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INSIDE:

JANET ECHELMAN & GORE

BIOMIMICRY

48 NEW MATERIALS

BEST OF SHOW

US \$ 5.00



Left & bottom:

She Changes, 2005

Waterfront plaza, Porto and Matosinhos, Portugal

Height 50 m X 150 m X 150 meters

Tenara® PTFE architectural fiber

HIGH NET WORTH

by Jacquelyn Gray

Anyone seeking evidence of the close link between Art and Science needs only to look at the list of credits for sculptor Janet Echelman's most recently completed work, *She Changes*. It consists of a huge (46 meters in diameter and 14 stories high), multi-layered, hollow, billowing form created by twisting, braiding, and knotting together nearly one ton of W.L. Gore & Associates' Tenara® fibers. A hollow steel ring holds this net open at its mouth and provides a place for a series of tethers originating from three steel poles of varying height to suspend the entire contraption over a three-lane highway roundabout on the Porto-Matosinhos waterfront of northern Portugal. Although *She Changes* originated in the mind of Boston- and New York-based sculptor Echelman, she had to collaborate with several international firms before it could become what Robert C. Morgan of Sculpture Magazine called, "One of the truly significant public artworks in recent years."

New York-based architect Philip Speranza sat next to Echelman and translated her drawings and models into 3-D computer models. Peter Heppel and Associates in Paris resolved the aeronautical engineering issues, created the net shape and developed the software program for the piece. The structural engineers were AFAssociaados of Gaia, Portugal. The engineer of record was JV Partners. Everson Cordage/Diamond Nets in Washington State fabricated the piece both by hand and by machine. The net was then shipped in pieces to Portugal where it was installed on an

oval traffic island designed by landscape architect Eduardo Souto de Moura of Porto, who also created the lighting scheme so important for the effect of the sculpture at night.

The overall effect of the red and white sculpture—what Echelman describes as "wind choreography"—was achieved in great part through its raw material. After extensive research, Echelman's team specified Tenara Architectural Fabric by Gore™. Gore created Tenara by discovering a way to expand Polytetrafluoroethylene (ePTFE) into a yarn coated with a flexible fluoropolymer. PTFE is the chemical found in Teflon—a good thing considering that *She Changes* sits on a challenging site. "It needed to survive in a harsh, polluted, windy environment with periods of strong UV exposure," Echelman said. "It needed to be light enough to respond to the wind. I wanted it to retain a vivid red color without fading over time. It needed to be low maintenance, resist vandalism, and be built within \$1.6 million."

It also had to fit in with the directive of the client—the municipal government of Porto-Matosinhos for "a landmark symbol of the newly developed waterfront, visible at least 1 kilometer in all directions, including the ocean, while not blocking the views of the water," as Echelman explained. This ruled out solid objects. A net—symbolic of the region's fishing heritage—was the answer. However, using plant fibers, silk, or even nylon to make the ropes would not work for a permanent sculpture.

She Changes (detail), 2005.
Tenara® PTFE architectural fiber, 50 x 150 x 150 meter

"PTFE is a unique polymer," said Cindy B. Lubin of W.L. Gore. "It is the most inert polymer known. It has high tensile strength, resistance to creep, and superior flex resistance. It's a difficult polymer to manipulate, but Gore's expertise is in manipulating PTFE into forms like rods for fibers."

Echelman explained, "Tenara helped me solve many problems." "First, it is 100% UV resistant, and second, it is colorfast (they've put my red fiber in their test chamber, and it's now simulated more than 20 years with no fading whatsoever). One of the technical benefits of its UV-resistance is that it doesn't lose any strength over time, so we didn't have to over-engineer it to account for strength-loss, which I have to do with other types of textile structures. Tenara could be custom-pigmented in a large range of colors, including red, which is often a difficult color to get. It also had the suppleness and lightweight qualities that were necessary to get the choreography I wanted for the sculpture."

Part of this choreography involved the way the appearance of the piece changes from day to night. The net does not block the view to the ocean in the daytime, but when up-lit at night, it glows. Lubin explained that this glow comes from Tenara's "highly diffuse reflective" quality.

Although this was Echelman's first time using Tenara, it was not her first textile-related project. She used knitted stainless steel and nylon for

Eye of the Storm at Harvard University in 1999. In 2001, she used hand-knotted nylon for a pair of temporary sculptures in Spain as part of her *Target* series. She began this phase of her work in 1997 with nylon and cotton fishing nets inspired by time spent on the coast of India. This winter she'll install a new project that involves textile sculpture and projected light to transform a section of downtown Tampa, Florida, where she grew up. And she's in the early design stage of a monumental landmark project in the American Southwest. Echelman also works in brick, cast bronze and aluminum, blown and cast glass, welded steel, knotted and woven enamel-coated nylons and polyesters, and sewn vinyl-coated polypropylene.

Echelman also might have helped to create a new market for Gore. She and her collaborators went back and forth with Gore working out the tenacity and denier of the fiber as well as its color. "I can't say that we've ever done anything quite like this," said Lubin, who added that while the Tenara has been used in mobiles and as a secondary material in sculptures, *She Changes* was its first use as a primary material in art, particularly in the cord and net form. Since the completion of the project in Porto, artists have approached Gore about using Tenara and a few are in the early planning stages of using it in their work. ■