

Researchers develop mathematical model of flowers' iridescence

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(Phys.org)—Nature's ability to create iridescent flowers has been recreated by mathematicians at The University of Nottingham. The team of researchers have collaborated with experimentalists at the University of Cambridge to create a mathematical model of a plant's petals to help us learn more about iridescence in flowering plants and the role it may play in attracting pollinators.

An iridescent surface appears to change colour as you alter the angle you view it from. It is found in the animal kingdom in insects, inside [sea shells](#) and in feathers, and is also seen in some plants. Iridescence in flowers may act as a signal to pollinators such as bumble-bees, which are crucial to crop production.

Understanding how petals produce iridescence to attract pollinators is a major goal in [plant biology](#). An estimated 35 per cent of global crop

production depends on petal-mediated animal pollination but a decrease in pollinator numbers across the world has started to limit the odds of pollination and reduce crop production rates.

Flowers and the animals that pollinate plants interact at the petal surface. The surfaces of many petals have regular patterns, produced from folds of the waterproof cuticle layer that covers all [plant surfaces](#). These patterns can interfere with light to produce strong optical effects including iridescent colours, and might also influence animal grip.

Iridescence in plants is produced by nanoscale ridges on the top of the cells in the petal's epidermal surface. These tiny ridges produce structures called diffraction gratings. The particular shape and spacing of these ridges and the shape of the cells sculpt the outermost layer of the petal giving it a unique physical, mechanical or optical property. These properties interfere with different [wavelengths of light](#) creating the colour variation when it is seen at different angles. Pollinators, such as [bumblebees](#), can detect the iridescent signal produced by petal nanoridges and can learn to use this signal as a cue to identify rewarding flowers.

The research has been published in the *Journal of The Royal Society Interface*. Rea Antoniou Kourounioti, a PhD student in the School of Biosciences, said: "We provide a first analysis of how petal surface patterns might be produced. Our team of researchers combined experimental data with mathematical modelling to develop a biomechanical model of the outer layers of a petal or leaf. We used this to demonstrate that mechanical buckling of the outermost, waxy cuticle layer, can create the ridge patterns observed in nature on petals and leaves. Learning more about how [iridescence](#) is produced is important for pollination of crops and also for other types of patterning in biology."

Provided by University of Nottingham

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