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Hybrid Models of Sustainability

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Abstract
This paper presents a design strategy that links environmental energies to building form with an investigation of vernacular habitation patterns and craft. Through hybrid conceptual models that reflect the "graining" of the built environment, an ordering system is revealed that is not constrained by the limitation of imagining the project, first and foremost, as a building. The designer is asked to imagine a fabrication partially authored by the site; and in so doing, creates a proposal that is extremely site specific and therefore inherently sustainable.

The creation of this hybrid model forces the designer to engage the problem by making things with his or her hands and bodies.

Beginning with orthographic projections of the hybrid model, architectural drawings are produced that encode programmatic relationships and an architecture emerges from these sensibilities that aspires to be both environmentally sensitive while maintaining cultural authenticity.

Keywords: Sustainability, Architecture, Urban Design, Vernacular Habitation Patterns.

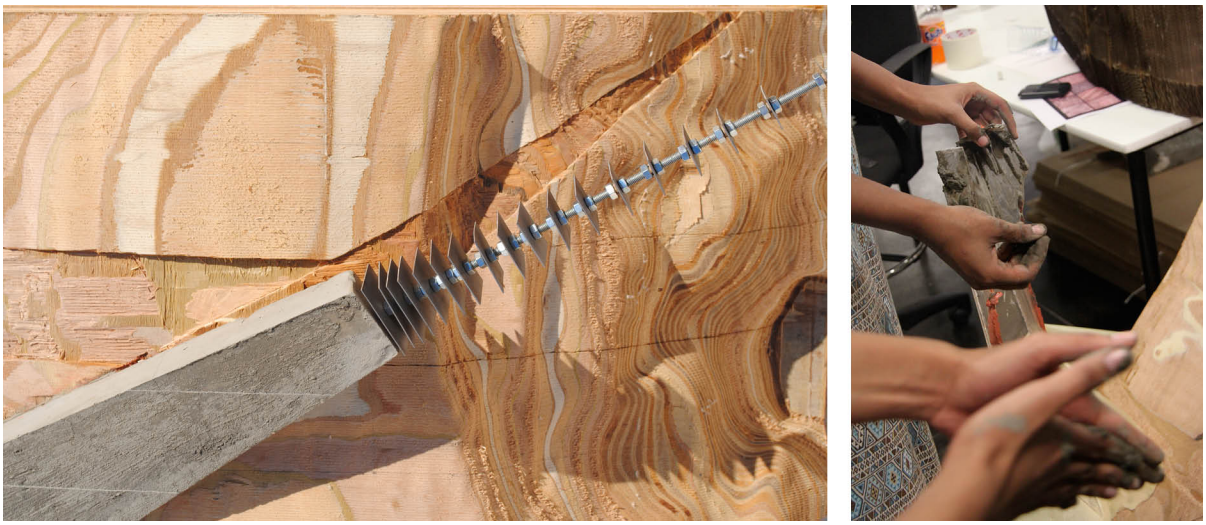

Figure 1. Hybrid Conceptual Model, K. El Jack

1. Introduction

The design process presented here has been developed over more than a decade of teaching architectural design studio and building technology seminars in which students are challenged to investigate building design through conceptual "hybrid" models. The models are hybrid in nature because while they are roughly the size and scale of the assigned building program and placed within a scaled model of the site, they are not meant to represent larger architectonic assemblies. That is, they are meant to exist as autonomous 1:1 structures.

Figure 2. Hybrid Conceptual Models, C. West, F. Hussain, T. Joseph/S. Hueske

These fabrications reveal the physical ordering system of the site while allowing programmatic hierarchies to emerge that can inform the development of a building design. Rather than approaching the creation of architecture as a linear process, the simultaneous development of conceptual ideas while exploring full-scale assemblies forces a cyclical design thinking that reconciles environmental energies, physical site forces, vernacular craft, and traditional habitation patterns concurrently.

The resulting construct demonstrates the ability to engage, analyze, organize, and manipulate diverse bodies of knowledge. The work is self-critical in that it subverts prevailing belief systems regarding subject-object, building-landscape, concept-detail, and nature-culture.

