Do unrelated plants growing in the same region look similar due to climate adaptation?

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Which features of plants are adaptations to the climate and which are climate neutral? How much variation (plasticity) can a plant species show in adapting to short and medium term climate change? Are the plants we see today primarily a product of climate change over evolutionary time?

Plants are a key factor in the global climate balance, they absorb CO_2 and emit oxygen, they stabilize soils and intercept rainfall, reducing erosion, they generate local microclimates and can slow the spread of deserts. However, analysis of the physical and biochemical traits of plant species in relation to climate adaptation is currently quite limited in scope. The focus of such research is generally on crops or whole ecosystems, such as grassland or forest.

This PhD will study physical, biochemical and genetic features in three distantly related plant groups at the species-level to search for common patterns in relation to climate adaptation. The plant lineages under study occur predominantly in the Mediterranean climatic region but members of these lineages have spread beyond this climate zone. Common changes in features among these lineages will help understand the constraints on species imposed by climate. Your input into the project will be to test and evaluate as wide a range of characters as possible for the obvious or cryptic influence of climatic.

Over the course of two years, working alongside the experts at University of Reading and the Royal Horticultural Society, you will build up extensive datasets of features for the approximately 200 study species and these will be interpreted in the light of molecular phylogenies and climate envelope models. The applicant will have the opportunity to study preserved plants in herbaria, cultivated plants, and possibly some species in the field. You will have the opportunity to interact with internationally recognised expert groups in phylogenetics at Reading and horticultural taxonomy at the RHS Wisley.

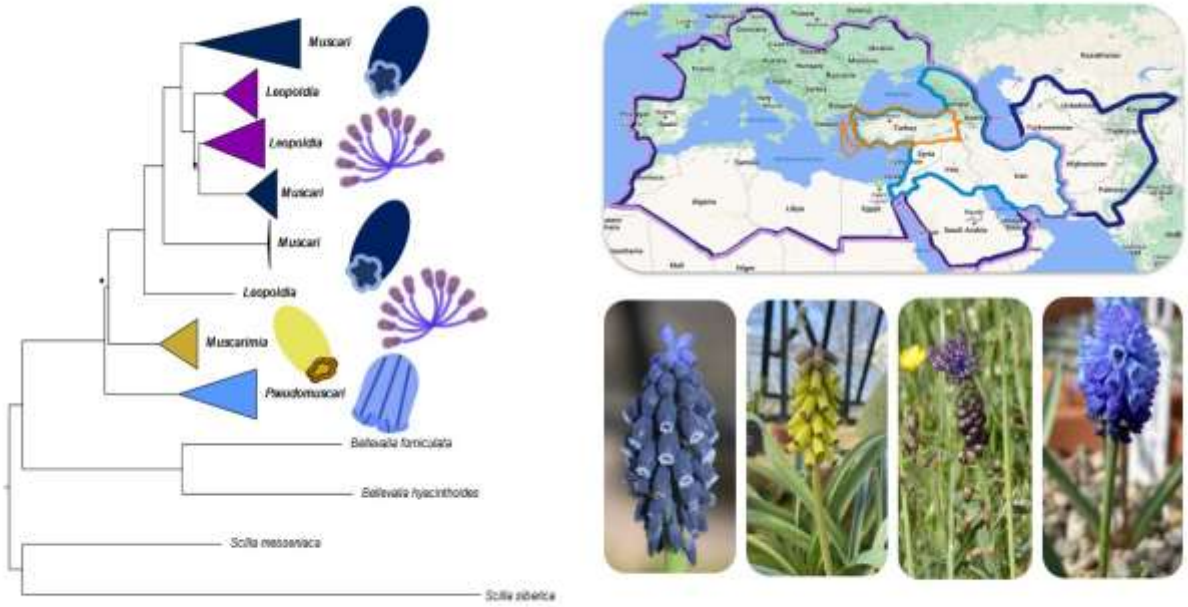
During the first year of the PhD you will develop your skills in phylogenetics and climate modelling. You will begin a survey of herbarium and living specimens to build a spreadsheet of plant characters. You will develop an initial ontology to describe the features you find.

In the second year you will have opportunity to focus on some features that show exceptional promise as adaptive elements but also aim to detect those that might be neutral in relation to climate. You will have the chance for an outreach event to communicate your findings to a broader public.

Your final year will be the opportunity to complete the data synthesis, fill any crucial data gaps and complete the thesis.

Along the way you will publish papers reporting your progress and the completion of particular aspects of the study. Key findings will contribute to the global knowledge of the adaptations of plants to their environments and their ability to expand beyond previously occupied niches.

We will promote outreach activities throughout the PhD.



Training opportunities:
You will work primarily in the new Health and Life Sciences Building and newly refurbished University Herbarium. You will also have opportunity to work with the professionals at the Royal Horticultural Society garden, Wisley. You will interact with a range of specialist growers and will be encouraged to plan a field visit to see some of your study organisms in nature.

Student profile:
This project would suit an enthusiastic and hardworking student with skills in practical biology, especially those with experience of plant morphology. Familiarity with 'R' would be valuable. Good teamwork skills are essential as you will work as part of a larger research group.

Funding particulars:
The project is sponsored as a CASE studentship with the Royal Horticultural Society. You will have opportunity to interact with the broad group of PhD students supported by the RHS.

References: (optional)

Some useful background reading includes: Yesson, C., Toomey, N.H. and Culham, A., 2009. Cyclamen: time, sea and speciation biogeography using a temporally calibrated phylogeny. *Journal of Biogeography*, *36*(7), pp.1234-1252.

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