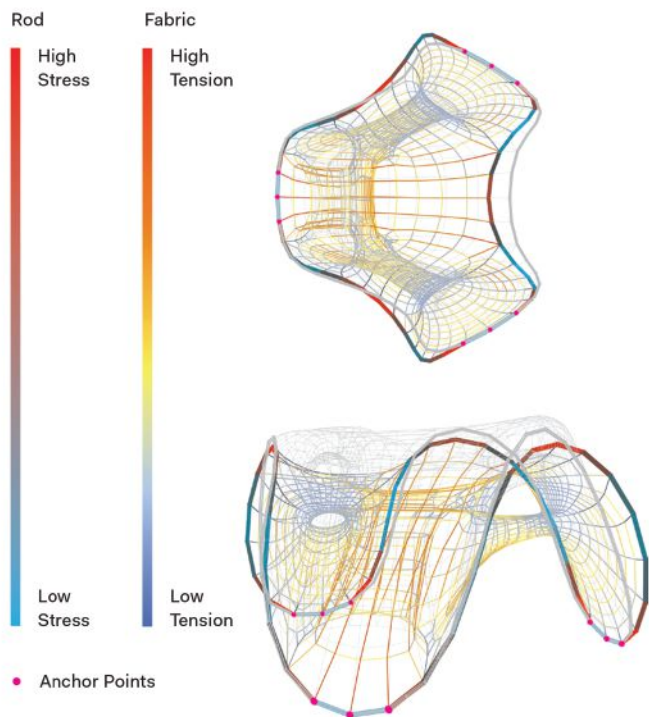


**Award:**  
**Pure Tension Pavilion**  
**Synthesis Design + Architecture**

To showcase its high-tech V60 model, Volvo Car Italia wanted a exhibition pavilion that was iconic, portable, easy to assemble, and suggestive of the vehicle's three modes of propulsion: diesel, electric, and hybrid. Synthesis Design + Architecture (SDA), in Los Angeles, won the international design competition by tacking on two requirements of its own: The pavilion had to charge the car's battery and fit inside the back of the V60 for storage. In short, it would become a practical, essential accessory that embodies the car's sustainability message.

Inspired by the lightweight, tensile membrane roofs of Frei Otto, SDA founder and principal Alvin Huang, AIA, and his team explored potential configurations for the pavilion using Grasshopper plug-in Kangaroo as well as through physical models built with wire and nylon stocking. The team added visual interest to a conventional tent-form with the pavilion's three apices, a nod to the V60's three modes of operating. To add stability and lift to ensure



clearance for bystanders, the team introduced two catenoid tunnels in the membrane.

SDA had four months to turn its design concept into reality. It collaborated with the Los Angeles office of BuroHappold Engineering and Elgin, Ill.-based Fabric Images to develop a frame of 24 pre-bent 3-inch-diameter aluminum pipes that slip-fit together and through neoprene sleeves in the pavilion membranes much like tent poles. The team also simplified the frame's geometry into five arcs that create what Huang says is a hybrid between a hyperbolic paraboloid and a minimal surface.

Next came enabling the pavilion to harvest solar power. The firm created a heat map to determine which thin photovoltaic-panel layout would capture the most solar energy, using Rome as the test site because the pavilion would debut in Italy. They then hand-stitched the two curvilinear fabric membranes from a series of flat pieces, and stitched the 252 flexible solar panels to the mesh, tucking the wires into fabric channels.

"It was a highly digital design process with a highly manual assembly process," Huang says.

The prototype fits into two 65-inch-by-15-inch-square cases and can be assembled and dismantled by two people in less than an hour. After piecing the frame together, the users would zip the neoprene sleeves around it, and then zip together two vinyl-encapsulated, polyester-mesh membranes to create the final structure. The aluminum frame pushes outward while the tensioned skin pulls inward, holding the pavilion's form in equilibrium.

Though juror Steven Rainville was initially lukewarm to the project's marketing focus, he respected its multifunctionality. Overall, the design and fabrication process captivated the jury. "The pavilion has a magical lightness," juror Marc Fornes said. SDA is currently refining the pavilion's design, in collaboration with Volvo, to produce a limited commercial edition that is smaller, easier to assemble, and more efficient in charging the car. —C.H.



## Judges

French architect **Marc Fornes** is the principal and founder of TheVeryMany in New York, as well as a self-described connoisseur of computer science. His work focuses on investigating design through codes and computational protocols. He received a master of architecture and urbanism from the Architectural Association School of Architecture in London.

**Joyce Hwang, AIA**, is an associate professor of architecture at the University at Buffalo, the State University of New York, and the director of Ants of the Prairie, a research and practice firm in Buffalo, N.Y., that confronts contemporary ecological conditions through creative means. She received an M.Arch. from Princeton University and a B.Arch. from Cornell University.

**Steven Rainville, AIA**, is a principal at Seattle-based Olson Kundig Architects, which he joined in 1996. He is also the director of the firm's R&D department as well as the founder of Mind Mine, the firm's forum for crowd-sourced ideas that break down boundaries between industries. He received his B.Arch. from Washington State University.

## Credits

### **Pulp Pavilion, page 104**

*Client:* Coachella Valley Music and Arts Festival  
*Design Firm and Fabricator:* Ball-Nogues Studio, Los Angeles · Gaston Nogues, Benjamin Ball, ASSOC. AIA (project leads/designers); Rafael Sampaio Rocha (project manager); Ricardo Garcia, John Guinn, Fernando Marroquin, Rafael Sampaio Rocha, Forster Rudolph, Corie Saxman, Nicole Semenova, Ethan Schwartz (onsite project team); Andrew Fastman, AIA, Michael Anthony Fontana, Cory Hill, James Jones, Mora Nabi, Jacob Patapoff, Allison Porterfield (support)  
*Lighting Programming:* F. Myles Sciotto  
*Structural Engineer:* Nous Engineering · Omar Garza  
*Funding:* Commission from Goldenvoice  
*Size:* 1,300 square feet

### **Pure Tension Pavilion, page 108**

*Client:* Volvo Car Italia  
*Design Firm:* Synthesis Design + Architecture, Los Angeles · Alvin Huang, AIA (principal); Filipa Valente, Chia-ching Yang, Behnaz Farahi, Yueming Zhou  
*Structural Engineer:* BuroHappold Engineering  
*Electrical Engineer:* Ascent Solar

### **Bar Raval, page 110**

*Client:* Grant van Gameren, Mike Webster, and Robin Goodfellow  
*Design Firm:* Partisans, Toronto · Alexander Josephson, Pooya Baktash, Jonathan Friedman, INTL. ASSOC. AIA, Ivan Vasylyv, Ariel Cooke  
*Consultant and Fabricator:* Millworks Custom Manufacturing  
*Special Thanks:* Klaudiusz Kociolek, Gregory Rybak, Nick Savage, CNC Software/Mastercam  
*Size:* 1,500 square feet

### **Co-Robotics and Construction, page 112**

*Design Firm:* Rust Belt Robotics Group, University at Buffalo, State University of New York (SUNY)

*OSCR-1 and OSCR-2 Team:* Ball State University · Mike Silver, Mahesh Daas, Josh Vermillion (faculty); Yevgen Monakhov, Jason Foley, Matthew Fullenkamp, Assoc. AIA, William Zyck, Justin Krasci, Michael Bolatto, Tyler Cox, ASSOC. AIA, Glenn Cramer, ASSOC. AIA, Robert Cichocki, Antone Sgro, Derek Anger, Tianxia Peng, Derek Newman, David Smith, Yao Xiao, Matthew Wolak, Thomas Friddle (students)  
*OSCR-3 Team:* University at Buffalo, SUNY Team · Mike Silver, Karthik Dantu (faculty); Colin Jacobs, Tim Ruhl, Albis Del Barrio, David Heaton, Gary Chung, David Lin, Georine Pierre, Robert Miller, Johnny Lynch, Daniel Fiore, Dylan Burns, Jia Jian Feng You, Marc Velocci (students)

### **Queen Richmond Centre West, page 113**

*Client and Funding:* Allied Properties REIT  
*Design Firm:* Sweeny & Co Architects, Toronto  
*Structural Engineer:* Stephenson Engineering  
*Fabricators:* Cast Connex, Walters Group  
*Construction Management:* Eastern Construction  
*Electrical Engineer and Lighting Designer:* Mulvey & Banani International  
*Mechanical Engineer:* The Mitchell Partnership  
*Special Thanks:* Michael Emory, Hugh Clark, John Stephenson, Jeffrey Stephenson, Carlos de Oliveira, Frank DeCaria, Renato Tacconelli, Tim Verhey  
*Size:* 302,000 square feet

### **Radical Railbanking, page 114**

*Design Team:* Master of None, Ann Arbor, Mich. · McLain Clutter (project adviser); Sehee Kim (student research assistant)  
*Funding:* University of Michigan Office of Research, funding for Artistic Productions and Performances, 2011; University of Michigan Taubman College of Architecture and Urban Planning  
*Special Thanks:* Syracuse University School of Architecture · Mark Linder

### **Bands, page 115**

*Client:* Samitaur Constructs · Frederick and

Laurie Samitaur Smith  
*Design Firm:* Eric Owen Moss Architects, Culver City, Calif. · Eric Owen Moss, FAIA (architect); Dolan Daggett, Vanessa Jauregui, Nicholas Barger, Zarmine Nigohos, Sean Briski, Raul Garcia, Scott Nakao, Richard Yoo (project team)  
*Structural Engineer:* Arup  
*Size:* 183,000 square feet

### **Philip J. Currie Dinosaur Museum, page 116**

*Client:* Philip J. Currie Dinosaur Museum  
*Design Firm:* Teeple Architects, Toronto · Stephen Teeple, Martin Baron, Mark Baechler, Will Elsworth, Lang Cheng, Carla Pareja, Gloria Perez  
*Architect of Record:* Architecture | Tkalcic Bengert  
*Structural Engineer:* Fast + Epp  
*Mechanical Engineer:* Hemisphere Engineering  
*Electrical and Civil Engineer:* AECOM  
*Exhibit Consultant:* Reich+Petch  
*Landscape Architects:* Scatliff+Miller+Murray  
*LEED Consultant:* Enermodal Engineering (now part of MMM Group)  
*Contractor:* PCL Construction Management  
*Fabricators:* StructureCraft Builders in collaboration with Fast + Epp  
*Size:* 42,000 square feet

### **Breathe Brick, page 117**

*Design Firm:* Both Landscape and Architecture, Charlottesville, Va. · Carmen Trudell (primary investigator)  
*Collaborators:* California Polytechnic State University, San Luis Obispo (Cal Poly) · Tracy Thatcher (consultant); Natacha Schnider, Kate Hajash, Cameron Venancio, Justin Wragg, Jennifer Thompson, Michelle Kolb (student research assistants); Rensselaer Polytechnic Institute · Kateri Knapp, Kyleen Hoover (student research assistants)  
*Funding:* Cal Poly College of Architecture and Environmental Design's Planning, Design and Construction Institute