Review of Madsen, Mark E. and Carl P. Lipo’s “Behavioral Modernity and the Cultural Transmission of Structured Information: The Semantic Axelrod Model.”

I am familiar with the authors’ research that explores cultural evolution through computer simulation. This paper presents an important model that explores how the structure of cultural information affects cultural evolution. This research integrates graph theory/social network analysis concepts with an individual-based model to examine the population-level patterning of cultural traits. One of the primary contributions of the model is the way that the authors conceptualize cultural information as structured knowledge that naïve agents acquire from others through social learning. It is refreshing to read a discussion that acknowledges the “complicated and multifaceted” nature of cultural evolution. The authors apply this model to the evolution of behavioral modernity in homonins.

Although computationally intensive, this model seems to make a valid contribution to our understanding of cultural evolution. However, the contribution of this article could be strengthened by a couple of revisions that could increase its impact.

Comments:

1. The authors seem to be focused on cultural evolution in hominins rather than the larger group of hominids. They do not discuss social learning among other apes.
2. Page 11: A relevant aspect of the learning strategy discussion is the cost-benefit tradeoff of the teachers discussed in Shennan and Steele 1999.
3. Page 21-24: A general question about the use of information with tree-structure concerns the suitability of this model for various cultural traits. When would non-tree structure be a better model for the structure of information? The justification of the tree structure as well as the various graph metrics needs to be more explicitly outlined in this section. This would help the reader understand the importance of different metrics of the graphs that are varied in the model. At the moment, it is difficult for the reader to trace the expectations of different graph structures or properties of the graph like automorphism.
4. Page 26-27: The link between the simulation experiments and the archaeological problem outlined in the introduction could be better articulated here.
5. Page 29: What else could explain the extremely low cultural diversity that characterizes the material culture during the Lower and Middle Paleolithic? It is important to think about the overlap in outcomes between the variables presented in this model and other evolutionary forces including selection, particularly when discussing an analogy with technology that could have some outcome on food gathering, and processing.