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dwelling engages dweller engages dwelling

by

David DaPonte

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REQUIREMENTS FOR THE DEGREE

Master of Architecture

APPROVED, THESIS COMMITTEE:

Gordon Wittenberg, Thesis Director
Professor
Rice University School of Architecture

David Brown, Thesis Reader
Assistant Professor
Rice University School of Architecture

Luke Bulman, Thesis Reader
Visiting Critic
Rice University School of Architecture

Doug Oliver, Thesis Reader
Visiting Critic
Rice University School of Architecture

Kimberly Shoemaker, Thesis Reader
Visiting Critic
Rice University School of Architecture

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Abstract
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David DaPonte

There is an inherent relationship between the house and the movement of the human body. We act and react against it. We move around, slide past its’ walls, stroll across the floor; are connected visually to the landscape through apertures and are sheltered by the roof. Our engagement is anything but exciting.

How could the house allow or even promote a physical engagement with the user? Could material help provide these actions. This thesis is an investigation into blurring the boundary between the house, furniture and the engagement of the human body; a dance between the three.
Acknowledgments

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A Few Experiments

My thesis project really began during my pre-thesis semester when I took an independent study of furniture design that I intended to evolve into, or at least parallel, my thesis project. The intimate relationship between the furniture object and the human body; my criticism, as well as, admiration for many furniture designs; and the opportunity to work hands-on with full scale tests, made furniture an attractive subject, to me. My initial analysis had four main topical areas: The first was flexibility—is furniture adjustable and moveable, or is it permanently fixed, and why? The second was aesthetics—it must be an interesting design. Next was comfort—how well does the object fit the body and encourage proper body posture? And last was engagement—what is the level of engagement required or promoted between the user and the object?

I began my research by looking at furniture from the past and present. The works of Alvar Aalto, Marcel Breuer, Le Corbusier, Gerrit Rietveld, Charles and Ray Eames, Finn Juhl, Isamu Noguchi, Frank O. Gehry and
Gaetano Pesce are a few of the designers whose work I have admired and were influential in my thoughts. Furniture, or objects before they are given generic names based upon their use and function, is necessary, useful and desirable equipment. They are moveable articles used in preparing an area for occupancy and use. Standard types are: the chair, anything we can sit on; the table, anything large with a flat top we can sit at; the cabinet, anything we can store other named objects in; the lamp, anything that is illuminating, and so on. There are also subcategories such as the stool, coffee table, end table, daybed,
Relationships

The Stump relates to the body differently than the Bent Chair. In its relationship to the human body it is the lesser. It is a simple object with its sole purpose - to support a seated figure. It is flexible, in terms of portability. It can support the S, M, L, XL body size fairly comfortably, it can swivel, turn, and recline to the desired location. (Not up, it is a 130lb's) It is at the user's whim. The Bent Chair however is closer to an equal. It demands attention. It is not as easily moved from location to location, (though it only weighs about 30lb's). It is however flexible in terms of comfort. It flexes and supports where needed. It supports the lower back, doesn't cut into the back of the knee, helps prevent the hips from rotating forward and is desk lamp, dining chair, lounge chair etc.

To narrow the field of research, I chose the chair, which can be better defined as an object that will support a person in a seated position. The idea of creating movable, transformable and adaptable objects has stirred my curiosity for some time. I read that the body's muscles require periods of both movement and relaxation. After about three minutes the muscles begin to fatigue under constant pressure. Then the body almost instinctively moves and readjusts itself, releasing some muscles while tensioning others. [Next time you are sitting, lying down, or standing, pay attention to the time it takes before you have to move or change positions]. Another interesting observation is that form-fitting chairs are more comfortable at the onset, but, after longer periods of time, restrict movement and are often uncomfortable. On the other hand, simple chairs, with basic designs and functions, may not be as soft, but are often more comfortable in longer durations. Another problem with form fitting chairs is that they are often
tall enough to support the lower back. However it cannot just be sat on. There is more to the human engagement with the chair than just merely sitting, and the material chosen allowed for these qualities.

