Summer scholarship projects available in the Nicotra lab

For more information contact Adrienne.Nicotra@anu.edu.au
Or see http://science.anu.edu.au/srs/rsb/ for application materials.

1. Physiological response and growth of subtropical Eucalypts following defoliation.

Eucalypt trees naturally lose leaves to processes such as insect attack and wildfires. In plantations, artificial defoliation (pruning) is an important silvicultural tool for enhancing commercial log value. From the tree's perspective however, any leaf loss removes the photosynthetic machinery required to capture the energy needed for survival and growth. Previous research has demonstrated that a number of Eucalypt species have an ability to compensate for lost foliage through a short-term increase in the photosynthetic capacity of the remaining crown. However, it's not clear how these species respond to repeated leaf loss, or whether Eucalyptus species differ in their ability to tolerate leaf loss. The scholar on this project will contribute to a large collaborative study investigating physiological responses to leaf loss in several *Eucalyptus* species and will conduct a focused independent study on a sub-set of these species. Through this work the scholar will learn a broad range of contemporary techniques in plant physiological ecology. The project is supported in part by the Forestry CRC.

2. The role of phenotypic plasticity in plant invasions and its implications for biodiversity under climate change

Invasive plants have proven their ability to colonise novel environments. The mechanisms underlying invasion however, remain poorly understood. Invasive plant populations often display differences when compared to populations in their native range. For example they may look different and appear to be more responsive to environmental growth conditions, suggesting that rapid evolution, high levels of phenotypic plasticity or a combination of these are contributing to their success. These same processes may facilitate invasive plants to adapt to rapid global climate change. As part of a larger collaborative study involving CSIRO Entomology, the scholar will conduct a focused independent study comparing growth and physiological traits of a native and an invasive species occuring across a broad environmental gradient. The project may involve some fieldwork in arid NSW, and will provide the scholar with a broad range of contemporary techniques in plant physiological ecology.

3. Alpine seed ecology: Australian alpine seed ecology: Plant conservation and adaptation to climate change

The Australian alpine region is critically vulnerable to climate change and increased human activity. Many alpine plant species are already threatened with extinction. The summer scholar on this project will be part of an enthusiastic team of ecologists, botanists and seed scientists currently investigating impacts of climate change on the reproductive ecology and demography of Australian alpine flora. This scholarship will involve fieldwork in the Australian Alps as well as work at the Australian National Botanical Garden Seed Bank. In addition to taking on a focused independent project, the scholar will contribute to *in situ* field surveys, seed collecting activities, and will learn first hand about seed banking as a tool for *ex situ* plant conservation. Project outcomes will contribute to facilitating effective management of Australian alpine flora, enabling us to preserve alpine biodiversity and improve ecosystem resilience to climate change.

4. The ecology and evolutionary biology of Australian *Pelargonium* species

Australia's native *Pelargonium* species (relatives of the horticultural geraniums) are found throughout the temperate region of the country and are characterized by being very amenable to harsh conditions, and in having very variable form depending on growth conditions. Their variability has led to confusion about how many species of *Pelargonium* we really have, and to interesting questions about how the group has diversified. This project is part of a larger study on the evolution of the group and will focus on reproductive traits in particular. The scholar will contribute to fieldwork as well as conduct a focused glasshouse experiment to determine what the breeding systems of a subset of the species are.