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Catalan Combinatorics of Finite Coxeter Groups

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Recently, a new perspective has emerged in the study of finite Coxeter groups, first appearing in the work of Haiman in the 90's. There is a ``Catalan number `Cat(W)` associated to each finite Coxeter group W, with the classical Catalan numbers associated to the symmetric groups. Along with this comes a family of numbers, including generalized Naryana numbers and ``positive'' Catalan numbers.

There are three families of objects that embody this ``Catalan combinatorics'': the ad-nilpotent ideals in a Borel subalgebra of a Lie algebra, the cluster complex (associahedron) of Fomin and Zelevinsky, and the generalized noncrossing partitions. Each of these families is intrinsically worthy of study, and there are many open conjectures relating the families to eachother.

I will outline these three beautiful topics and try to give a hint of the deep connections between them.
