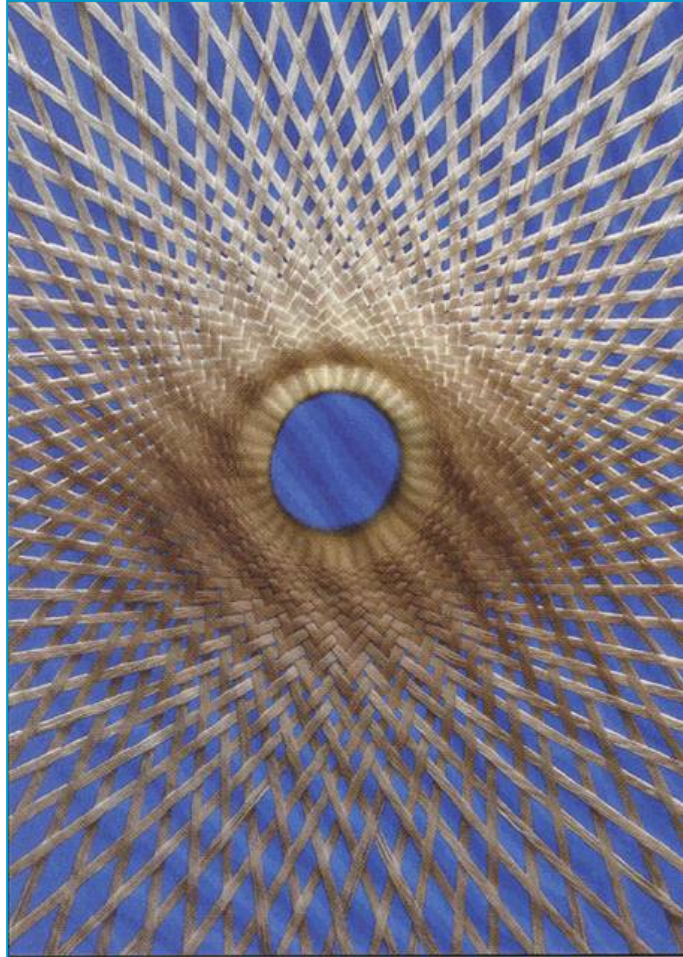


# *Extreme Textiles: Designing for High Performance*

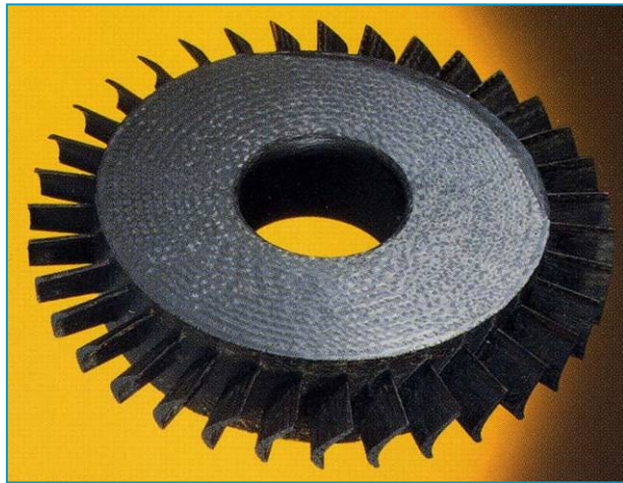


April 8, 2005 – January 15, 2006

Cooper-Hewitt, National Design Museum, Smithsonian Institution

## *Extreme Textiles: Designing for High Performance*

The exhibition, *Extreme Textiles: Designing for High Performance*, reveals the extraordinary innovations in textiles designed and engineered for ultimate performances in extreme circumstances. Known as technical textiles, they are



Rotor blisk for turbine engine, Foster-Miller Inc.

fundamental yet often disguised components in the environment around us: our landscape, our buildings, our vehicles, as well as in our bodies. Organized by Cooper-Hewitt, National Design Museum, Smithsonian Institution, *Extreme Textiles* will be the first major museum exhibition to explore this topic. Focusing on approximately 100 realized products or projects, this exhibition will unveil the unexpected and remarkable achievements of textiles in a wide range of areas including architecture, product design, apparel, medicine, transportation, aerospace, industry, and the environment.

In the last fifty years, new fibers, such as aramid and carbon fibers, have caused engineers and designers to re-examine the structural capabilities of traditional textile structures like weaving, knitting, braiding and embroidery. *Extreme Textiles* will explore the history and development of these innovative fibers and structures, some



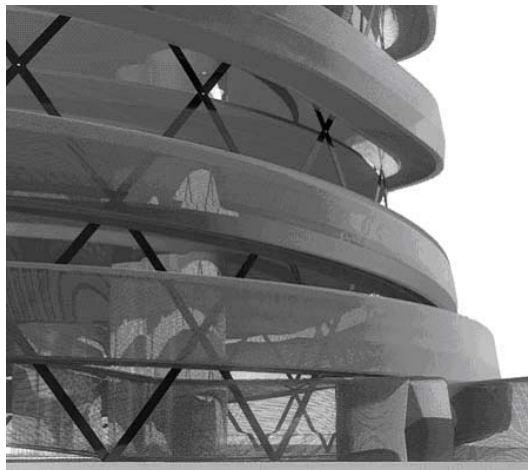
Composite racing scull, Van Dusen  
Racing Boats

based on ancient techniques, some inspired by nature, many unimaginable a century ago. The Cooper-Hewitt's own superb textile collection will be used to illustrate historical examples of textile structures and techniques that continue to be used in the most pioneering textiles today. The exhibition will also highlight the most current advancements in textile design and engineering from structural support for buildings to bio-implantable materials for surgery. Each combines the lightweight, flexible qualities of textiles with outstanding performance characteristics and represents the most dynamic and vital examples of contemporary design.

