EUC MS intro 2

1. Introducing ecological proteomics

The last few decades have seen a step change in our ability to describe biological forms and processes at the molecular level

Tech is allowing us to move away from focusing only on model organisms; we now have complete sequence data for many species

Transcriptomics is perhaps the best developed omics approach in ecology, and gives us a high-throughput approach to characterise gene expression under different conditions

Information about protein abundance may be more useful information for answering many ecological questions where [protein] ~ the capacity for perfoming a certain function. I.e. when it is important not simply that a certain protein or protein group is present, but how \*much\* is present.

Proteomics has not really caught up with transcriptomics: ecology really needs scalable methods for absolute quantification of proteins in wild organisms.

1. A continental-scale field study of the molecular composition of leaves

We have developed proteomics methods that allow comprehensive extraction of leaf proteins and absolute quantification of the top 2000-3000 most abundant proteins. This allows us to compare protein abundances between samples, which has been achieved in model organisms under controlled environments but not with a large-scale, fully replicated ecological study in wild plants.

We have used this new tech to conduct a continental-scale ecological proteomics study to ~~characterise~~ the influence of biogeographic and environmental controls on of leaf protein expression.

We sampled leaves from Acacia, Eucalyptus and the Proteaceae (three of the most dominant plant lineages in Australia) across eastern Australia, X km N/S by X km E/W.

This paper introduces our approach and dataset and presents an initial foray into a new field.

1. How do leaves construct their photosynthetic apparatus in different environments?

There are factorial possible combinations of hypotheses about relationships between abundances of different protein categories and environmental conditions. We concentrate here on *photosynthesis* as it represents the most abundant set of biochemical reactions on the planet.

Much of what is known about photosynthetic capacity in wild plants is based on using leaf N as a proxy – more leaf N, more photosynthetic proteins. Photosynthesis links global C and N cycles (Maire 2012?) and leaf N is important in global scale terrestrial biosphere and coupled climate-vegetation models (Kattge 2009).

We can now develop a more nuanced understanding of how plants allocate resources to the two major components of photosynthesis: the light capturing photosystems and the carbon fixing Calvin cycle enzymes.

Our analysis was guided by some fundamental ecological hypotheses: