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New 'Smart-fabric' inspired by pine cones

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November 26, 2004 A new smart-fabric derived from the properties of pinecones has been developed by the UK based [Centre for Biomimetic and Natural Technologies](#). The fabric adapts to changing temperatures by opening up when warm and shutting tight when cold just like a pinecone's scales do in nature, and is just one of the emerging developments in the burgeoning field of "biomimetics".

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Smart by nature

Biomimetics is the science of applying nature's principles to human engineering and design. The concept is actually quite old - the Chinese wanted to make artificial silk 3,000 years ago, and Leonardo da Vinci copied the wing principles of birds for the designs of his flying machines. Scientists also announced in 2001 that they had gene-spliced a spider



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gene in goats to produce a silk-milk tougher than Kevlar that is being pursued for military applications.

The most commercial application of Biomimetics has been the development of Velcro by Swiss engineer George de Mestral in 1948. The product legend goes that after walking his dog and clearing the pet of burrs, Mestral realized how the burr hooks clung to fur and voila - Velcro was born. Now, with advances in technology and the need for sustainable technologies and whole systems thinking, Biomimetics is fuelling a scientific revolution.

"The new smart clothing will make wearers' lives much more comfortable by automatically adjusting their clothing to control their body temperature," said Julian Vincent, professor of biomimetics at the University of Bath in the United Kingdom, one of the main researchers in the emerging field.

"We've all known days when the weather alters quickly and it's difficult to dress to match the changing temperature. Often it's a case of being too hot or too cold, or taking a jumper on and off. The new smart clothing will make all that unnecessary and we're pleased to combine our expertise in technology with cutting-edge clothing design. We've drawn upon nature to come up with an idea by looking at how pine cones react to lack of moisture by opening up."

The "breathing" fabric is designed to stop the wearer getting hot or cold by adjusting itself to both internal and external temperatures. The textile is made up of a layer of thin spikes of wool, or another water-absorbent material, that opens up when it's made wet by the wearer's sweat. When the layer dries out, the spikes automatically close up again. A second layer underneath protects the wearer from the rain.

Pine cones similarly use two layers of stiff fibres running in different directions to open up and release their seeds when they fall to the ground. The seed release is stimulated by the lack of water as they're cut off from the tree.

This type of adaptive "[smart fabric](#)" could be of particular interest to the defence industry because a minimum of layers of clothing need be worn at all times, particularly in areas of the world with widely fluctuating temperatures. A soldier in the deserts around the Gulf, for instance, might need only a few layers by day in the baking heat but lots of layers by night in the chill of the sand.

The "pinecone fabric" will be representing British science at the 2005 [World Exposition](#) at Aichi, Japan from March - November, 2005. The Expo's theme is "Nature's Wisdom". The University of Bath has also entered into commercial research development with the [London College of Fashion](#) and is now hoping to attract commercial investment.

Other transgenic clothing projects worldwide include the jacket grown from living tissue developed by the Australian-based [Tissue Culture and Art Project](#). Grown using a combination of mouse and human cells, the two inch jacket was created in an

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attempt to create "victimless leather". Similar to the pine-cone inspired fabric, a "bionic jacket" powered by a six volt battery that regulates temperature via a computer and controls the desired fabric thickness, has been shown at www.alexsoza.com .



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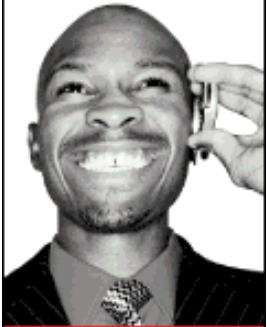
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