

A self-structuring envelope made of folded, pattern-rolled, thin-gauge sheet metal; experimental applications for sustainable biodegradable plastics; and stronger, lighter, hollow metal structural systems inspired by the functionality of avian skeletons: Digital fabrication is an ever-growing field increasingly relevant to architectural practice. The following articles detail projects that are shaping digital fabrication and pushing its boundaries.

PHOTO COURTESY IGOR SIDDIQUI.



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Plastic Effects

by Rachel Adams

While advances in digital technology have made many designs look sleeker, there is a continued desire to move “off the screen.” With this in mind, the marriage of materials with production has come to the forefront of design. For many architects, including Austin-based Igor Siddiqui, materials are capable of great transformation and should be considered early in the stages of the design process. Siddiqui, an assistant professor at The University of Texas at Austin School of Architecture and principal of ISSSStudio, is drawn to specific materials, such as rubber and bioplastics, that are flexible, pliable, and allow themselves to be transformed through experimentation. Siddiqui’s studio and his teaching philosophy exemplify the melding of digital design with the do-it-yourself and open-source culture of physically making the materials.

In December of 2011, Siddiqui, in collaboration with Matt Hutchinson from the San Francisco-based firm PATH, installed “Bayou-luminescence” at the end of a residential alley in New

Orleans. One of the winning entries from an international competition sponsored by AIA New Orleans, “Bayou-luminescence” was cast from a translucent industrial urethane rubber, creating a synthetic skin that was stretched over a curved steel framing system. Lit from within, the geometric-patterned skin referenced the many surfaces found throughout the New Orleans region. The two conjoined, self-supporting volumes created distinct spaces: a social space around the outside of the structure and a meditative space inside the larger cone.

Structurally, the work utilized the tension between the elastic rubber surface and the metal frame. The rubber cladding was cast from custom CNC-routed formwork with a shallow relief, and each of the 12 panels had its own unique mold, with the edges consisting of eyelets and tabs that attach to the frame and keep the tension. With halogen lighting strategically placed to illuminate the structure and its surroundings, the translucent rubber was aglow — a beacon encouraging viewers to approach.

