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Response of Sea Urchins to Light Polarisation

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The usefulness and importance of light polarisation have skyrocketed in recent times with applications found in biomedicine, imaging, characterisation of biological and chemical systems, and astrophysics just to name a few. Ecologically, more and more examples of flora and fauna are found to utilise the polarisation of light for growth, navigation, and communication, increasing the need for polarisation characterisation. Current polarimetric photodetectors for visible light generally use a polarising filter, which reduces their overall sensitivity and effectiveness. This motivates the search for better alternatives, both for linear and circular polarisations. In this work, we explore the possibility of polarisation detection via biomimicry by investigating the linear and circular polarisation sensitivity of the sea urchin species *Paracentrotus lividus*, *Echinus esculentus*, and *Psammechinus miliaris* through their phototactic responses under illumination of light. It was discovered that *P. miliaris* has the ability to differentiate between horizontally and vertically polarised halogen light and additionally *P. lividus* potentially has the ability to differentiate circularly polarised light. These findings could lead to a novel mechanism of polarisation detection in the visible domain and a step toward a new technology or its determination. Such a detector would be simpler compared to current alternatives, making it cheaper and easier to produce, and also allow for direct detection of polarised light in the visible wavelengths.

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