DuPont "Smart" Materials

Since the invention of Neoprene synthetic rubber and nylon in the 1930s, DuPont has led the way in developing innovative materials/fibers/textiles. Among these are Kevlar®, Tyvek®, Lycra®, and Coolmax®, which have significantly improved the quality of people’s lives. Smart fibers continue to build off DuPont’s heritage of innovation in materials development by bringing active functionalities to garments and textiles.

Developing Future U.S. Soldier Uniforms
DuPont is part of an effort by the Massachusetts Institute of Technology (MIT) to develop materials to equip the U.S. soldier of the future with uniforms and gear that help heal, shield and protect them against chemical and biological warfare. DuPont is among the Founding Industrial Partners who will work closely with MIT’s Institute for Soldier Nanotechnologies (ISN), the U.S. Army Natick Soldier Center, and the U.S. Army Research Laboratory to develop these revolutionary new materials. Engineers and scientists will work to develop ideas such as a uniform that is nearly invisible and soft clothing that can become a rigid cast when a soldier breaks his or her leg.

Fibers That Can Change Color and Shape on Command
Smart fibers can function as conductive "wires" and react to signals from electricity, heat or pressure. DuPont researchers are experimenting with different fiber profiles -- oval, square, or triangular -- that can be made to contract or expand to loosen and tighten clothing to make the wearer warmer or cooler. These fibers may ultimately combine with electronic devices, thereby enhancing fashion as well as function. For example, conductive fibers could change color on command from an electric signal that changes the reflective quality of specially dyed fiber/cloth.

Conductive Fiber with Kevlar®
Aracon® is a conductive fiber consisting of Kevlar® aramid fibers clad with a variety of metals. This results in a strong, light composite conductor and shielding material that combines the strength of Kevlar® (used in bullet-resistant vests) with the conductivity of metals. Aracon® fibers are stronger than steel, more flexible and lighter than copper, and good conductors of electricity.

Future Applications
DuPont researchers are now examining future applications for "smart materials," including:

- Sleepers that can monitor an infant's vital signs
- Garments featuring a weave that -- with the press of a button -- can open or close, to allow more or less airflow, increasing comfort during changes in weather or times of day/night