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A Tower for Stacell

We will explore the origins of concepts or pregnant ideas that subsequently become material structures — like the various shapes of gravity seen in nature, and the morphologic of getting where we need to go in spite of it.

— Alan Stacell

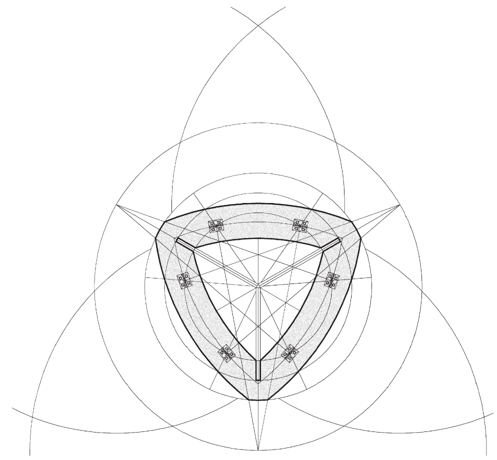
Finding beauty in structures was one of Alan Stacell's passions. A brilliant architecture professor and prolific artist, he taught in the College of Architecture at Texas A&M University for forty years. His creative energy and insights were abundant and inspired students to stretch their own creative potentials. Stacell had a particular interest in the work of structural innovators like engineer G. Robert LeRicolais, artist Kenneth Snelson, and especially R. Buckminster Fuller whose concept of tensegrity — structural tensile integrity — guided many of his own structural experiments. He led his students in hands-on adventures exploring structural designs that included large model building studies for cranes, bridges, floating structures, and futuristic cities.

When he died of cancer in 2001 eight students came up with the idea of creating a self-suspended, tensile tower in his memory and installing it in the atrium of the architecture building. Stacell had often extolled the virtues of box trusses that used triangulation to develop great strength. One day he showed me a sketch of two pyramids, one inverted inside the other, with red lines showing where cables would be attached to join the two pyramids in suspension. I built a study model of the idea and showed it to him. The model led to the idea of a tower formed from a series of these construction modules linked together. As interpreted by the student team after Stacell's death, the tower was analogous to a strand of DNA, with interlocking structural modules delicately held in place by tensile cables.

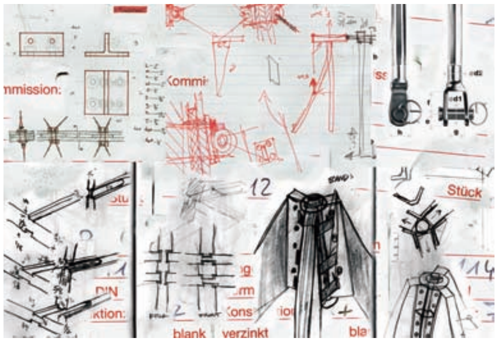
After enlisting support and guidance from various professors, the team began to work on making the tower a reality. The design they settled on was a 43-foot-tall, thin pyramid, formed of nine plywood structural segments, each composed of three diamond-shaped ribs held together at midsection by a compression ring. The modules would decrease in size and thickness as the tower rose, making it lighter and giving it an elongated appearance. The wooden structural units interlock like a cross-braided chain, but where they overlap they do not touch. Instead, a system of twelve outer steel cables and one inner cable cause the wooden members to work against one another, creating a harplike aesthetic holding them tautly in suspension. The half-module wooden unit at the bottom of the tower is connected to a concrete foundation, weighted to offset lateral forces.

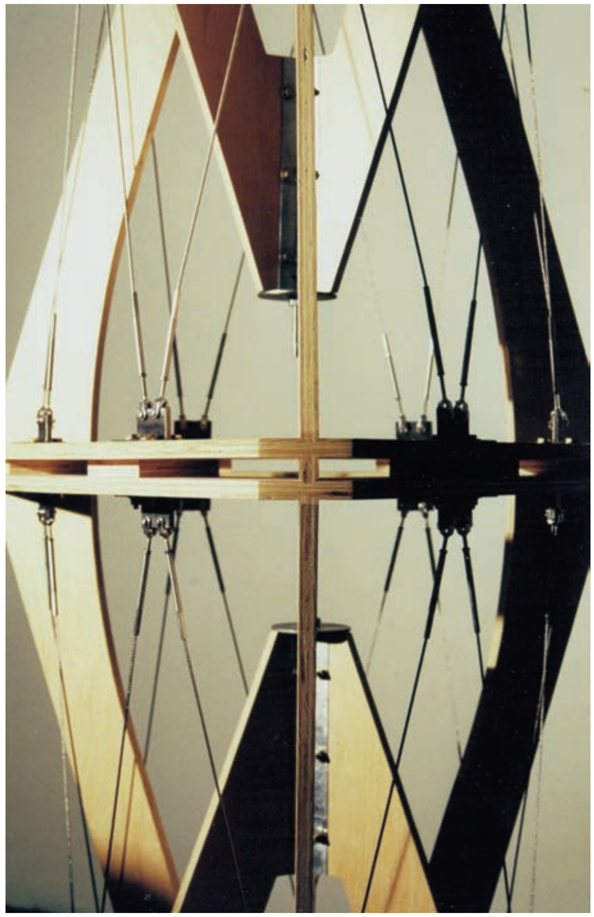
Custom metal T plates were fabricated and bolted through the wooden compression disks to form fluidic, tensile connections to the cables. There are six points of connection at every ring; each connection receives two cables and the twelve cable segments crisscross in a hexagonal pattern forming a cylindrical cone similar to a tapering column. The T plates at the bottom compressive unit are bolted through to the foundation with twenty-four 1/2-inch anchor bolts. Calculations showed the compressive forces that the plywood modules would need to resist. Full-scale compression tests were performed in the engineering lab on sample ribs made of 1/2-inch, 5/8-inch, and 3/4-inch maple-veneered plywood, the three sizes to be used in the construction, to ensure that they would have adequate strength. A 3-D computer model of the tower was constructed and used to determine the exact sizes of the wooden members and the lengths of the cables for each of the nine modular sections.

To assemble the tower from the prefabricated pieces, the team created a cranelike boom, affixing it to the fourth-floor landing of the atrium. The students erected the tower by raising the top box truss first, then attaching the next lower one to it, contin-



1. Digital drawing, plan.
2. Full-scale prototype of top compressive unit.
3. Sketches of connection details.
4. Preassembly of components in university's woodshop.
5. Photograph of connection.
6. Final adjustments of the structure.
7. Tower in situ at Texas A&M University.





uing this process until all nine-and-one-half box truss units were laced together — a process that took approximately eleven hours.

The completed tower was dramatically unveiled at a memorial reception on December 9, 2002, one year after Stacell's death. The tower still occupies a prominent place in the atrium of the architecture building at Texas A&M University, a symbol of the structural fascinations engendered by Stacell.

Project Team: Patrick Winn (designer and team leader), Dave Sellers, Nicholas McWhirter, Brad Adams, Reynold Magnuson, Drew Duffy, Aaron Cooke, and Justin Dezendorf.

Faculty Advisers: Rodney Hill, Robert Schiffhauer, Thomas Regan, Phillip Tabb, and Skip Coody.

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