The exhibition is curated by Matilda McQuaid, Exhibitions Curator and Head of the Textiles Department. The 8,000-square-foot exhibition, which will have special installations in the garden, will be open at Cooper-Hewitt, National Design Museum in New York City, April 8, 2005-January 15, 2006.

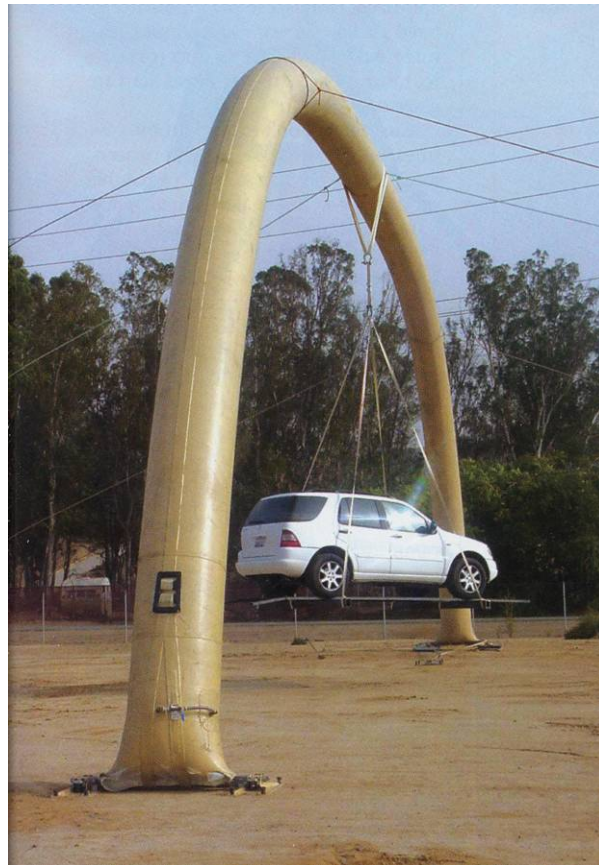
## About the Exhibition

*Extreme Textiles: Designing for High Performance* will be the first exhibition to look at the broad spectrum of contemporary design through the specific lens of textile fibers and structures. Materiality is at the heart of contemporary design, but textiles are frequently overlooked as high-performing materials with varied structural capabilities. The goal of this exhibition is to reveal the incredible breadth of areas in which textiles are being used, to show compelling solutions to engineering problems, and to provide inspiration for new approaches to design.



Peter Testa, Carbon Fiber Tower

The exhibition will focus on fully realized products or projects, highlighting the successful collaboration between design, industry, and science. As they are in the industry, the materials in this exhibition will be assessed in terms of their high-performance characteristics: **Stronger, Lighter, Faster, Smarter, and Safer.**



Airbeam inflatable support beam, USArmy and Vertigo Inc.

**Stronger:** Incredible strength is one surprising advantage of the new textile fibers. A flexible, soft polyester sling can do the lifting of a steel chain five times its weight. Airbags can be slipped deflated under collapsed structures, then inflated to lift

hundreds of tons. Inflatable braided Airbeams serve as structural support for temporary shelters such as airplane hangars and field hospitals.

**Lighter:** The quality of lightness is always a focus of design for space and aeronautics, where the cost of transporting materials is extraordinarily high. From the Wright Brothers' 1902 glider to the next generation of Mars rovers—large inflatable balls called Tumbleweeds—will present solutions to the problem of flight, and the numerous ways those solutions have been adapted for other purposes. Deployable, rigidizable trusses for space arrays will be compared with a carbon-fiber pedestrian bridge added to an existing bridge that could not support the weight of a traditional cement structure. Peter Testa's Carbon Fiber Tower project looks at the possibility of a future architecture that is entirely textile and can be fabricated on-site. A textile concrete reinforcement is suggested by the Universitat Kaiserlautern as a lightweight replacement for steel reinforcements in traditional concrete architecture. The main goal of the U.S. Army's Objective Force Warrior Program is to reduce the soldier's load from over 100 to under 40 pounds, which has led to unique collaborations with an eclectic group of non-military designers, who proposed everything from integrated antennas to nanofiber membranes to protect against biochemical hazards.



