

## **Pollen-pistil communication in flowering plants: a role for pollen endocytosis?**

### **Supervisory team:**

**Main supervisor:** Dr Barend H. J. de Graaf (Cardiff University)

**Second supervisor:** Dr Emyr Lloyd-Evans (Cardiff University)

Dr Walter Dewitte (Cardiff University), Dr Veronica Grieneisen (Cardiff University)

**Collaborators:** Dr Kate Heesom (University of Bristol), Liquids Research Ltd

**Host institution:** Cardiff University

### **Project description:**

Reproduction success in flowering plants is unequivocally determined by the species-specific communication events between pollen and pistil resulting in fertilisation, and the development of viable seeds ultimately. Upon pollination, only own pollen will be accepted and continue their journey through the pistil whereas all other 'foreign' pollen will be rejected. After pollination, pollen grains produce a tube needed for the accurate delivery of sperm cells to the female embryo sacs deep down in the pistil ovary, harbouring the egg cells that are waiting to be fertilised. These pollen tubes show polarized growth, a type of cell growth which is characterised by extension at the growing apical domain only. Signals provided by the different female pistil tissues guide these pollen tubes in the right direction over long distances in a relatively short time. How growing pollen tubes perceive these signals & translate them into a (species-specific) growth response is currently not known. Two processes of membrane trafficking at the apex characterize this polarized growth in pollen tubes: exocytosis and endocytosis. In other eukaryote cell types, including in plants, the process of endocytosis has been demonstrated to play an important role in cell and tissue signalling. However, a role for endocytosis in intra and inter-specific pollen tube communication with the surrounding pistil tissues has not been established yet.

This PhD-project includes a wide range of state-of-the-art research techniques: from protein biochemistry, molecular biology, genetics, microscopy and imaging analysis, to mathematical modelling. In collaboration with Dr Emyr Lloyd-Evans, the successful candidate will identify and functionally characterise pollen and pistil-proteins that are taken up by pollen tube endocytosis, and establish a link between the endocytic activities found during the polarised tip growth with pollen tube growth efficiency *in vivo*. The candidate will make use of immunoaffinity purification strategies to obtain tissue-specific organelle fractions followed by proteome analysis (mass-spectrometry) and generate transgenic plants to unravel pollen or pistil-protein function. In addition, the candidate will also obtain important skills in life cell (confocal) microscopy and image analysis in the lab of Dr Walter Dewitte at Cardiff University. Applicants for this PhD post with experience in plant cell biology & general protein analysis research would be favourable.