Chiral crabs

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Sander Wezenberg, and PhD students Thomas van Leeuwen and Kaja Sitkowska, from the University of Groningen in the Netherlands, spoke to us about their work in chirality and molecular motors, and the seaside scene on the cover of *ChemComm* that it inspired.

Chirality is a very important property in science and nature. It is a form of asymmetry, whereby you can have two objects that are identical in every way, except that they are mirror images of each other. Your hands are an example of a chiral object.

When chirality is applied to molecules, the two mirror-image forms of the molecule are referred to as isomers, and are often called the 'left-handed' and 'right-handed' isomer. It is very common for one isomer of a molecule to exist in nature, whilst the other isomer can only be obtained by synthesising it in a lab. "No-one knows where this preference for one chiral form in nature comes from", says Thomas. "It's still a bit of a mystery in chemistry."

This can be a problem for chemists, as sometimes it is the non-naturally-occurring molecule that is the most useful in reactions, and for applications such as drug molecules. It is therefore very useful to be able to convert a molecule from one chiral form to the other.

Flipping chirality

Switchable chiral polymers – that is, long molecules that you can flip between left-handed and right-handed chiralities – have applications in, for example, sensing materials.

"We are working on a way to control the chirality of polymers using a small molecular motor as a trigger," says Thomas.

Sander explains: "We have a very unique molecule – a molecular motor – in which you can control the chirality using a sequence of light and thermally-activated steps. We have now found a way to transfer the chiral information from that molecule onto another molecule – the polymer – meaning that you can control the handedness of the polymer in a dynamic way."

Molecular motors are a hot topic in the group, which is led by Ben Feringa who won the Nobel Prize in 2016 for his work in this area, alongside fellow recipients Fraser Stoddart and Jean-Pierre Sauvage.

The molecular motor attaches itself to the polymer via non-covalent interactions and light is used as a stimulus to switch its chirality. Because of the way it is attached to the polymer, the polymer also switches.

More information: Thomas van Leeuwen et al. In situ control of polymer helicity with a non-covalently bound photoresponsive molecular motor dopant, *Chem. Commun.* (2017). DOI: 10.1039/C7CC03188B

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