14' Racing Sailboat

**Faster** Textile foundations impart a high performance edge to all types of sporting equipment: sailboats, racing sculls, skis, skates, surfboards and bicycles have all benefited from the combination of strength, rigidity and light weight attained in carbon fiber composites. The highlight of this portion of the exhibition will be a small high-performance racing sailboat which is almost entirely textile, from its carbon-fiber hull and braided mast to its composite sail with unique fiber placement. Sailing has been closely linked to cloth from its beginnings, and sailboat designers have proved

real leaders in the development of textile-based composites. This area will also include the bicycle wheels that Tour de France competitor, Jan Ullrich, rides on, the prosthetic foot that Marlon Shirley ran on to set the world record for a disabled runner, and a Formula I racing car. Faster may also be interpreted as rapid deployment, as in the case of refugee shelters or oil-spill containment booms, which can be easily stored and quickly transported in emergency situations.

**Smarter** Because of the intimate contact of people with textiles in their apparel and in their home environments, textiles seem to be the natural choice for seamlessly integrated computing and telecommunications technologies. This area will include carpeting with sensors, which could form the foundation of any sort of smart home or responsive home environment. Margaret Orth's soft switches will allow the visitor a tactile sensation in which the common light switch is re-imagined as a pom-pom, tassel, or fur that one has only to touch. An interactive installation of electronic ropes will introduce a concept which could be used to create self-monitoring suspension bridges with smart cables which track the stress/strain load.

**Safer** In the area of protective apparel, textiles have been used against a startling array of hazards. Unique combinations of high performance fibers and structures make them cut, abrasion, or puncture-resistant, bullet-proof, protective against extreme cold and heat, chemical or biological hazards, radiation, or high voltages.

Borrowing from Smithsonian's National Air and Space Museum's fascinating collection of space and shuttle suits, this portion of the exhibition will explore the multiple layers of incredibly specialized textiles which comprise these designs, as well as show how those technologies have become available for police and fire-fighters' uniforms, exploration and sports apparel. Alternately, shielding fabrics provide protection for sensitive equipment from electromagnetic smog. The combination of textiles used in the Mars landing airbag provided protection from both mechanical and electrical damage for Pathfinder and Mer.



Mars Lander Airbag, NASA and ILC Dover

Medical textiles: A brief journey inside the body will look at textiles as they are used to replace or enhance human tissue. Knitted and woven polyester tubes have been used since the 1950s to replace human arteries in bypass surgeries. A simple nylon sock can be used to prevent enlargement of the heart in patients with congestive heart failure. The flexibility of machine embroidery may allow customized

replacement ligaments to be produced in a matter of minutes. Fibrous breast implants are being suggested as a safe replacement for silicone in reconstructive surgery. Currently, there is intense interest in the study of nanotechnology, which



Arterial graft, Boston Scientific Inc.

may provide the solution for tissue engineering. The process of electrospinning will be elucidated, with its vast potential for serious advancements in the creation of living, responsive tissue.

## Publication

The exhibition will be accompanied by a 240-page book with approximately 150 full-color photographs and 150 black and white and will include six essays by specialists in the fields of architecture, design, and textile engineering.

### Contents:

Foreword: Paul Warwick Thompson, Director, Cooper-Hewitt

Introduction: Matilda McQuaid, Exhibitions Curator and Head of Textiles,

Cooper-Hewitt

“Fibers and Structures: Case Studies”, Susan Brown, Curatorial Assistant, Textiles Department, Cooper-Hewitt

“Textiles and Structure in Architecture”, Philip Beesley, architect

Interview with Eric Goetz, master boatbuilder, Matilda McQuaid

“NASA Textiles”, Cara McCarty, Curator of Decorative Arts and Design, Saint Louis Art Museum

“Space Suit”, Amanda Young, Museum specialist, National Air and Space Museum

“Smart Systems”, Patricia Wilson, Principal Scientist, Foster-Miller Inc., Wearable Electronics Team

## Education Programs

### **Public Programs/Adult Audiences**

Design the Experience Conference:

The Conference will address the convergence of science, technology and design through focusing on development in textile technology. Topics will include the space suit, smart environments, bio-mimicry, and forward thinking architecture. Speakers will include Saul Griffith, MIT Media Lab Molecular Machines; Eric Goetz, master boatbuilder, Eric Goetz Custom Boats; Stephanie Kwolek, scientist and inventor of Kevlar; and curators from NASA.

Extreme Sport Performance Panel:

A discussion about design innovations in sporting equipment and the influence these products have in making humans faster, stronger and safer.

### **School, Youth and Family Programs**

School tours

Guided tours and activity guides engage young visitors in the design process as they explore the exhibition's objects and themes for information and inspiration.

### **Design Directions**

This series introduces New York City public high school students to college and career opportunities in design. *Extreme Textiles* will provide an exciting context for introducing students to many design career opportunities related to science and design.

### **Summer Design Institute**

Every year, 200 – 250 program participants learn strategies for promoting innovation, critical thinking, visual literacy, and problem solving across the K-12 curriculum and throughout the community. During the exhibition curator Matilda McQuaid will serve as a keynote speaker and NASA Habitability Center team will lead a workshop on creating livable environments in outer space, utilizing new materials.