1073-05-201 **Joshua N Cooper*** (cooper@math.sc.edu), 1523 Greene St, LeConte College, USC, Columbia, SC 29201, and **Aaron Dutle**. *Spectra of Hypergraphs.*

We present a spectral theory of hypergraphs that closely parallels graph spectral theory. Classic work by Gelfand-Kapranov-Zelevinsky and Canny, as well as more recent developments by Chang, Friedland, Lim, Pearson, Qi, Zhang, and others has led to a rich understanding of "hyperdeterminants" of hypermatrices, a.k.a. multidimensional arrays. Hyperdeterminants share many properties with determinants, but the context of multilinear algebra is substantially more complicated than the linear algebra required to understand spectral graph theory (i.e., ordinary matrices). Nonetheless, it is possible to define eigenvalues of a tensor via its characteristic polynomial and variationally. We apply this notion to the "adjacency hypermatrix" of a uniform hypergraph, and prove a number of natural analogues of graph theoretic results. Computations are particularly cumbersome with hyperdeterminants and resultants, so we discuss software developed in Sage which can perform basic calculations on small hypergraphs. Open problems abound, and we present a number of directions for research.

Joint work with Aaron Dutle of the University of South Carolina. (Received August 01, 2011)