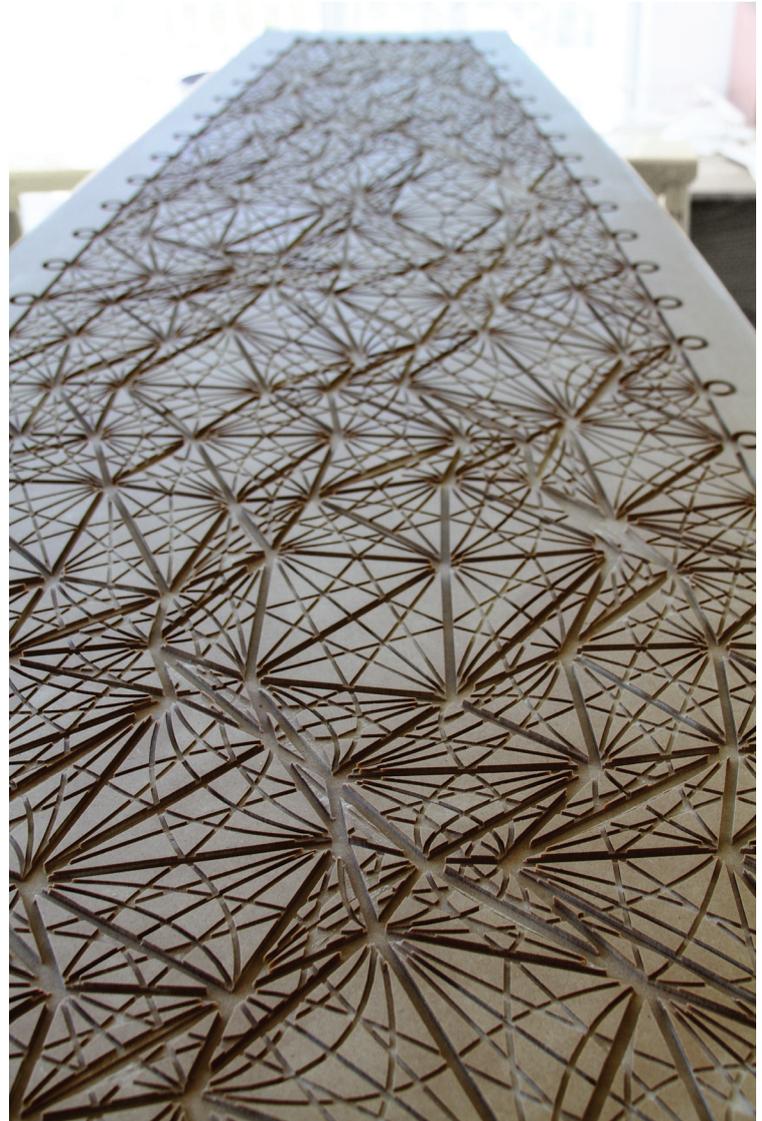
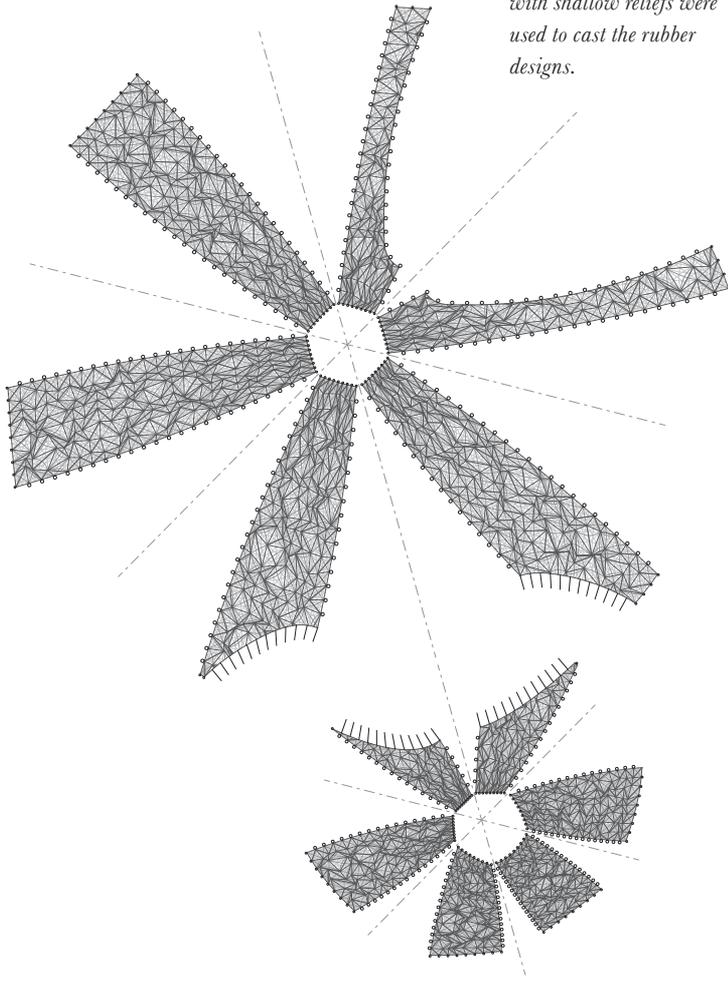


Opposite page “Bayou-luminescence” in New Orleans, December, 2011.

This page clockwise from top left A visitor touches the rubber strands attached to the metal frame. The conjoined structures create social spaces around the installation and a private interior area. Halogen lights illuminate them.



Twelve distinct panels of CNC-routed formwork with shallow reliefs were used to cast the rubber designs.