The Bent Chair is constructed of 10 layers of 1/16" Birch aircraft plywood, laminated together with epoxy resin. The material allows for the flex. Giving more at the initial bend and slowly decreasing the amount of bend with added weight. This was necessary to allow for a wider range of people of multiple heights to feel comfortable sitting in the chair. The center of the lumbar in the lower back doesn't vary much for heights, but it varies enough that when it supports in the wrong location it can be very uncomfortable. With the increase in height there is an increase in weight, particularly in the upper body. This forces the chair to flex a bit more, naturally adjusting the lumbar support.

designed to fit a specific body shape and size, and for figures outside of that range, the chair's form often won't correctly support the body. With these concepts in mind, I began to design the simplest type of chair, the seat, and I produced the "Stump" (see images). In my next project, I took the seat requirement, one step further and played with material boundaries-this experimentation with materials was the initiation of my final thesis project idea. Here I wanted a flexible seat, that looked flimsy, yet was strong enough to sit on, so I decided to impregnate felt with resin (see images). I called
The Green chair was in interesting process. I overestimated the strength of resin. I knew it was brittle, but had hoped the felt as a substructure would provide a little help in that area. It did a little but not nearly enough. And the chair broke. It however was not failure. Many ideas came to mind for future project due to this test.

Initially I hoped to extend this pre-thesis research and reapply the ideas to the house and its relationship to the body-or better stated, the body and its relationship to the house. This concept highlights a sort of blurring that occurs when one stresses the primacy of the house over the body in furniture design.
Study models for the Bent Chair.
The following images are short descriptions of the process for creating the Bent Chair. The first initial process, after arriving at a design, was to figure the curves. For the back of the chair I used a flex curve along my back. Transferred the curve to a drawing and began constructing a jig. A few tests were done before the final jig was created. The chair is constructed of 10 layers of birch aircraft plywood. Each layer, 1/16" thick, was steamed, bent into shape, dried, then laminated with epoxy resin to the next layer. The entire process took a little over 6 weeks with test, failures, an enormous learning curve, and a great deal of patience.
Decoding the House

Furniture experimentation was, in fact, just the forward to my thesis; it encouraged me to push the concept of material exploration, body movement, surface, flexibility, mobility and, most importantly, engagement with the user. This ideal house would tend more toward furniture itself, assume a more active role in the lifestyle of the user, and leave behind its traditional backdrop status, particularly within the suburban house.

The house and all its parts are labeled, as it has been for centuries. Entry, Dining Room, Kitchen, Powder Room, Master Bedroom, Master Bathroom, Hall, etc. are all recognizable labels for distinct space within the home. They define what the space should be used for and further satisfy the chief functions of the house: sheltering, eating, sleeping, recreating and cleansing. It is simple, and would invigorate the user's typical interaction with the home-moving through thresholds, from one space to the next; hanging art; applying a fresh coat of paint; or shifting the furniture arrangement for an occasional change in scenery.
In thinking about a house that is primarily about engagement, my first impulse was to erase the labels within the house and create a clean slate with no, or as few as possible, stereotypes. I looked at many standard home designs, and thought about the suburban home condition. For this investigation, I decided to take an average 2,000 s.f. home on a standard 50’ x 100’ lot, erase all the labels, and replace them with my own terms of action, engagement, movement, etc. I thought of children, and what they do in spaces before they are taught to follow rules. A child’s terms to describe actions within spaces might be more like: run, jump, swing, yell, wash, hide etc. These are terms that happen both within and outside of the house, but do not necessarily define a particular space. Because of this blurred boundary, I decided to consider the “outside” as part of the house as well.

After loading this standard suburban tract home with verbs and adjectives, I erased the house and examined just the terms. Some terms with similar functions or actions seemed to localize and create interesting patterns; I viewed this
play
lie
jump
run
rest
listen
pivot
view
eat

argue
care
sleep
dream
eat
love
talk
change

love
talk
care

rest
think
jump
sweep

hide

view
disguise
celebrate
rest
feel

shift
move

walk
conceal

support
share

celebrate
gather
store

relax
talk

display

great
read

gather
infuse
move

hide
open
close

events | AFTER WORK movement

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system as driven by a sort of underlying gravitational pull where eddies of multiple functions might come together and begin to interrelate to the house.

