1086-52-2286 **Dominic Spadacene*** (domspad@umich.edu), 6003 Woodview Pass, Midland, MI 48642, and **Craig Corsi**, **Satyan Devadoss** and **Daoji Huang**. *Polyhedral Coverings of Tree Space.*

A classical problem in computational biology is the construction of a phylogenetic tree from a sequence alignment of n species. The work by Billera, Holmes, and Vogtmann (2001) provides a construction of a space T_n of such trees, which was shown to have a CAT(0)-structure, enabling the computation of geodesics and centroids. Due to its conical structure, the combinatorial characteristics are encoded in its cross-section L_n, a simplicial complex, which from an operadic viewpoint corresponds to fully-grown trees. We provide a novel construction of L_n in the language of the associahedron and the permutohedron, famous classical polytopes that encapsulate algebraic information. These polytopes themselves appear in numerous contexts, ranging from root systems and knot theory to Floer homology and moduli spaces of curves. We prove that L_n is covered by $n!$ associahedra, with the discrete fiber over this map keeping track of the planarity of the tree structure. Moreover, permutohedra are shown to be embedded in L_n, each corresponding to a caterpillar tree. Finally, we reinterpret the topological results regarding L_n of Robinson and Whitehouse (1996), demonstrating that each permutohedron completely captures the homotopy structure of L_n as a wedge of spheres. (Received September 25, 2012)