

Adaptive Clothing

“No wardrobe malfunctions”



by Stephen Sundarrao
University of South Florida
Associate Director, Center for Rehab
Engineering & Technology

Clothing like other aspects of human physical appearance has social significance. They convey indications of the person's social class, income, occupation, ethnic and religious affiliation, attitude, marital status, sexual availability and sexual orientation. Clothes convey social messages including the stating or claiming personal or cultural identity, the establishing, maintaining, or defying social group norms, and appreciating comfort and functionality.



Adaptive clothing is a term applied to various types of garments worn by individuals with special needs ranging from those that may have arthritis and difficulty buttoning clothes to those in wheelchairs that need specially designed attire that allow the person to put them on and take them off in a seated position. Skimming the Internet, you will find various solutions such as Velcro, elastic laces and zippers that help overcome the barriers.

However there is an amazing amount of innovative technology in clothing that is available for other applications that can not only improve the look and design, but perhaps even enhance the function for an individual beyond just an outfit.

When NASA astronauts are suited up for space heroics they're more Marshmallow Man than Spider-Man, but that could change with a sleek new space suit designed by MIT aeronautics professor Dava Newman. The revolutionary BioSuit is lightweight and form-fitting, allowing physical feats not possible in the current bulky gear. Space suits now use gas pressurization—a mini-version of Earth's atmosphere—to balance the vacuum pull of space. That requires bulk and almost 300 lbs. of equipment. Newman's suits create a pressurized environment with tight layers of patterned nylon and Spandex to form a skeleton-like shell. She hopes they'll be ready in a about 10 years, just about the time NASA plans to be sending people to Mars.



Since the 1800s, when women used corsets stiffened by whalebone to support their breasts, bra designers have experimented with innumerable structures and materials. "Making a bra is like building a bridge," says Manette Scheininger, a senior vice president of design, merchandising, and research and development at Maidenform. "You have weight that has to be uplifted. You have to have support all around."

The first sports bra was created in 1977, when two American women took a pair of jockstraps, cut them apart, and sewed them back together. They dubbed their creation the Jogbra. Other bra designs since then have used gel and water pads, silver fibers that cool the skin and dispel bacterial growth and body odor, and air bags that wearers can pump up to enhance the appearance of their breasts. NuMetrex line of clothes that monitor the body provides a comfortable alternative to the cumbersome heart monitoring chest straps that tend to chafe, slip and loosen during workouts. NuMetrex garments -- including the Heart Sensing Sports Bra, Cardio Shirt for Men, and Racer Tank -- offer seamless comfort combined with superior monitoring performance. They sense heart rate through stretchy fabric electrodes that are knit directly into the fabric, and send that data to a compatible wrist watch or cardio machine via a tiny transmitter that is snapped into a pocket in the garment. Launched by



Textronics Inc. in December 2005. Sensatex, Inc. is a life science technology company focused on the development of Smart Textile Systems. Their first product, the Sensatex SmartShirt is a patented wearable Smart Textile unisex T-shirt designed to acquire physiological information and movement data from the human body. Originally developed and patented by researchers at the Georgia Institute of Technology and funded by DARPA, the primary research and development arm of the Department of Defense, the SmartShirt is made using any type of fiber. It is woven or knitted incorporating a patented conductive fiber/sensor system designed specifically for the intended biometric information requirements. Heart rate, respiration, and body temperature are all calibrated and relayed in real time for analysis.

At Tokyo University, a team led by Professor Susumu Tachi. The team has managed to create clothes that are covered in tiny pieces of glass which effectively become a screen. A video camera is then used to record the scenery behind the wearer and the results are projected onto the clothes. The effect is that the wearer appears 'transparent'. The team has said that the system is still less than perfect. Unless an observer is looking in roughly the same direction as the video camera, the clothes will not be a perfect match with the background. The claimed uses are for

things like surgery, allowing a surgeon to effectively see through their hands. We think they are seriously underestimating the revolution this technology could cause once it is perfected.

Cool Biz, a combination of the English words cool and business, is the catchword in Japan this summer. It is the title of a government campaign to persuade office workers to dispense with their ties and jackets as an environmentally friendly way of staying cool without lowering the air conditioner thermostat. And now an innovation called *kucho-fuku* (air-conditioned clothing) is taking the Cool Biz concept one step further. This new type of garb lets people stay cool even in long sleeves. Air-conditioned clothing, was unveiled by *Kuchofuku Inc.* went into full-fledged production in April 2005. Air-conditioned clothes have two small fans about 10 centimeters in diameter attached to the right and left sides of the back of the clothing, just above the waist. The fans draw in a large amount of air and help to vaporize sweat. As the perspiration evaporates, heat is dissipated, bringing down the wearer's body temperature.

Sweating is the human body's natural air conditioner, and air-conditioned clothes are designed to give this mechanism a boost, ensuring that it functions properly even on the hottest, most humid days.

Computer chips, sensors and other mini electronic devices have become embedded in just about everything — cars, toasters, credit cards, even dogs and cats. The next frontier for microelectronics may be clothing, according to an Arizona State University researcher who is trying to merge technology with fashion.

Frederic Zenhausern, director of the Applied NanoBioscience Center at ASU, has joined with Ghassan Jabbour, a professor at the University of Arizona, to develop two prototypes of "biometric bodysuits" that contain embedded sensors, power sources, microfluidic devices and other gadgets not normally associated with the latest Paris fashions.

Two prototypes, dubbed *Scentsory Chameleon Bodysuits*, were displayed May 14-16 at *NextFest 2004*, a future-technologies show sponsored by *Wired* magazine and *General Electric* in San Francisco. In the future, such an outfit could diagnose diseases and deliver medications to the wearer, monitor heart rate or blood pressure, deliver interactive games and other forms of entertainment or function as a wearable computer. Another possibility would be to download different designs from the Internet so the fabric could change colors and patterns, *Zenhausern* said. And it could all be made to look stylish by blending the electronics with high-fashion designs, he said.

The personal wellness garment was developed by *Zenhausern* with *Galina Mihaleva*, a costume designer in the dance department at the ASU *Herberger College of Fine Arts*; and *Jenny Tillotson*, a clothing designer based in London.

Dr. James Canton, chief executive of the *Institute for Global Futures* in San Francisco, said biometric clothing could reach the market in a few years. He said *Levi Strauss & Co.* already produces clothes with a nanotech coating that resists stains.

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