Towards an Affective Architecture: The Use of Constructs to Develop Design Concepts

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INTRODUCTION

The traditional studio working method of designing via small-scale models and 2-D drawings limits students' development of their material sensibility. The development of a material sensibility leads to a greater understanding of how the sensory qualities of materials and the perception of atmospheric effects combine to create an affective architecture. Through the exploration of full-scale investigations of materials and atmospheric effects, students can improve their understanding and appreciation of a material's qualities and sensory affects.

Full-scale design exercises also encourage an alternative design process that integrates production techniques and strategies into the creative process while working with actual materials rather than modeling materials.[1] Working on full-scale design exercises extends the exploration of design concepts beyond the schematic level of renderings, drawings, etc. and introduces the issues of materiality, fabrication, and construction assembly into the design process. Installations and prototyping are two full-scale design exercises that effectively blend conceptual thinking with the act of building into a synthetic design process. This paper demonstrates how constructs[2] can be employed as a heuristic strategy to explicate a design studio agenda.

The work presented in this paper is from two separate upper division studios[3] with similar agendas: towards an affective[4] architecture. This agenda is goal oriented – concerned with product rather than process[5] – employing form, space, movement, material and atmospheric effects, and events to define an environment's mood or atmosphere, and how it appeals to the senses. An affective architecture prioritizes the spatial experience and the sensations engendered by an architectural environment;[6] attempting to create environments that are charged and active spaces in which the occupants (spectators, inhabitants, etc) are not passive recipients of information but are actively contributing to the production of affects. The dynamic relationship between the space and occupant in an affective environment establishes a responsive feedback loop of percepts – situations or conditions that influence a particular perception of material qualities – and affects – subsequent emotional responses.[7]

In each studio, students completed an atmospheric[8] installation that was affective and triggered a sensational response. Students were encouraged through pedagogical instructions to be cognizant of and purposeful in the types of environments that they were proposing. Initial design proposals (concept design) focused on visualizing the installation's mood or atmosphere and suggesting how the space might be experienced. Full-scale prototyping investigations of material and atmospheric effects enabled students to test the affective qualities of their designs with their own senses. By examining the tactile qualities of materials – smooth, soft, rough, flexible, warm, hard, cool – and the immaterial qualities of atmospheric effects – shade, light, color, reflection, sound – students began to develop a material sensibility.[9] Through full-scale investigations, an ability to properly employ material effects as design mechanisms was cultivated. The lessons learned from prototyping investigations enabled students to properly adjust their designs and realize the intended (visualized) mood of the installation space. The exercise of visualization, construction, and experiencing the completed project's spatial atmosphere was instrumental in elucidating the intangible concepts of affective environments.

INVESTIGATIONS INTO MATERIAL AND ATMOSPHERIC EFFECTS

A current interest in architectural materiality within contemporary design practices and academia is questioning the traditional working scale at which the design process begins, and the timing in which production techniques and strategies are considered. While studies on urban form, program, and composition can be reduced in scale without compromising their results, studies on materiality cannot and need to be investigated at or near full-scale in order to properly experience a material's qualities and sensory affects.

In recent years, there has been an influx of material investigations promoting design studies as a form of research.[10] In both research-driven practices and academia, production techniques and strategies have become an integral part in the investigations of material or systemic performance, and in the production of material and atmospheric effects. In academia, many courses that conduct material research take the form of a seminar or workshop, in which the research (research through making) is linked to a particular tool or technique from the outset. In these investigations, the design process embraces a tool's manufacturing specifications as the agent of design innovation in a bottom-up approach to generate formal experimentation.[11] Proportions, patterning, ornamentation, modularity, tectonics, and aesthetics are all intertwined with the fabrication technologies and construction methods. These material investigations have been effective in integrating materiality, fabrication, and construction assembly into the conceptual design

Figure 1: Legato Installation, view from interior

process. However, this material research is typically disassociated from a particular project and designed without consideration of or in response to a specific program, site, or event.

A design as research pedagogy can be more effective in promoting the use of constructs to influence the development of a design concept if it was employed in the context of a design studio and linked with a particular project. In this new context, material investigations instead operate in a supporting role and are tied to the goals of a specific project. The tool, technique, and method are selected in support of a concept; this approach avoids producing a product whose qualities or properties are limited or predetermined by a preselected tool or technique. By incorporating full-scale investigations (prototyping) of material and atmospheric effects into the studio design process, the production techniques and strategies become more varied between projects inasmuch as their selection of a tool, technique, or method is concept based towards achieving a desired affect.

SPATIAL INSTALLATIONS IN THE DESIGN STUDIO

Design and construction of small or temporary projects, such as spatial installations and pavilions, have been an opportunity for professional architects and artists to realize experimental concepts.[12] These types of projects are valuable in two ways: they produce a complete spatial experience of an architectural environment and they develop a technical expertise specific to an individual design methodology and agenda. Their value is further increased when the design research extends over a series of projects and the knowledge gained from one can subsequently be applied to the next. A spatial installation is an effective studio exercise, in type and size, for developing the students' understanding of how the percepts and affects of materials can be employed as design tools to create an affective architecture, and for integrating issues of materiality, fabrication, and construction assembly into the design process. Installations integrate constructs into the design process during the concept development phase via prototyping of material and atmospheric effects, and through the project's final fabrication and assembly. Prototypes and installations differ in that one is a fragment or part and the other an entire project. And unlike the seminar based material research projects previously discussed, studio installation projects have a specific program, site, and event. The potential extent of the studio installation project is relative to the amount of time allotted and resources available. Size does matter, in that the project size needs to be small enough to ensure a timely completion but still large enough to produce the desired spatial or experiential affects.

While an installation project could be the sole focus of a design studio, it can also be used as a brief instructional exercise to explicate a conceptual agenda. Last year I employed the latter model within two upper-division option studios. Although slightly different in their execution, the installation projects followed a similar path of development. Students developed design proposals for a site-specific installation project that attempted to enhance or shape the occupants' experience of a particular place or affiliated event through spatial organization, material sensations, and atmospheric effects. Prototyping investigations completed at the early stages of the design process yielded an invaluable opportunity for students to test with their own senses the affective qualities of their designs and make necessary design adjustments prior to the final fabrication phase. Consideration of fabrication methods and means of assembly were an equal part of the design process and project selection. After working initially on design concepts in small groups, one design proposal was selected as a collective studio for further development and construction. Fabrication and assembly introduced construction related concerns such as connections, tolerance, sequencing, and attachment. In promoting a horizontal design structure within the studio, the project fostered a collaborative working environment[13] and instilled a vested interest in the project's success in each student.

These installation projects, with embedded prototype investigations, promoted the consideration and integration of material qualities and construction techniques from concept design through fabrication; the extension of these issues through all phases enabled the students' design process to become more synthetic and sympathetic to the realities of construction.

LEGATO – AN INTERIOR INSTALLATION

An interior installation was used as an introductory exercise[14] to promote the studio's agenda of creating affective environments. The *Legato* installation occupied a room nested within a studio classroom; a semi-public space connected to five other studios via a roof deck but without direct public access. This unique space has a square plan with three interior walls containing two entry doors on adjacent walls and one north facing exterior full height window wall that opens onto a roof deck. The room has a tile floor, concrete ceiling, and asbestos filled walls that cannot be punctured. The 400 square foot installation created three distinct spatial zones, two studio critique areas and a private space, each with its own atmospheric identity. These atmospheric zones served as event spaces for class activities, inter-studio gatherings, and after-hour events. The installation's overall form and materials were strategically designed to buffer the room's soft uniform daylighting in order to create varying light qualities within the two main critique spaces.

The completed *Legato* installation engaged the senses in an affective exchange through the employment of form, texture, color, material and lighting. Vibrant lighting, surface texture, and the formal manipulation of a single surface combined to give the installation a dynamic atmosphere. A quilted white textile membrane draped below the underside of the surface structure absorbed the daylight and emitted a translucent glow, while simultaneously concealing the plywood lattice that lies above it. Equal level lighting between inside and outside dissolved the window wall and extended the room onto the exterior patio. At night, the soft and subtle atmospheres were abandoned as artificial lighting illuminated the room, creating a harsh and edgy environment. Direct artificial light revealed the surface structure by casting harsh and intricate shadows onto the textile membrane. Vibrant colors were absorbed by the membrane and filtered onto the walls and floors below. The reflection of the illuminated structure onto the adjacent glass surface of the window wall amplified the nighttime atmospheric effects and isolated the room from the exterior context.

The five-week design to completion process was loosely structured into three phases: case study research, design and prototyping, and fabrication and assembly. Each phase had specific learning objectives. Case study research provided an understanding of how a material's qualities and sensory affects can be employed to produce a sensuous

Figure 2: Legato Installation, night view from exterior

atmosphere. Design and prototyping cultivated an ability to develop visualized concepts into physical effects. Resolving issues of fabrication and assembly enabled the integration of production techniques and strategies into the creative process.

In the first phase – case study research – students critically examined recent architectural installations completed at MoMA/P.S.1, SCI-Arc, and the Serpentine Gallery. Research was focused on understanding the qualitative aspects of the installations, the differences in the design strategies, and the fabrication techniques used to create the intended atmospheric effects. In each of the installations, architects appropriated the traits or qualities unique to the material used in order to create an atmospheric environment. Through comparison of multiple installations, students were able to recognize common threads, lineages, and design strategies. The information on materials and design techniques gathered during this research phase formed the conceptual basis of the students' installation design proposals.

In the second phase – design and prototyping – students worked in pairs to produce a design proposal via presentation boards, a full-scale prototype of one fragment of the installation, and a time/cost estimate for the completion of the installation. The design brief required the students to initially identify the event(s) or programmatic activities for the proposed space, and then develop an architectural proposal – affective environment – that defined the spatial experience. During this phase, students tested their design concepts via full-scale prototypes. Oftentimes the prototype did not result in the de-

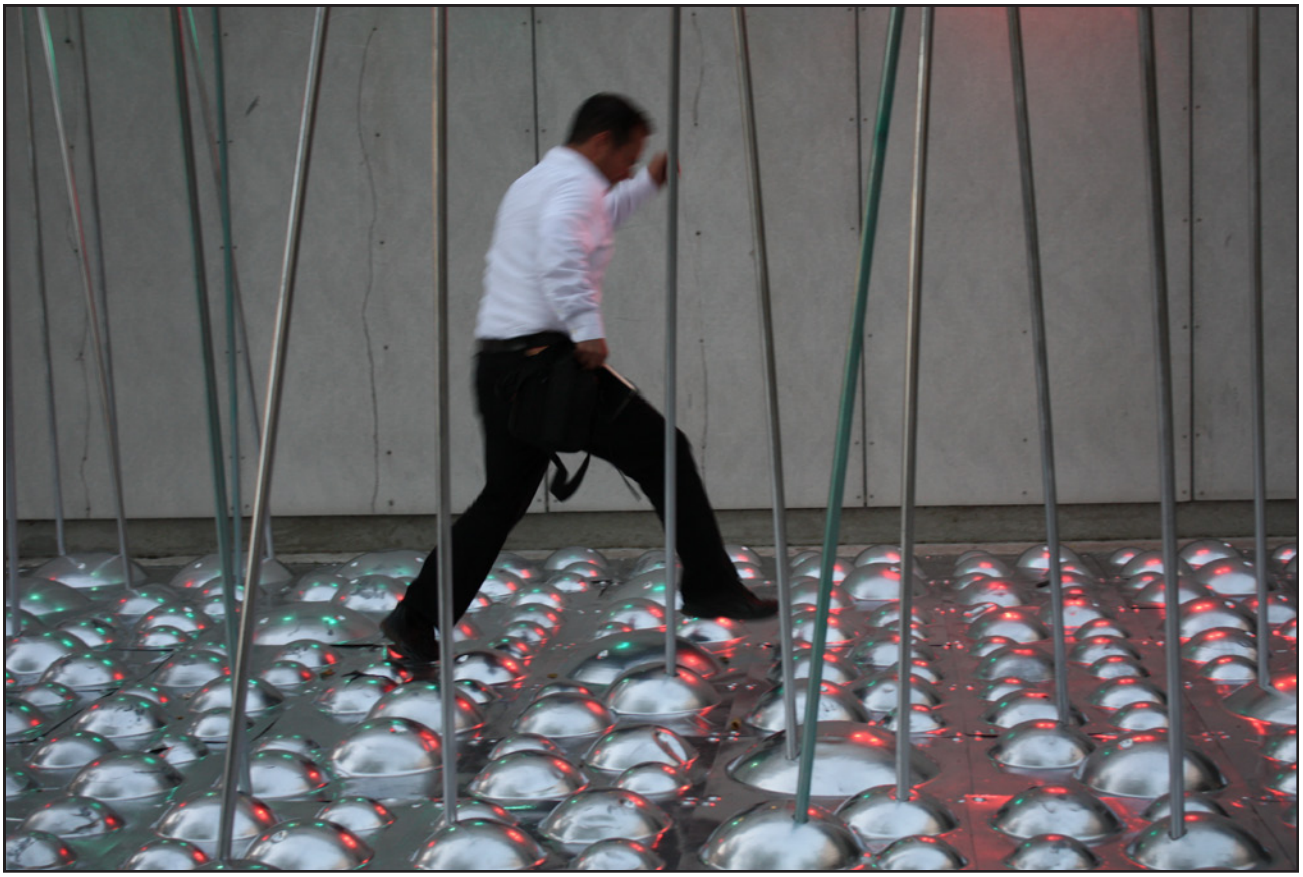

Figure 3: Pop! Installation

sired material or atmospheric effects and several design iterations (and prototypes) were required to produce it. For example, the combination of lighting and material attributes did not always produce the intended sensations or atmospheric moods. The prototype exercise emphasized the difficulty in translating a virtual image into a physical experience, and the importance of full-scale testing early in the design process to allow for adjustments to the design.[15] The collective studio reviewed the individual design proposals and selected one scheme to pursue based on design and feasibility. The selected scheme was then altered to incorporate ideas and qualities found in the remaining design proposals. With this amalgamated scheme, the studio broke into four groups to further the design's development in the critical areas of materiality (color, texture, etc.), immateriality (artificial lighting), form (structure and fabrication), and assembly.

In the third phase – fabrication and assembly – the collective studio fabricated and assembled the installation. A digital fabrication process utilized the CNC router to mill custom shapes from typical plywood sheets for the installation's undulating lattice structure. The lattice was formed using twenty-foot long structural ribs comprised of multiple pieces. The need for multiple pieces was due to the router's maximum cutting area. Rib pieces were designed to connect lengthwise with puzzle-piece-connections to reduce axial disconnection, and to connect perpendicularly with other ribs using finger connections to create a lattice. Lattice ribs were placed at two spacing increments – eight and twelve inches – providing different levels of density that were orientated relative to the window wall. The lattice was hung from ceiling beams at various rib intersections and supported off the concrete floor where the ribs rested on it. A fabric soffit was draped below the lattice and artificial lighting mounted above to complete the installation. Two dominant lessons learned during the assembly phase were construction tolerances and sequencing. Partial prototypes of two joints suggested the allowance of tighter connections between members but the need of aligning over four hundred connections in the completed assembly required additional tolerance and resulted in increased time for assembly. Based on the support conditions, the overhead lighting elements were installed first, the structural lattice second, and the fabric soffit or undersurface last; this sequence proved difficult to fine-tune the lighting effects (placement and direction) cast onto the fabric surface after it was installed.

