COMBINATORICS OF THE TREE AMPLITUHEDRON

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The tree amplituhedron $A(n, k, m)$ is a geometric object generalizing the positive Grassmannian, which was introduced by Arkani-Hamed and Trnka in 2013 in order to give a geometric basis for the computation of scattering amplitudes in $N = 4$ supersymmetric Yang-Mills theory. I will give an elementary introduction to the amplituhedron, and then describe what it looks like in various special cases. For example, one can use the theory of sign variation and matroids to show that the amplituhedron $A(n, k, 1)$ can be identified with the complex of bounded faces of a cyclic hyperplane arrangement (and hence is homeomorphic to a closed ball). I will also present some conjectures relating the amplituhedron $A(n, k, m)$ to combinatorial objects such as non-intersecting lattice paths and plane partitions.

This is joint work with Steven Karp, and part of it is additionally joint work with Yan Zhang.