When to grow up? The spatiotemporal regulation of shoot maturation in plants

Supervisory team:
Main supervisor: Dr Jim Fouracre (University of Bristol)
Second supervisor: Prof Kerry Franklin (University of Bristol)

Collaborators: Dr James Clark (University of Bath)

Host institution: University of Bristol

Project description:
How individuals mature throughout a life-cycle is a key question in developmental biology. Maturation occurs by two mechanisms: discrete transitions between different developmental stages and a continuous aging process. The correct timing of developmental transitions and the rate of aging are controlled by both endogenous and environmental factors, and are critical for survival and reproductive success. In flowering plants there has been considerable research into the regulation of developmental transitions, such as from the juvenile to the adult phase of vegetative development, and the switch from vegetative (when only leafy shoots without flowers are produced) to reproductive growth (floral induction). The aging process for individual organs, termed senescence, has also been well defined. However, due to the high speed at which model plant species like Arabidopsis transition between different stages of growth, it has been difficult to distinguish the shoot-wide effects of aging from those of discrete developmental transitions.

Making use of new genetic lines and technological advances, we will investigate how aging and developmental transitions are coordinated during shoot maturation. Specifically, we will quantify genome-wide changes in gene expression and chromatin accessibility in the meristems of wild type plants (that undergo developmental transitions) and genetic mutants that remain in the juvenile phase. In doing so we will reveal unique and novel signatures of plant aging and make insights into the temporal regulation of plant stem cells. Given the importance of shoot maturation to crop yields (for example through the regulation of plant establishment and the timing and longevity of seed production) the results are likely to have strong potential for improving agricultural outputs. This project will combine fundamental training in plant molecular biology and bioinformatics and is ideal for a candidate looking to acquire essential tools in developmental genetic analysis.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.