Then I interviewed a few of my friends for a description of what they do in the morning, afternoon, after work, and in the evening. I asked them to be very descriptive about events, and I then mapped their path with the terms I had previously lain out. The initial study model of this led me to rethink the idea of furniture. The model presented some interesting situations with material nodes and prompted me to think back to the idea of blurring the boundary between the house and furniture.
Another Chair??

Next I performed a similar analysis with furniture and decoded its terms, thinking of the furniture as simple objects with no particular use associated with their form. In a sense, I was trying to think of furniture as a child would before he or she saw anyone use that particular object. The bed, as we call it, could become a trampoline or a ship surrounded by water, or a stair could change into a steep mountain, a waterfall, or, perhaps, a treasure box for toys and books. By decoding furniture in this way, I could then think of the house and its structure in a non-prescriptive way.

I did a quick mock up of a “soft wall,”-a design that could be a bed, a go-between, a chair, a light, a shade, or…whatever. The idea was to create a surface that could be one thing until the user engages with it, at which point it could become something else. This surface could be a dividing wall, where, when someone acts upon it on one side, there would be a reaction on the other side which might, in turn, engage someone or something else. Here architecture begins to become more than merely a structure or backdrop to the activity within it.
The New Polyurethane House

Taking these ideas, I acted upon the site, shifting terms and squeezing them together to form a core area, or a collection of nodes, that could act and react with other adjacent activities. I began to experiment with a second set of study models reacting again to the terms laid out, but this time thinking more about movement, and the flow of a surface. Instead of flat surfaces, I modeled twisting, turning, and overlapping surfaces that may start horizontal, turn vertical then flip back to form another horizontal surface. I analyzed the spaces I created and, simultaneously thought of material possibilities.

Although I had originally thought of a variety of materials that could create interesting possibilities and promote an engagement with the user within the house, I thought it best to focus in on one and push it to its extreme possibilities. This notion of flexible spaces, made polyurethane a fascinating research material. Polyurethane comes in a variety of durometers, colors, densities, and flexibilities. I performed
a variety of tests and experiments with the material, testing its thickness in relation to its flexibility, and thought of how the material could be used. In particular, I looked at the interesting shapes and situations forming in the study models and then tried to figure out how a polyurethane system could enhance that condition. For instance, the material is very flexible. It could be impregnated with fiberglass to keep the material thin yet strong (I found that the thick fiberglass mesh had a great look, especially when light falls through. Fiberglass cloth works well, also, but it doesn't increase the rigid-
ity of the polyurethane and makes it translucent). Another means of support could be using grommets, as one would for a canvas tarp, or perhaps embedding steel cables that could be stretched across a frame, consequently creating a transparent surface. Another test I performed was to pour the polyurethane in a shape similar to the waffle slab used for concrete floors; this proved successful. Among polyurethane's many advantages are: its strength and its highly scratch, corrosion, and tear resistant surface. It must, however, work in conjunction with other materials. While there are instances
where the material could be self-supporting, over great distances or heights, an additional structural system will need to be used. Another great advantage of the materials is that it is primarily used for mold making, so it can be shaped to any imagined form. For instance it could come down a wall and turn into a sink or a tub, wrap over the floor (a new non-slip surface), or fold over itself a few times to create a seat. By varying the thickness, and using other materials in conjunction, the rigidity and strength can be fairly well predicted, and its potential for design is limitless.
Many of the images in the previous pages as well as the following pages show a few possible examples of how this material could be used. The large flip that happens in one of the main areas could be used as a means of egress to get to the second level. It is a shelter within another shelter. Steel cables were designed to support this curve. In doing so the cables also provide an additional, almost invisible, walking surface. The material is used as both an interior space creator as well as an exterior material. The washing and cleaning areas are covered almost floor to ceiling with the material. At times the poly-
urethane is a wall surface that turns to become a sink, which soon becomes a seating surface and ultimately transitions to become the floor.

This investigation explored just a few of the possible situations that polyurethane could be used. And has only begun to explore a new way of thinking and programming the house based upon the actions of the human body and its ability to engage with the house itself as opposed to the traditional labeling manner.
Bibliography


Website: www.perryhomes.com/communities/houston/