

Butterfly inspires new nanotechnology

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By mimicking microscopic structures in the wings of a butterfly, an international research team has developed a device smaller than the width of a human hair that could make optical communication faster and more secure.

The researchers, from Swinburne University of Technology in Australia and Friedrich-Alexander Universität Erlangen-Nürnberg in Germany, have produced a photonic crystal that can split both left and right circularly polarised light.

The design for this crystal was inspired by the *Callophrys Rubi* butterfly, also known as the Green Hairstreak. This butterfly has 3D nano-structures within its wings which give them their vibrant green colour. Other insects also have [nano-structures](#) that provide colour, but the *Callophrys Rubi* has one important difference.

"This butterfly's wing contains an immense array of interconnected [nano-scale](#) coiled springs that form a unique optical material. We used this concept to develop our photonic crystal device," Swinburne PhD graduate, Dr Mark Turner, said.

Using 3D laser nano-technology, the Swinburne researchers built a photonic crystal with properties that don't exist in naturally occurring crystals, specifically one that works with circular polarisation. This miniature device contains over 750,000 tiny polymer nano-rods.

The photonic crystal acts as a miniature polarising beamsplitter, similar to a device invented by Scottish scientist William Nicol in 1828. Polarising beamsplitters used in modern technology - such as telecommunications, microscopy and multimedia - are built from naturally occurring crystals, which work for linearly polarised light but not circularly polarised light.

"We believe we have created the first nano-scale [photonic crystal](#) chiral beamsplitter," Director of the Centre for Micro-Photonics at Swinburne, Professor Min Gu, said.

"It has the potential to become a useful component for developing integrated [photonic circuits](#) that play an important role in optical communications, imaging, computing and sensing.

"The technology offers new possibilities for steering light in nano-photonic devices and takes us a step closer towards developing optical

chips that could overcome the bandwidth bottleneck for ultra-high speed optical networks."

The research has been published in the journal *Nature Photonics*.

More information: [www.nature.com/nphoton/journal ...
photon.2013.233.html](http://www.nature.com/nphoton/journal...photon.2013.233.html)

Provided by Swinburne University of Technology

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