Linking pattern and process in cultural evolution

Bryan Wilder
University of Central Florida

Mentors: Laura Fortunato, Santa Fe Institute and Anne Kandler, City University London

This work aims to lay the theoretical and methodological foundations for investigating how individual level interactions aggregate to produce population level patterns of cultural diversity. Cultural traits can be transmitted between individuals in different ways. Here we investigate the dynamics produced by horizontal transmission (transmission within age groups), vertical transmission (from parent to child), oblique transmission (from older generations to younger), and random transmission (between any two individuals in the population). We ask under what conditions population-level characteristics such as cultural diversity show a distinctive signature of the underlying transmission process. To investigate this question, we develop an agent-based simulation model capturing the demographic and cultural dynamics relevant to the process of cultural transmission. Using this model, we develop theoretical expectations for the distribution of several population-level measures under different modes of transmission and show under what situations the distributions over each measure can be distinguished. We find that distinguishability depends on several factors, primarily the frequency with which traits are transmitted. In particular, traits which are transmitted obliquely have a much more homogeneous distribution than other traits when the rate of transmission is high. Additionally, traits which are transmitted via multiple different mechanisms can show higher diversity than traits that have only a single means of transmission. However, under many conditions we find that commonly used population-level statistics cannot distinguish between competing hypotheses.