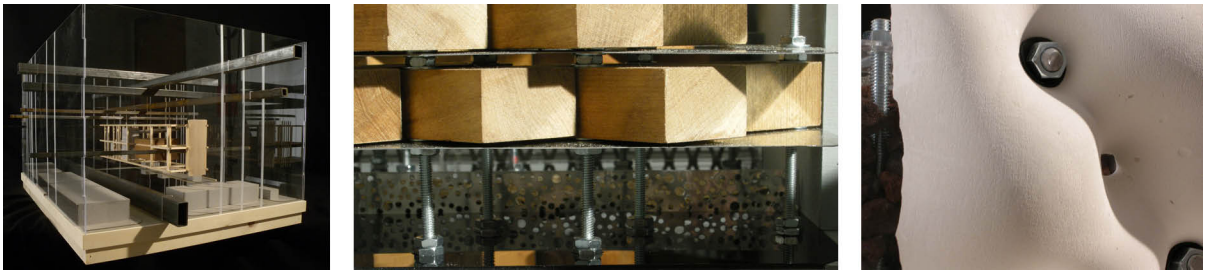

Figure 3. Hybrid Conceptual Models, B. Blackmon/A. Buchanan, G. Camuso/C. Fowler, R.Mott/L. Straus

2. Methodology

"Hybrid" models are created based loosely on the Light-Space Modulator studies by Laszlo Maholy-Nagy at the Bauhaus (1922-1930). Variations on such light-shadow studies have proven fruitful to beginning design experiences.[1] Unlike the Maholy-Nagy piece, which is void of program and site context, this model begins to blur the subject-object relationship typical of object buildings sitting within the landscape. The designer reveals a construction informed by the ordering systems of the site and the environmental forces acting upon it. These systems are unearthed as if by an archeologist carefully brushing away the dirt of an excavation site. [2]

Figure 4. Light Space Modulator, 1922 – 1930,
Laszlo Moholy-Nagy

The overlay of ordering systems: environmental energies, the graining of the landscape, or the fabric of an urban context is reflected in a model void of the expectations that it perform as a building. This level of abstraction supports a more intuitive approach to sustainability. For example, rather than designing south-facing windows and doors that frame views and allow for the modulation of the sun's energy, the seasonal and diurnal patterns of light and shadow carve voids into the construct allowing a distinct ordering system to emerge.

In architectural terms, we may refer to this as site specificity, the site forces become an armature upon which the fabrication relies for connection to the ground, the sky, the landscape, the horizon, to our time, and our place.

The process also forces the designer to create with his or her hands and bodies. Unlike an architectural model in which foam core and chipboard are called upon to represent building materials and glue may be an acceptable means of connection, the hybrid model assumes no representational abstraction. Connections are understood and evaluated as the physical joining of two disparate items. The metal washer that comes into contact with steel may be selected differently than the rubber-gasket used to connect acrylic or glass. These selections are made with great intention.

Craft is explored at a large scale; one that allows for the muscular memory of making that moves beyond an intellectual exercise alone. David Trubridge states of craft: "It is knowledge, but not rational knowledge. It is knowledge that resides in the body…It is stored in muscles and nerves, not the brain." [3]

Through welding metal, casting concrete, working with carpentry tools, laser cutters, or CNC routers, an objet d'art is created that stands autonomously to reveal and reconcile site forces such as sun direction, prevailing winds, watershed, bird migration, ecological patterns, and, of course, zoning/contextual constraints.

These techniques are also carefully chosen. The hybrid model incorporates regional traditions of craft, building, and settlement patterns in a ways that celebrate their value in creating authenticity while being reinterpreted to convey a solution that both acknowledges the rich past of a particular place while articulating a restructured sense of place that is relevant to our time.

3. Development

The hybrid model establishes sensibilities for site strategy, form, programmatic configuration, building systems, and materiality. The model is sliced into orthographic views that serve as the underlay for conventional architectural modes of representation: plans, sections, and elevations. Programmatic hierarchies are refined but already exist, having been drawn from the network of environmental and cultural form determinants. The resulting built form or urban design plan has great specificity with relation to the intended user group and suggests an empowerment of that user.

Circulation and egress are also derived from the conceptual model in that hierarchies begin to emerge that can be interpreted as place space/path space and servant space/served space. The structural grid, having been derived from site forces, responds efficiently and appropriately to topography, wind, views, loads, and even site access for materials delivery. Mechanical and electrical systems are sized efficiently and complementary to the passive strategies that the hybrid model implies such as solar orientation, thermal mass, and prevailing winds/ventilation.

4. Results

Project: Multi-Family Replacement Housing, Moore, Oklahoma, USA

This project reveals an ordering system that reconciles solar orientation, climate patterns, urban context, and the path of a devastating 2013 tornado, through a distinctly agrarian vernacular. The tornado path is articulated as a scar upon the landscape that has been sutured to reinforce connections to a community center and park. The project speaks to larger conceptual ideas of community healing and resiliency.

