

Iridescence of butterflies and paint

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From the outset of the Interact residency (Jan to June 08) I have been working with two second-year students on an **innovative physics project** ([/schools/biosciences/research/artists-in-residence/interact/project-description.aspx](#)), 'The Iridescent Properties of Butterflies and Paints', set by Dr Mark Colclough. Professor Mike Gunn (Head of the School of Physics and Astronomy) initiated the project with an eye on, and in response to, my residency theme.

Enjoyable, regular lab sessions with **Katie Lane and Andrew Emms** ([/schools/biosciences/research/artists-in-residence/interact/student-picture.aspx](#)), the two eager students who chose to undertake the topic, became an important fixture in my weekly schedule and proved to be mutually beneficial. And so were the discussions with Jonathan White, their day-to-day supervisor.

Having spent many years mixing colour merely by eye, the opportunity to familiarise myself with the measuring of wavelengths via spectrometry has been very welcome indeed. Adopting such scientific methodology seems particularly relevant in the context of a project that requires colour matching of a novel kind. Iridescent colour is not stable – it fluctuates depending on the incidence of light and viewing angle. For instance, in the case of *Morpho sulkowskyi* (one of the **butterfly species** ([/schools/biosciences/research/artists-in-residence/interact/butterfly-species.aspx](#)) investigated) as the viewing angle becomes increasingly oblique the intense electric blue changes from a greenish hue into a deep purple-toned violet, until the colour almost disappears. A beige ground-colour with brownish markings is then revealed.

With *Morpho didius*, on the other hand, the colour change was much less pronounced. Due to the colour-shift effect encountered, a series of **measurements from a number of different angles** ([/schools/biosciences/research/artists-in-residence/interact/different-angles.aspx](#)) have to be taken to pinpoint this rather elusive changeable colour. In the absence of purpose-built equipment Katie and Andrew have had to improvise and they have certainly risen to the challenge. It has been fascinating to watch them gradually assemble their apparatus, consisting of a light source (slide projector), collimator, an orbiting telescope arm, spectrometer and various focusing lenses. This experimental set-up has since provided useful measurements, in particular in terms of butterfly iridescence.

The iridescent paint samples I prepared to be compared with, and matched to, selected *Morpho* species, on the other hand, proved far more difficult to analyse. Nevertheless, some **preliminary comparative spectral analyses** ([/schools/biosciences/research/artists-in-residence/interact/paint-butterfly-spectra.aspx](#)) were made. Based on the data acquired, I subsequently developed small scale biomimetic studies, **simulating the natural iridescence** ([/schools/biosciences/research/artists-in-residence/interact/biomimetic-studies.aspx](#)) of *M.sulkowskyi* and *M.didius* using various combinations of paint layers.

Overall, while major strides have been made, there is ample scope for future, perhaps, more sustained research projects. Regarding the mutual benefits, Katie and Andrew have approached the project with curiosity, an open mind and perseverance. In addition to acquiring relevant data, they seem to have developed an appreciation and understanding of the optical **mechanisms underlying iridescence** ([/schools/biosciences/research/artists-in-residence/interact/mechanisms.aspx](#)) in both nature and art. Katie is planning to specialise in optics in her final year. In return, the students have most definitely helped me branch out and venture further into relatively new territory – the world of spectrometry. Perhaps, most importantly, on the way we have all become increasingly aware of how seemingly disparate disciplines can truly complement one another.

This work was part of the **Interact (Artists in Industry)** (<http://www.interact.mmu.ac.uk/placements/profile.php?artist=29>) programme.



F.Schenk



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Same painting illuminated from a range of angles

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