COMBINATORICS SEMINAR
Descents, Peaks and P-partitions

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Abstract:

In the group algebra of the symmetric group, let E_i be the element of formed by taking the sum of all permutations with i descents. The linear span of the E_i forms a subalgebra of the group algebra called the Eulerian descent algebra.

We describe the structure of this and similar subalgebras, where we can replace descents with cyclic or augmented descents, and the symmetric group with the hyperoctahedral group. Our main tools are variations on Stanley's theory of P-partitions.

Analogous structure can be found in Eulerian peak algebras (the span of sums of permutations with common peak numbers) by using variants of Stembridge's 'enriched' P-partitions. The formulas derived suggest that such peak algebras for the symmetric group are images of descent algebras in the hyperoctahedral group, a fact recently proved in work of Aguiar, Bergeron, and Nyman.