Welcome plenary lecture

00-01: Spectroscopy in plant-animal interactions: Looking at the natural world as a herbivore

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The nutritional quality of food eaten by wild vertebrate herbivores influences why animals occur where they do. Crude protein and poorly-defined complexes such as "fibre" are the most widely used indicators of quality and are often combined as ratios of dubious validity. Furthermore, ecologists seem to have abandoned earlier collaborations with chemists to study other plant constituents and continue with uninformative assays (e.g. total phenolics) with little or no evidence that they improve our understanding of animal foraging choices. Furthermore only a few samples of each species are usually analysed despite potentially large intra-species variability in forage quality.

Spectroscopic methods are an ideal to way to address many of these problems. Quantitative, near infrared reflectance spectroscopy (NIRS) has proved particularly suitable for the rapid analysis of large numbers of samples. Not surprisingly, we often find that variation within a plant species is greater than variation between species within a landscape.

However, beyond analytical speed, spectroscopy allows the capture of complex compositional data from plants far beyond the handful of traits that are currently analysed in ecological studies. Responses of animals to variations in plant composition can be modelled better by spectroscopy than by identifying individual chemical components. For example, the best measure of the quality of food for koalas is how much they are willing to eat. This can be much better explained by NIR spectra of *Eucalyptus* leaves than by any combination of known nutrients and toxins. Thus, instead of seeing a forest as a chemically variable landscape, spectroscopy allows us to more closely approximate its value from a herbivore's perspective.

Finally, quantifying the factors important in the distribution and abundance of animals across wide areas requires complex statistical models that account for the heterogeneous nature of landscapes and allow us to isolate the impacts of individual variables alone and in combination with other factors. We are currently testing how we incorporate spectra into these modelling structures so that plant composition can be more widely used into conservation planning.