POP! – AN EXTERIOR INSTALLATION

While the *Legato* installation was an assignment at the beginning of a term used to introduce a studio agenda, the *Pop!* installation occurred at mid-term[16] to reinforce pedagogical objectives. Both projects had similar goals of integrating constructs into the studio design process by linking full-scale material research with a particular project. *Pop!* was an exterior installation tied to a particular event – a rare one-day design symposium located on campus. The installation was designed to engage and amuse a 400-person procession in an affective exchange as they passed through a courtyard from the lecture hall to the closing reception. *Pop!* was situated at the courtyard entrance atop a thirty-foot wide by one hundred-foot long concrete pathway; the slab on grade served as the sole support for the installation. The 600 square foot single purpose installation was assembled the day of the symposium and disassembled after the procession's passing. The installation created an artificial walking surface comprised of metallic painted plastic tiles with various sized semi-spheres. The spheres were alternately filled with concrete and left hollow; several filled spheres served as a bases for eight-foot tall metallic painted poles that were embedded in the concrete. Multi-colored lights were projected from above onto the tiles and poles.

The installation's design focused on utilizing the ground-plane to engage multiple senses – sound, sight, and touch – with material and immaterial effects. The installation's title *Pop!* was attributed to the sense of sound; as you walk atop the artificial surface, the material below you would begin to respond to your weight, cracking and producing a popping noise. Delight, perplexity and curiosity were engendered by the sense of sight; a field of various sized metallic silver bubbles and elongated poles contrasted the typical concrete sidewalk with a reflection of brilliant sunlight and captured the colors of artificial lighting at night. The materiality of the opaque plastic bubble field produces uncertainty and amusement for the sense of touch; although the top surface is uniform and suggests a degree of security, the reality of what lies below engages the occupants in a playful exchange as some bubbles are solid, filled with concrete, and some hollow, waiting to be popped.

Figure 4: Pop! installation hollow bubble popped

The twelve-day design to completion process and limited budget demanded a synthetic and efficient design and construction process. The case study period that introduced to the concepts of the studio agenda occurred at the beginning of the term and was not including in this exercise. The design phase was similar to that of the *Legato* project with the exception of prototyping, which was marginalized due to time constraints. Additional time in the schedule would have allowed for further prototypes and an opportunity to make research-tested design modifications.

Earlier in the term students researched a wide range of recently completed installations and pavilions in order to understand contemporary strategies and mechanisms used to produce moods, atmospheres, and affective environments. This research provided the students with a toolbox of successful design strategies to be used as the foundation of their design proposals, similar to the first phase of the *Legato* project.

During project days one through five, students worked in small groups to produce a half dozen design proposals that included: the concept for the intended affective exchange between the installation and the occupants, the specific material properties or qualities needed to produce the desired affects, potential fabrication techniques or methods, material cost and time-schedule. The collective studio then designed a final scheme by using various concepts and technical information generated from the initial brainstorming activity.

With the design concept determined, students developed a critical path of production and assembly for the final seven days with little flexibility for error or delay. The five critical steps in the production process included: digital fabrication files, CNC milling of four positive tile molds, thermoforming plastic tiles, concrete casting in plastic tiles, and paintwork of plastic tiles. The importance of the critical path of production was understood only after experiencing the fabrication process on both sides: designer and producer. Days six through twelve, students were engaged in the critical path of production; the students worked with a sense of urgency and purpose knowing that any slippage in the allotted schedule of production would have been irrecoverable. Days six and seven: digital fabrication files including tool paths for the CNC router needed to be completed and checked by shop assistants prior to the start of fabrication. Day eight: eight hours reserved to use the CNC router to mill four 24”x24”x6” wood tile molds with each tile requiring two hours of machine-work to complete. Day nine: four hours in the morning reserved to utilize the thermoformer in the Packaging Lab (Industrial Technology Department) to fabricate 160 plastic tiles using the four wood molds; evening casting in the concrete lab using the plastic tiles produced in the morning as casting formwork and allowing the concrete to cure overnight. Days ten and eleven: multiple coats of metallic paintwork to topside of plastic tiles. Day twelve: morning assembly prior to start of symposium, evening dismantling after closing reception party.

