



**Date:** Monday, 24 October 2022

**Time:** 11:00am – 12noon

**Speaker:** Professor Andrew Francis (Western Sydney University)

**Venue:** Hybrid – In-person at Macquarie University and Zoom

**Title:** Sandwiches, eggs, and trees: phylogenetic trees and partitions of finite sets

**Abstract:** Phylogenetic trees are ways to graphically represent the evolutionary history of a set of species, and have been around since the days of Charles Darwin. They are simple graph-theoretical objects in a sense, with leaves representing observations in the present, a root representing the nearest common ancestor, and internal vertices that represent speciation events. Reconstructing a tree based on observations in the present, however, is a complicated task, often involving statistical evolutionary models together with searches over tree space.

This talk will be taking a strictly \*combinatorial\* view of phylogenetic trees. Specifically, I will describe the surprisingly general fact that the set of phylogenetic trees and forests corresponds to the set of partitions of finite sets. This builds on work due to Diaconis and Holmes in 1998. This sort of correspondence opens doors to looking at trees and forests through the lens of set partitions and the diverse mathematics that comes with such general ideas. In particular I will describe a connection to Brauer diagrams, and take a little peek into what sort of algebraic structures might create new ways to look at tree space.

Joint work with Peter Jarvis, recently published in Proc Roy Soc A, 2022.

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