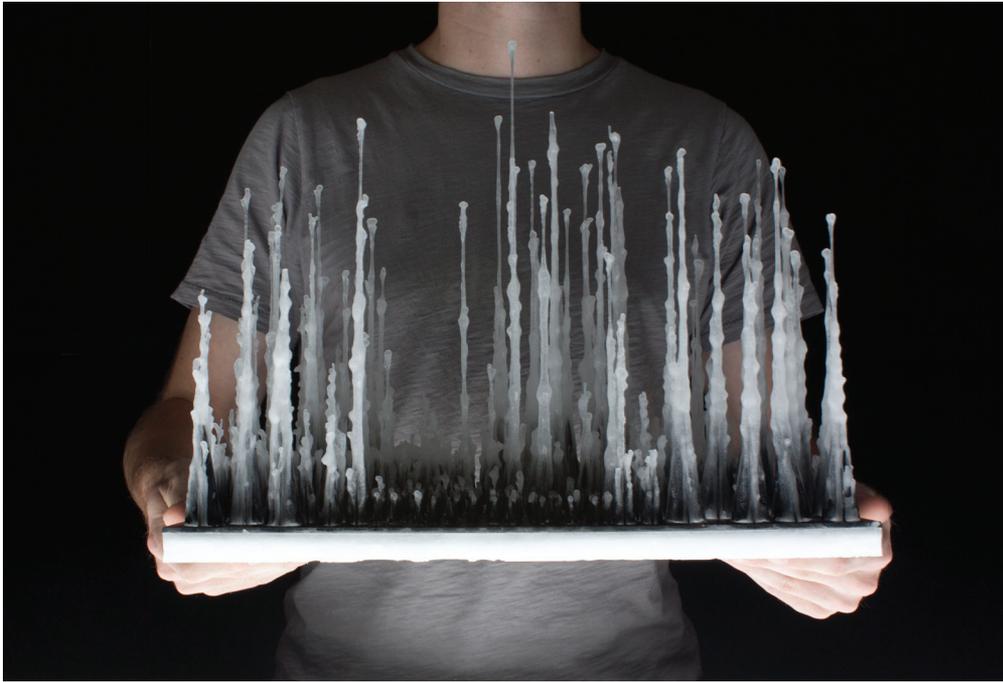
This experimental work marked the beginning of Siddiqui's foray into allowing materials to inform design in the earliest stages. With the help of digital software, building materials were chosen as the structural ideas were being formed. Urethane rubber was put through many tests and cast numerous ways in order to create the patterned impressions and stretch that resulted in "Bayou-luminescence."

Siddiqui has taken his interest in merging materials with production into his UT Austin graduate seminar, Prototype. His students learn a more sustainable way of conceptualizing and producing; Prototype links the studio design process with industrial production, allowing students to discover how crucial materials are to the final product. With a renewed interest in serial production, Siddiqui's seminar sets out to question,

as well as to contribute to, the discourse surrounding the impact of prototype processes on design disciplines. Questions relating to full-scale making, factory production vs. site production,

"Protoplasic" presents a series of design experiments that use open-source formulas for biodegradable plastics as a point of departure.

manufacturing products that can aggregate, and shaping notions of repetition and variation with both material and digital processes are addressed throughout the semester. In 2014, as Siddiqui's personal work moves into bioplastics, Prototype will shift its focus in that direction as well.



