Biology 314/414 –

**Taming the Tree of Life: Phylogenetic Comparative Methods—**

**from Concept to Practical Application**

**Graduate student topic:**

**Phylogenetic diversity**

Phylogenetic diversity is one of many diversity metrics used to understand how and why species are distributed across a landscape. It can be seen as an analog of species diversity or functional diversity. Phylogenetic diversity is increasingly taken into account when making conservation decisions.

*Measuring phylogenetic diversity*

In order for phylogenetic diversity to be useful, it must be calculated for a data set with many species. The most common data sets for which phylogenetic diversity is informative are community data sets, which summarize the species in a given area.

It is possible to measure phylogenetic diversity using many different metrics. One of the simplest and most common metrics is to trace the shortest distance between two species along the edges of a phylogenetic tree. The distances for each species pair are then averaged, resulting in a mean phylogenetic distance. Mean distance can then be explicitly compared among groups or used as a covariate for analyses between groups.

There are different ways to tweak this diversity measure. Think about how species abundance might play into phylogenetic diversity. What if there is just one individual that is distantly related to the other species, and all the other individuals are closely related? Could this be a problem?

**For this laboratory assignment, please follow these instructions:**

1) Today we will be working with a community data set from the Sherman forest plot in Panama. Sherman has a 5.96 hectare long term forest monitoring plot with size, species, and location of each individual tree. Part of the plot has 200-year-old forest, while part of the plot has forest cleared within the last 20 years. We will be comparing these two forest types. Open the file Phylo\_Diversity\_Lab.R

2) Go through the code file to calculate the mean diversity for one plot, and then for all the plots. Which forest type has the higher diversity?

3) Explore the other diversity index option. What is this second index telling us? Which forest type has higher diversity now?

4) Follow the code to make a plot of the difference between diversity by forest type. The area of each forest type in our data set is not the same. What is the code doing to try to make up for this?

5) Based on your answers to the above questions and based on the results you obtained from this lab, write a short paragraph of the type you would find in a discussion section. The paragraph should reference the results by way of the figure you created (and please include a caption). Make sure to explain any caveats to the results.