**Targeted Project / AY 2024 -2025**

# Developmental mechanisms of air space morphogenesis in plant leaves

**Project Code:** TRG-SLCU-CW

**Supervisor:** Dr Chris Whitewoods (chris.whitewoods@slcu.cam.ac.uk)

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**Co-supervisor:** Prof Henrik Jönsson (Sainsbury Laboratory)

**Research area:** Developmental and Computational Biology

**BBSRC DTP main strategic theme:** Understanding the rules of life

**BBSRC DTP secondary strategic theme:** Bioscience for sustainable agriculture and food

**Project outline:**

Plants are full of holes. In leaves, air-filled spaces between cells make up to 70% of leaf volume. These air spaces increase the efficiency of gas exchange for photosynthesis, but how they are made is poorly understood. A key hypothesis is that faster growing epidermal tissue pulls apart slower growing internal mesophyll cells to form air spaces. However, this has never been tested.

In this project the student will use a combination of computational modelling and genetic perturbations to generate and test hypotheses of how air spaces form and are patterned in plant leaves. They will use confocal microscopy to characterise air space formation in leaves of the model plant arabidopsis, and use transgenic approaches to alter growth (cell expansion and division) between layers, quantifying any changes. The student will also develop computational models of air space formation. These models will use the developmental data from arabidopsis as a starting point and will test how differential patterning of cell division, expansion and adhesion between layers can contribute to air space formation and patterning. They will combine these data with known molecular regulators of air space formation discovered in the Whitewoods lab to gain a holistic understanding of how molecular mechanisms regulate local differences in growth to drive air space formation at the organ scale in plant leaves.