On vanishing and separation properties of characters

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Norddeutsches Gruppentheorie-Kolloquium
November 4-5, 2005

In work by G. Malle, G. Navarro and J. Olsson the classical theorem by Burnside on the existence of character zeros was refined; this led to a question on character zeros of prime order in the case of the symmetric and alternating groups. In recent joint work with J. Olsson this was settled by investigating partitions with "small" p-cores. A consequence of this led to the question whether a partition of n is characterized by all or even just a few of its p-cores, for primes $p \leq n$. In character theoretic terms, this asks for a separation of any two irreducible characters of the symmetric group S_n by p-blocks, where $p \leq n$ are suitable primes. In recent joint work with G. Malle and J. Olsson, we have studied this separation problem for the symmetric and alternating groups and their covers, and also for groups of Lie type and sporadic groups.