

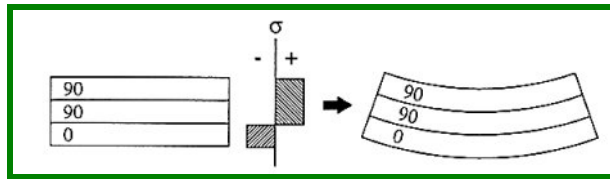
Pine Cone Effect

Biomimetic Principle

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- Pine cones are a source of inspiration for smart fabrics. When cones are hanging on the tree, they are firm and closed. But as they ripen and fall to the ground, they open in order to release the seeds.
- This works because the scales of the cone consist of layers of two materials that react differently to humidity. When the cone dries out, the scales will bend, because one of its sides will expand more than the other.



- This effect was mimicked (in reverse) by creating a multilayered textile with lots of little flaps, which automatically open when the person wearing it starts to sweat. When the skin returns to its normal humidity, the flaps will close again.

Further Information:

Papers:

Dawson, J., J. F. V. Vincent, et al. (1997). "How pine cones open." *Nature* **390**(6661): 668-668.

Websites:

<http://www.rdg.ac.uk/Biomim/projects.htm>

Applications

Responsive clothing, with transpirational properties based on the state of activity of the wearer, of particular interest to the defence industry

Current Commercial Development

Not yet developed