**MORPHIDAS: Morphometric Herbarium Image Data Analysis**

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**Introduction**

The Herbarium at the Royal Botanic Gardens, Kew contains over 7 million plant specimens. Many of these are irreplaceable, and of great scientific importance. Worldwide, major herbaria contain nearly 200 million specimens between them, and many herbaria are starting to digitise their collections.

*How can we make best use of such digital herbaria? What can we learn from them?*

Morphidas is a new 3-year project, funded by the Leverhulme Trust, that aims to develop and test new methods to analyse digital images of herbarium specimens.

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**Project aims**

Our project aims include:

- Working with whole herbarium specimens, including those with damaged leaves
- Automated extraction and analysis of morphological measurements
- Automated plant identification
- Investigate the effects of climate change on leaf morphology

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**Climate change**

Leaf shape is influenced by the temperature: warmer environments tend contain species with fewer teeth on the leaf margins, for example. We will extend this by analysing a large number of specimens, collected over the last 200 years from all over the world, and by measuring a wide range of morphometric features. We will also compare leaves from specimens of the same species that were collected from different environments.

As climate change becomes more rapid and widespread, an important aim of this project is to improve our understanding of the relationship between climate and leaf shape.

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**Automation**

To process thousands of specimen images, automation is necessary. Tasks to automate include:

- Locating individual leaves within images
- Locating margins and veins of leaves
- Using image processing to extract morphological features
- Measuring the patterns of variation of morphological features within and between groups
- Virtual restoration of damaged leaves