**Title:**

**ABIOTIC STRESS TOLERANCE IN MODEL AND CROP PLANTS: UNDERSTANDING THE ROLE OF MEMBRANE LIPID REMODELING AND LIPID METABOLISM.**

**Background:**

To date, studies into the molecular mechanisms important for withstanding salinity stress have focused primarily on the transport and movement of sodium within the plant and the changes in primary metabolism required for cellular synthesis of compatible solutes to balance salt accumulation [1], and have **largely overlooked the important role of membrane lipids.** Biological membranes serve as barriers and allow compartmentalization and maintenance of gradients within the cell, however that is not their only function. There is strong evidence emerging which implicates membrane lipid remodelling as an **important factor in abiotic stress tolerance.** This has been best described for sensing temperature and nutrient stress [2], with only a handful of studies describing a role of membrane lipids in salinity stress and tolerance [3]. This is despite the need to maintain membrane integrity, structure and function under dehydrating and strong ionic conditions, as well as the increasing evidence for the participation of lipid-derived signalling in sensing environmental changes and triggering downstream signalling cascades [4]. Numerous studies have detected changes in membrane permeability with salt stress and results indicate that these alterations differ with the degree of salt tolerance of the plant [5]. As permeability can be directly related to alterations in membrane lipid composition and lipid damage, this highlights an important role of membrane lipids in salt tolerance.


**Experimental approaches:**

This project will involve the fractionation of cellular and endomembranes using cutting edge technology to obtain highly pure membranes that will be used for downstream protein and lipid Mass spectrometry profiling as well as targeted quantitative next-generation proteomics approaches to identify components essential for salinity induced membrane remodelling and regulation of lipid metabolism.

A refined set of objectives will be developed by the student in collaboration with the supervisor Dr Bronwyn Barkla. The PhD study will make use of a series of unique resources and technology available within the Southern Cross Plant Science research centre.

In the first year, the candidate will be expected to:

- Prepare a critical and comparative review of the literature associated with abiotic stress induced lipid remodelling in glycopytes and halophytes.
- Grow sufficient plant material to prepare large quantities of microsomal membranes for fractionation.
- Determine the degree of salinity induced lipid remodelling in the cellular membranes by FITR
- Develop experience with relevant laboratory methods, and bioinformatics and statistics analysis platforms.
**Training:**
This studentship would be suitable for a graduate in plant sciences with a strong biochemical and molecular background and, will provide training in:

1. Experimental design
2. Proteomics and lipidomics research.
3. Bioinformatics, statistics and data interpretation
4. Dissemination of research results including the preparation of high impact refereed publications

In addition, this PhD studentship will be managed within the SCU postgraduate training programme in Plant Science Innovation [http://scu.edu.au/scps/index.php/161](http://scu.edu.au/scps/index.php/161), which provides opportunities to benefit from a broader range of professional training alongside the focused research project.

**Links to ongoing work and potential collaboration:**
Southern Cross Plant Science, SCU carries out research underpinning the selection, cultivation and utilization of plants. SCPS infrastructure includes facilities for plant growth, analytical chemistry, high-throughput DNA sequencing, genotyping, proteomics and bioinformatics. The candidate will also benefit from expertise and experimental resources available within the wider SCU research environment.

**Scholarship:**
$27,000 per annum