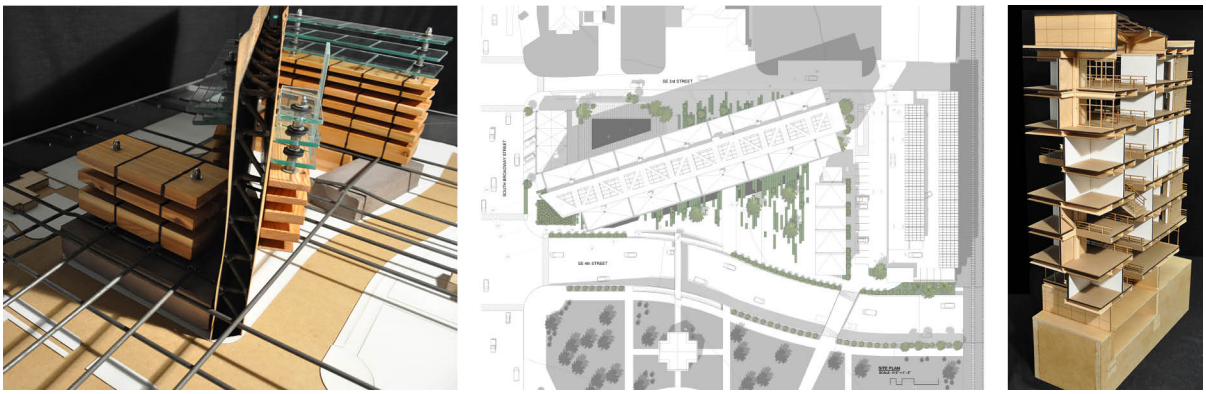

Figure 5. Hybrid Conceptual Model (concrete, steel, glass, wood) and Project, A. Forney/N. Stinebrook

Project: Cloud Seeding Research Center, Al Ain, United Arab Emirates
In designing a housing and a research center for cloud seeding in the United Arab Emirates, designers from the Middle East constructed hybrid models to explore both the nuanced environmental energies of the site as form determinants while looking to vernacular examples of craft and shelter. The vernacular techniques examined have allowed ancient desert dwellers to exist in this harsh environment for tens of thousands of years and include courtyard house typologies, arish construction, Bedouin weaving, mashrabiya screens, dhow boat-making, sand baffles, wind towers, qanat tunnels, and falaj channels to name a few.


Figure 6. Research Center Site, Al Ain, United Arab Emirates

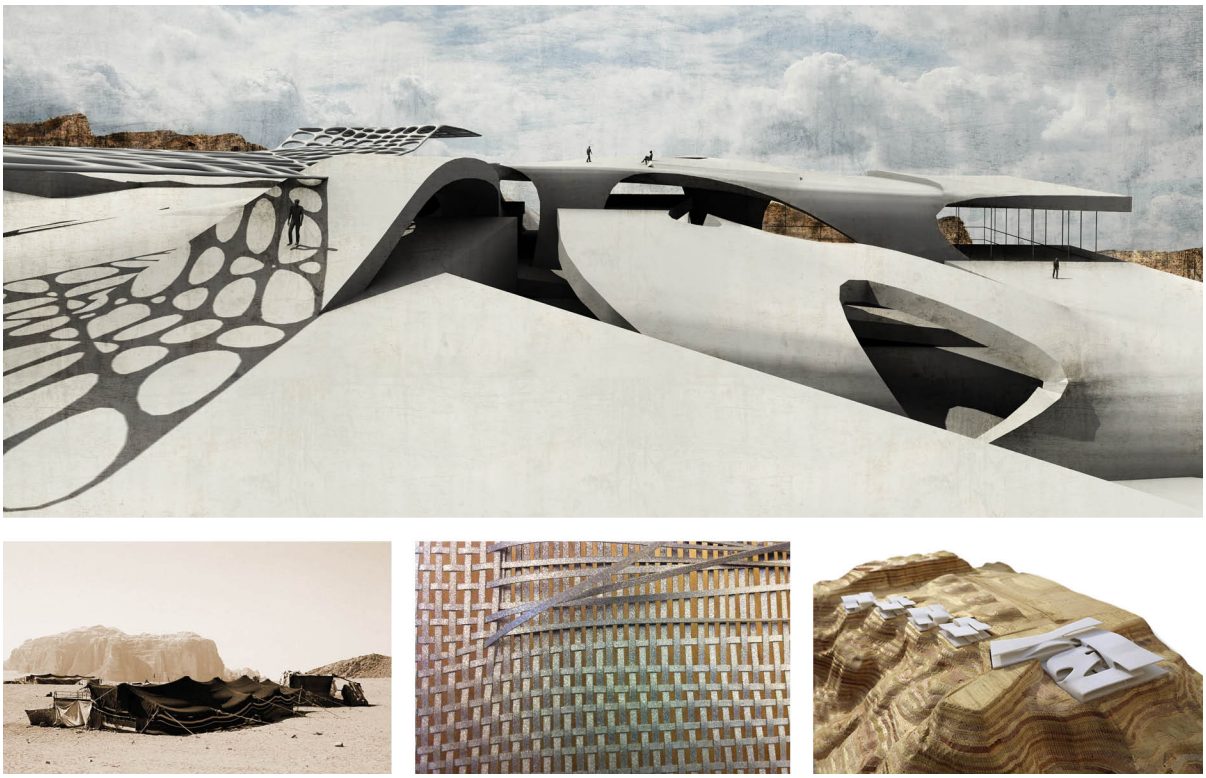
Figure 7. Hybrid Conceptual Models and Project based on Bedouin weaving, S. Al Qasimi