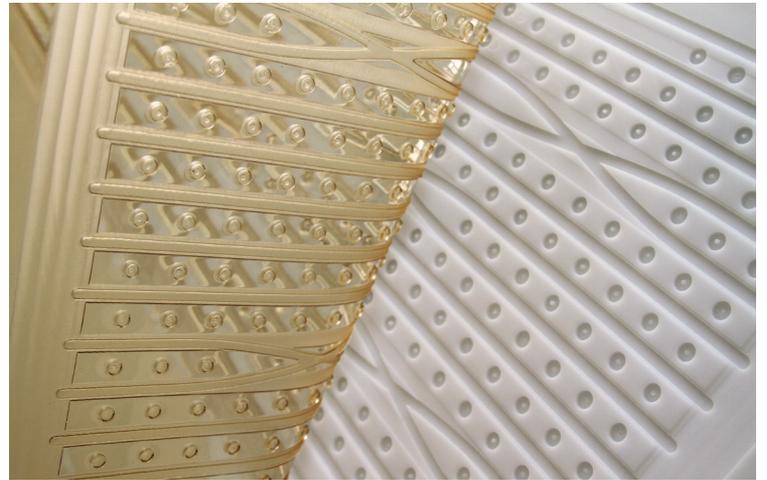
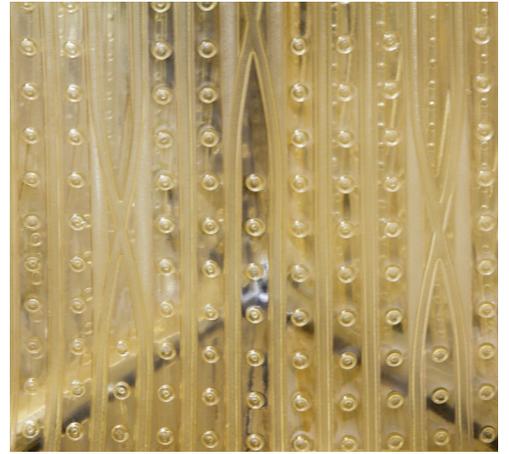
Left Siddiqui's students' projects at UT Austin include "Drip Wax," a design by Taylor McNally-Anderson, Tyler Noblin, and Stephanie Sodeke.



Above, left to right Nicholas Allinder and Monica Sanga developed "Emergent Scapes" using water as the formwork under Siddiqui's direction.

Right Magnetite was added to give the material its black luster.





This page clockwise from top left “Proto-plastics” explores the possibilities of biodegradable plastic. Details of the double-sided acrylic formwork and thin bioplastic sheets demonstrate Siddiqui’s process. Heavily patterned, the surfaces of the sheets vary, expanding on the geometric possibilities of the digital design.

Opposite page The seven-foot-tall sculpture is suspended from the ceiling and is surrounded by six of the forms. A continual conversation about organic and inorganic materials, the sculpture will be composted once the exhibit closes.





On January 31, Siddiqui opened the exhibition “Protoplastic” at Tops Gallery in Memphis, Tenn. “Protoplastic” presents a series of design experiments that use open-source formulas for biodegradable plastics as a point of departure. This exhibition investigates how the properties and effects of synthetic plastics — in this case, Plexiglas — can be replicated and enhanced using a more sustainable method.

Included in the exhibition are six double-sided formworks made from white acrylic and a seven-foot, tree-like sculpture created from bioplastic casts of the acrylic forms. The formworks are set into concrete blocks that encircle the sculpture, which is suspended from the ceiling of the gallery. Acting almost like a pendulum, the surface of the sculpture mimics the formworks, creating a conversation between the organic and inorganic materials. The works are all heavily patterned, created by manipulating and expanding on the geometry embedded in the original digital design. The biodegradable plastic recipes are based on a mixture of different starches, organic gelatin (animal- and/or plant-based), and glycerol. Depending on the depth of the

pattern on the acrylic forms, the bioplastics are either lacier or thicker, reinforcing the three-pronged design of the sculpture.

“Protoplastic” is an exciting departure from the industrial materials of “Bayou-luminescence.” It allowed Siddiqui more control over the material — he was “cooking” it from scratch

Depending on the depth of the pattern on the acrylic forms, the bioplastics are either lacier or thicker, reinforcing the three-pronged design of the sculpture.

while considering the aesthetics of the form and how it would come together. Emphasizing the organic nature of bioplastics, the sculpture will be composted after the exhibition is over. This work aims to raise awareness of new possibilities for this organic material.

Rachel Adams is an Austin-based curator and writer.