacks' project scope and intention is framed in such a way to directly consider the equipment and tools of our trade—from software applica-

tions for algorithmic computation (scripting) and the production of 3D prints to building codes and performance standards for structural, energy, and waste management systems. As such, the plausibility and constructability of each shack *as architecture* is essential to the strategy of collective technics. Furthermore, a series of requirements for modular construction, off-the-grid Mechanical-Electrical-Plumbing (MEP) systems, Passive House certification and other environmental performance criteria were assumed and investigated. Although the inaugural exercises consider specific constraints, process-work and the resultant artefacts take primacy over the original schema. There is a constant, improvisational negotiation between factual constraints and subversive counterfactual speculations. In this way, flexibility toward the configuration of experiments, improvisation, and attention to the openings created by the experiments forms a new constellation of models and paradigms that emerge from the technics first enacted. The research-creation activity privileges the process of becoming over being, or as Dumouchel (2008, p. 416) states, technical progress "should take into account not only the conceptual design of an object but also its technicality: the interaction of the various physical processes it involves, the evolutionary possibilities they contain, and the limitations they impose."

4.2. PROTOTYPING

The idea that technics is a mode of knowledge production and "immanent to the event in its unfolding" is pursued through the prototyping of the Shacks. Prototyping as architectural ideation, or "design intelligence" (Speaks, 2007), is driven today by an array of computationally-based tools that facilitate imaging, building information management, simulation, and fabrication. The notion of *failing fast* and autonomous exercises in prototyping loosely oriented to the overall conceptual schema, imposed constraints, and/or historical precedent, are all engaged as modes of fabricative knowledge generation. Attentiveness is given to the capacity of the tool to have "an effect, of inflicting some kind of blow on reality" (Harman, 2002) relative to its ability to participate in the object's ontogenesis and reveal alternative realities. Although those early, fantastic computational experiments established a point of entry to the interrogation of our leading design paradigms, it is important not to expect conventional teleological continuity between beginnings and end-results, for that would be to miss the real import of the experiments−their heuristic function, particularly for the research-creators conducting the experiments. Returning to Stiegler's insight, "the human invents himself in the technical by inventing the tool." Thus, the prototyping experiments are forays into shack-making through shack-tool-making.

4.3. SHACK TOOLS AND THE FACTUAL (CONSTRAINTS)

The Shacks prototyping process consists of a cycle of inputs (scripting and modelling) and outputs (machine fabrication and assembly). The crux here is the scripting and modelling process. Researchers utilize Grasshopper as an algorithmic scripting graphical interface, in which case the scripter is actually composing definitions visually on the screen. The defining of these computational operations, or tools, is what manipulates the 3D model in the parallel application Rhino. The production of fabricative knowledge is inherent to this relationship between tool-definitions and virtual modelling, and through these processes, shack-tool-making is further developed to automate structural selection relative to various degrees of deformation, panelisation, and CNC milling of surface patterns derived from imaging and form generation techniques. "Bone," "Tattoo," and "Jig" are the names of the three little shacks that have emerged from the investigation and subsequent cycles of recalibration. The three shacks correspond to three different construction and structural techniques conforming to three degrees of formal deformation (parametrically defined). Furthermore, three different foundation systems (footing, skid, floating) are proposed. Varying degrees of on- and off-the-grid MEP systems are accommodated by a common "Sole/Wet Module" designed in accordance with Passive House building techniques and performance benchmarks. Finally, each shack will be primarily factory-built, flat-packed for delivery, and assembled on-site, in keeping with best practices for modular construction. Below are examples of this unwieldy fabricative process, or as Murphie (2008) states, "leaky radical empiricism."

4.3.1. Scripting experiment for a panelised structural system

The uniqueness of the Bone Shack script lies in its capacity to automatically determine how the form may be divided into five SIP panels for off-site fabrication. The script begins by taking a shell version of the form and splitting it along Cartesian axes, simultaneously detecting and eliminating imperfect members according to structural fitness criteria. The divisions between the panels are generated in a way to ensure a constant 18-inch spacing, even where the panels meet along curving structural planes. This also optimizes the panels for fabrication by reducing the amount of curvature in a single member, therefore minimizing material usage. The joints of the members are kept as orthogonal as possible in order to quicken production and fabrication by avoiding the use of complex connections and numerous custom fittings. Throughout the design process it was necessary to return to the biomorphically designed T-Spline model and adjust it as the overall proportions developed according to various constraints such as cladding systems, highway

transport criteria, and aperture strategies. The script allows the quick generation of iterative structural systems that are progressively more compliant to both conceptual and practical considerations.

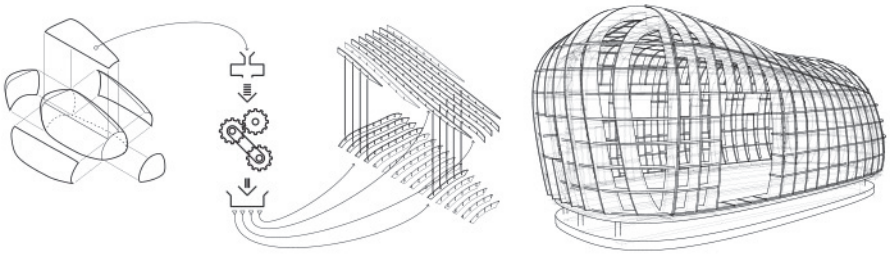

Figure 1. Bone Shack technic diagram for panelised structural system.