CONCLUSION

Recent studio installations *Legato* and *Pop!* were construct-based exercises that developed the stu-

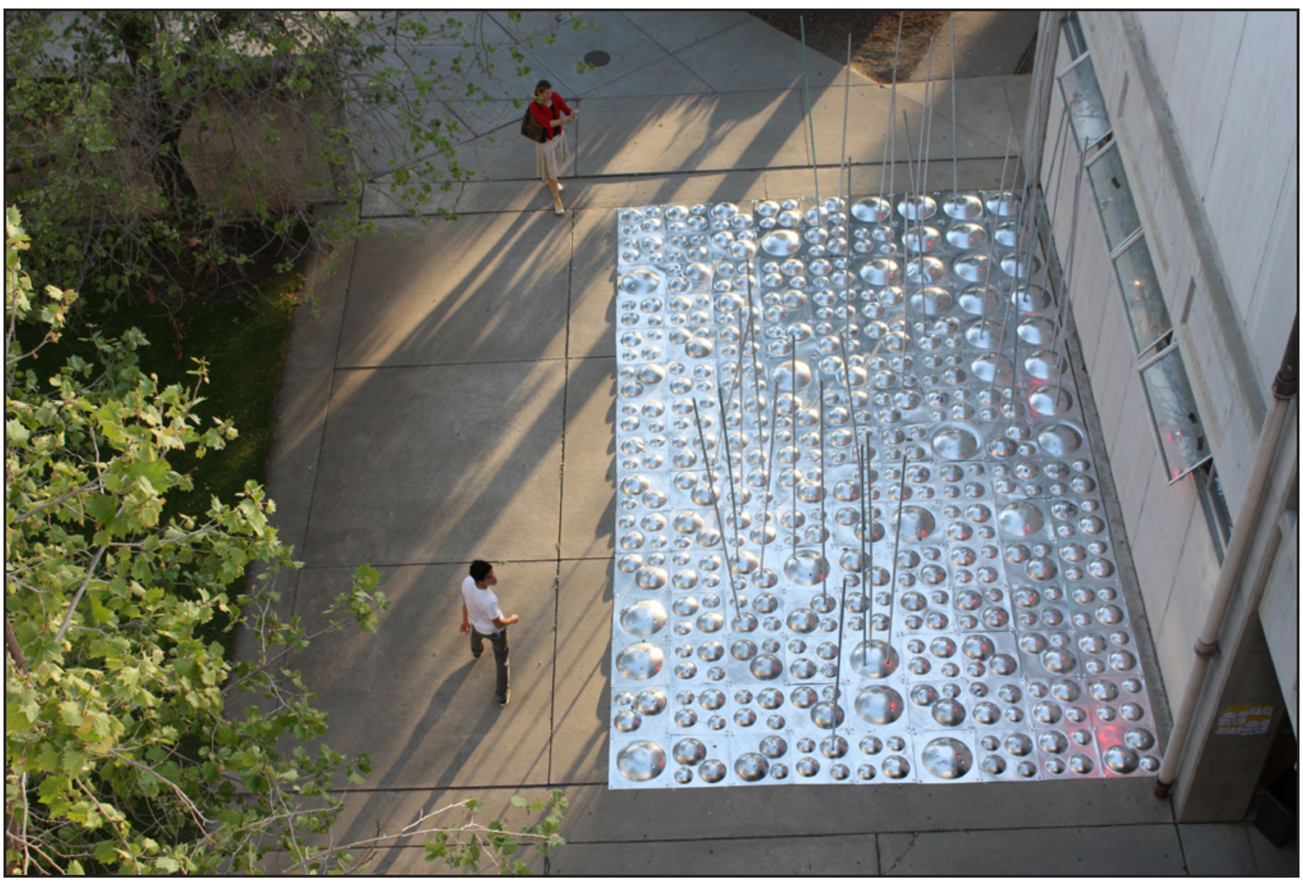

Figure 5: Pop! Installation, view from above

dents' ability to create an affective architecture. Though full-scale material and immaterial investigations students learned how the percepts and affects of materials define the mood or atmosphere of a space. By conjoining visualization and realization into a single design process, students were confronted with issues of materiality, fabrication, and construction assembly during concept design. This integration of construction issues into the creative process yielded design proposals that were more synthetic and sympathetic to the challenges of construction. In both studios, students were encouraged to consider the experiential aspects of their design proposals and to become cognizant of the types of environments they were proposing. Each installation project responded to a site-specific activity and attempted to enhance or shape the user's experience through spatial organization, material sensations, and atmospheric effects. In linking design research with a specific project, the concept designs and learning outcomes were more open or opportunistic and less predictable or predetermined by a particular tool or technique. Program, event, site, and schedule had a strong influence on the project's design direction and the lessons learned. The interior site and four-week schedule for *Legato* enabled students to develop a more spatial project with a complex formal structure that could be hung from the ceiling but required considerable time to fabricate and assemble. While the production of the structure utilized contemporary digital fabrication tools and was rather complex, the development of the fabric surface that lined the shell's underside was less sophisticated and relied upon hand production tactics rather than precise strategies. The exterior site and two-week schedule for *Pop!* encouraged the use of material properties to define the spatial atmosphere and relied upon the ground plane as the basis of the design. The production of the material effects was more intensive and required several processes – CNC milling of tile molds, thermoforming of plastic tiles, concrete castings, and paintwork – but intelligently relied upon repetition to counteract the brief schedule.

Installations and prototype investigations enable students to: examine how architecture is experienced at an intimate scale, develop a material sensibility, learn to employ materials and atmospheric effects to create affective environments, and experience their realized design's affective qualities with their own senses.

ENDNOTES

1. Materials used are not abstract, such as basswood and cardboard, or representative of another material, but are the intended materials and rely upon their inherent qualities to produce the desired architectural effects.
