Targeted Project / AY 2023 -2024

Evolution of petal patterning: a multi-faceted approach

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Research area: Evolution of development

Project outline:

Flowering plants appeared 300 million years ago, with flowers as one of their main innovations. Flowers facilitate the fertilization of female ovules by male pollen, for example by attracting pollinators with showy petals, and are therefore a key feature for plant evolution. This project is a collaboration between the Moyroud and Vroomans groups at SLCU, where we will study the evolution of petal patterning with computational models.

There are three possible angles to this project, depending on the interests of the candidate (with an option to perform experiments as well). Firstly, we can construct computational evolutionary models to generate regulatory networks that can pattern petals, using growth patterns identified through experiments as starting point. Because petals are modified leaves from an evolutionary viewpoint, we can use this approach to understand how the petal patterning mechanism was co-opted from the regulatory network that patterns leaves, and answer general questions about the evolution of novel traits.

Secondly, we can investigate how the regulation of petal growth interplays with its patterning. The signals that pattern cell fate, and possibly growth, are asymmetrically distributed. How can this give rise to a symmetrically shaped and patterned petal?

Finally, the Moyroud group has shown that pollinators have innate preferences for particular pattern sizes, but can still learn to visit flowers with different pattern dimensions. How do pollinator preferences and the regulation of petal patterning co-evolve to generate diversity in flower patterns? This will allow us to study the evolution of development in a broader ecological context.

BBSRC DTP main strategic theme: Understanding the rules of life