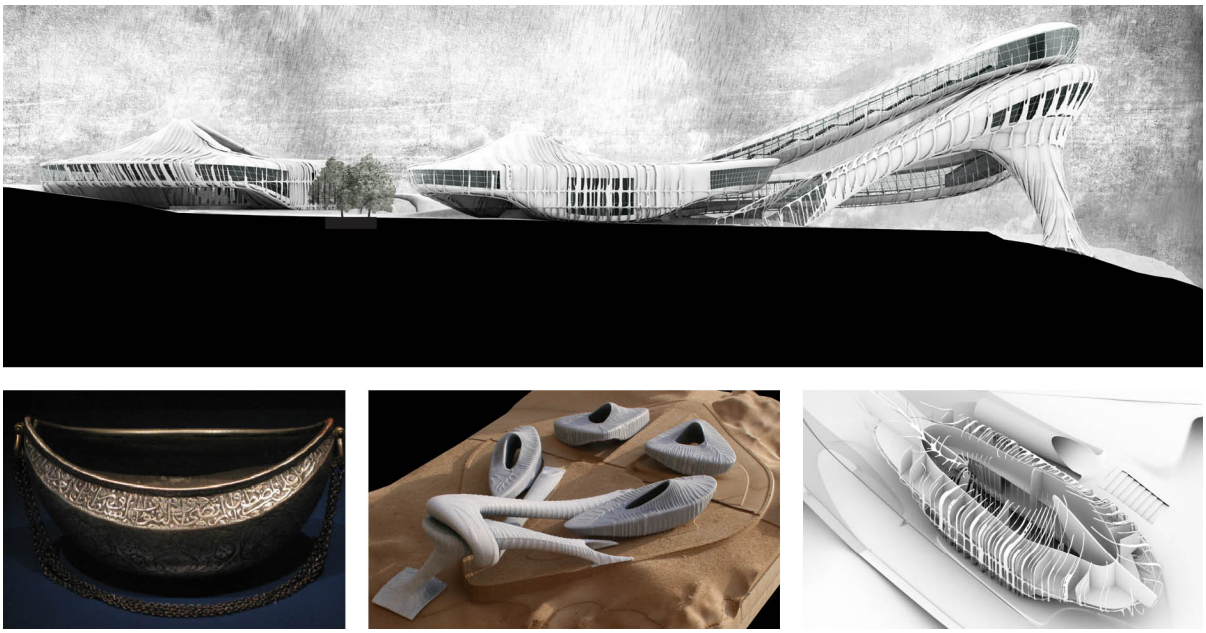

Figure 8. Hybrid Conceptual Models and Project based on beggar's bowl, H. Hatem

5. Conclusions

The visible context that a site provides is only one ordering system upon which the designer must rely upon in order to reveal solutions that reconcile program and climate while creating a sense of place that provides cultural significance.

These hybrid models provide an alternative design process, one that is cyclical and privileges neither broad conceptual ideas nor details at the scale of materiality. Rather, the fabrication provides an exercise that is read both as parti and full-scale mock-up.

The complex network of physical, environmental, and cultural forces at work are evidenced in an apparatus that embodies and synthesizes the framework for an architecture of environmental sensitivity and cultural authenticity.

6. References

1. Neiman, Bennett, Beginning Design Studio: An Analog-Digital Language of Vision, A Beginner's Mind, proceedings, 21st National Conference on the Beginning Design Student, University of Texas at San Antonio, 2005.

2. Of course this excavation is not free of the author's subjectivity. As in the Getty Villa renovation by Machado and Silvetti in which the excavation of meaning is more metaphorical and also the Vitra Fire Station by Zaha Hadid where the surrounding ordering system is extended and built upon; the architect modulates the contextual priorities or at the very least privileges what is to be brought forward.

3. Trubridge, David, The moral of craft, Cumulus Working Papers, Aalto University School of art and Design, 2010.