2. The term constructs is used here in reference to the act of making or building.
3. Both studios were at California Polytechnic State University San Luis Obispo and ten weeks in duration (one academic quarter).
4. The manner by which affective is used is in reference to Peter Eisenman's passage on affect and how it differs from effect. "The clearest example of effect is the utilitarian creed of modern architecture; form follows function. This argued that a socially viable programme, properly elaborated, would provide good architecture. Affect, on the other hand, has nothing necessarily to do with good. Affect is the conscious subjective aspect of an emotion considered apart from bodily changes. Affect in architecture is simply sensate response to a physical environment." Peter Eisenman, "*The Affects of Singularity,*" in AD: Theory & Experimentation: Architectural Ideas for Today and Tomorrow, Vol. 62, No 11/12, (Nov./Dec. 1992).
5. While every act of making has a process, here the process is only a means to an end and varies from project to project.
6. An emphasis is placed on situating the observer in the present condition and how one's spatial experience is shaped by the perception of surrounding phenomena. It is important to note that the perception of phenomena is not utilized as an instrument to attain meaning or understanding, but rather for the pure enjoyment or delight produced by the architectural spectacle. Several of the art installations by Olafur Eliasson utilize the perception of material and immaterial to create an affective environment. Eliasson's "Take Your Time" exhibition at MoMA and P.S.1 New York in 2008 illustrates how the composition and presence of the materials, handling of proportions, and affects of lighting have profound influence on the way a space is perceived. The intensity, direction, and quality of light shapes the way colors and materials are depicted both in terms of hue and depth, and can focus attention to particular elements within a space or on a surface.
7. Hélène Frichot, "Olafur Eliasson and the Circulation of Affects and Percepts: In Conversation," in Preston, Julieanna (ed.). *AD: Architectural Design; Interior Atmospheres,* Vol. 78 Issue 3, (May/ June 2008) pp. 30-35.
8. For more on atmosphere in architecture see Mark Wigley: "A long tradition of architectural theory suggests that architecture is never more than such a theatrical effect. In the middle of the last century, Gottfried Semper insisted that the 'true atmosphere' of architecture is 'the haze of carnival candles'. Architecture is but a stage set that produces a sensuous atmosphere. Semper argued that the full force of architecture is to be found in its outer surface, the decorative layer through which the atmosphere seemingly percolates. Architecture is indistinguishable from decor. To construct architecture is simply to prop up a surface that produces an atmosphere. Architects are special effects experts.