4.3.2. Point cloud data processing experiment

The Tattoo Shack is derived from an early imaging and point cloud data (PCD) processing experiment that focused on the interoperability of different data sets (pixel, PCD, geometry) and functions within different software applications (Leios, 3DS Max). Depending upon the function selected and the steps taken in the computation process, the same data sets resulted in radically different geometries and representations of space. Several effects and trajectories were imagined from this experiment. Interestingly, what was initially seen as a failed technic remerged later in the project and revealed itself in the surface CNC milling of the structural CLT panels.

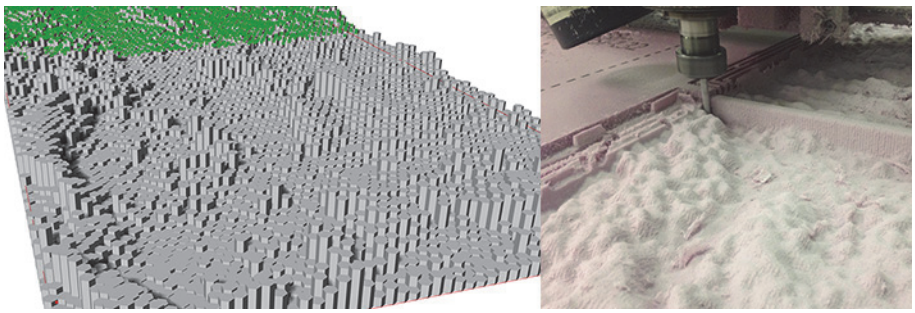

Figure 2. CNC milling Tattoo Shack prototype.

4.3.3 Delaunay triangulation experiment

As a consequence of the imaging-PCD processing experiment and prototyping above, it was found that this milling process for the full-scale fabrication of the Tattoo Shack's walls would be unfeasible. An alternate strategy attempted to translate the PCD as a series of tessellated folding planes, in which case the stock "unfolding" tool in Rhino, commonly used for faceted poly-surfaces, was optimized via a custom Grasshopper script. The script rationalized an intelligible non-uniform distribution of 3D Delaunay triangulation patterns through the 2D identification of lines as "ridges and valleys" (identical to notations found in conventional roof framing plans). Thus, the script optimizes the milling processes for a series of flat materials that are subsequently "folded" back into a constructible 3D envelope.

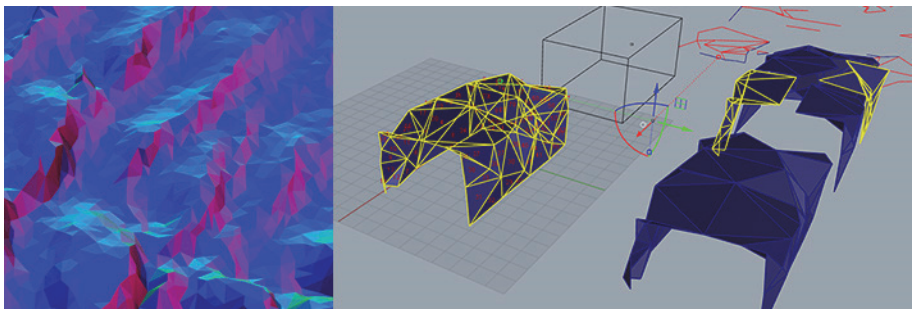

Figure 3. "Folded" Tattoo Shack script and virtual model

5. Conclusion

A series of fantastic (counterfactual) and factual material, formal, narrative, historical, programmatic, and performance technics were devised originating from concerns in the biomorphic, parametric, and sustainable design paradigms. These "what if? " scenarios were a collective, albeit discontinuous, attempt to propose unthinkable alternative realities through non-conceptual means "made possible by the refusal – a technically orchestrated refusal – of the world to be owned, by legal deed, by concept, or by experimental design" (Murphie, 2008, p. 2). The collective technics established privileges fabricative knowledge and artefact generation as a mode of thought over and above linear abstract schema based design processes.

The fabrication process took several directions with various successes and failures, all of which have continued to inform the project and articulation of the proposition. The collaborative and individual technics subvert the original abstract schema at each cycle of the prototyping process. Emphasis was placed upon not prefiguring or *preterritorialising* the problematic in or-

der to allow the project to emerge from the distinct, technique- and tool-oriented explorations. The organizing principle emerged from the reflection upon the various investigations. The lessons learned from several of the investigations reasserted themselves in transformative ways without being intended or anticipated beforehand. The reciprocal relationship between tools and tool-maker is complex and a two-way street: we make tools and tools make us. Invention is an ontogenetic process of which we participate but cannot simply conceptualize, prescribe, or technically mediate. Designers (as "the helpmates of emergence") must rigorously choreograph the techniques and technologically generative devices of our trade and, most importantly, develop the technics to be attentive to the unthinkable possibilities (to which) they open. Although understanding the "deep opacity of our technics" is largely a reflective endeavour, it is through the insight granted by fabricative knowledge that our decision-making will gain intelligibility and the nature and consequences of the two-way street will be brought to light.

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