Generalized Jucys-Murphy elements and canonical idempotents in towers of algebras

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The collection of symmetric group algebras serves as a motivating example for what I'll call a multiplicity-free family of finite dimensional algebras. Any such family has a canonical complete set of pairwise orthogonal primitive idempotents stemming from its representation theory. In the case of the symmetric group algebras, these idempotents were first given a tidy formula by Thrall (1941) using the infamous "Young symmetrizers." After explaining what I mean by "multiplicity-free family" and "canonical," I'll provide other examples (Brauer algebras will feature prominently), then highlight several methods to compute these idempotents based on work of Jucys, Murphy, and Vershik--Okunkov. Opportunities for SageMath projects--- including some suitable for novices---will be littered throughout. (Based on work with S. Doty and G.H. Seelinger, arXiv:1606.08900.)