The test of their craft is in the thinnest layer of paint, texture, or wallpaper." "The Architecture of Atmosphere," in Daidalos no. 68, 1998, pp. 18-27.

9. A material sensibility is an understanding of a material's characteristics and ability to expose it's latent potential. Recent work by artist Tara Donovan demonstrates how a sensuous atmosphere can be produced through the development of one's material sensibility. Her "Untitled (Styrofoam Cups)" work is an example of how the unique qualities of a conventional material can be recognized and exploited as an design opportunity; Styrofoam cups are applied via a bottom-up and repetitive assemblage that produces controlled but unexpected formal conditions at both the macro and micro scales with varying degrees of opacity.

10. An example of this type of material research was the subject of the "Matters of Sensation" exhibition at Artists Space New York in 2008, featuring a group of emerging contemporary architects that are pursuing a materialist architecture to induce sensation, fantasy, and pleasure.

11. An example of material research that links formal experimentation with a specific tool and manufacturing processes can be found in the student work completed in the technology seminars taught by Heather Roberge at U.C.L.A. Heather Roberge, "Between the Sheets," in Material Matters: making architecture, 2008 West Fall Conference Proceedings, ed. Gail Peter Borden & Michael Meredith. Washington DC: Association of Collegiate Schools of Architecture, 2008.

12. Installations and pavilions at P.S.1 in New York and Serpentine Gallery in London are an example of small-sized temporary projects that provide an opportunity for both young and experienced architects to experiment with manufacturing techniques and design strategies. Architects who have recently completed these projects include: SANAA, Frank Gehry, Zaha Hadid, Rem Koolhaas, Alvaro Siza, Oscar Niemeyer, Toyo Ito, Daniel Libeskind, MOS, WorkAC, Ball-Nogues, Xefirotarch, nARCHITECTS, EMERGENT, William E. Massie, and SHoP.

13. Another important outcome of the group work was that students learned to utilize design collaboration and time management skills.

14. Following completion of the installation, students began working individually on designs for a community performing arts center with a focus on developing three social zones or spaces: a plaza serving both as a forecourt to the arts center and a outdoor performance area for the community, a grand foyer that operates as a venue for unscripted social performances, and a main performance hall staged for public amusement. The pedagogical goal was for students to consider the project's programmatic events or activities and produce an affective architectural environment. The introductory installation exercise enabled the students to meet this design challenge by providing them with an understanding of how the percepts and affects of materials can be employed as design tools to create an affective architecture.

15. Prototype experimentation was restricted due to limited availability of the department's recently installed CNC router, which was used to fabricate the installation, and concern over material costs. However, these limitations proved to be strong incentives for thorough planning and careful detailing of digital shop drawings.

16. Following completion of the installation, students returned to their studio project, which had been developed through the concept and programming stages. The studio project was an extension of Le Corbusier's Carpenter Center for the Visual Arts; the primary program included new exhibition spaces to properly display contemporary artwork. The pedagogical aim was for students to consider how movement through space frames an occupant's experience of the project and to employ material and atmospheric effects to define the project's spatial atmospheres. The *Pop!* installation exercise provided students with an understanding of how to utilize material and immaterial effects to define a project's spatial atmosphere and create an affective architecture.