On noncoprime fixed point free action

Let G be a finite group and A be a group of automorphisms of G. The structure of the fixed point subgroup

$$C_G(A) = \{g \in G | g^a = g \quad \text{for all} \quad a \in A\}$$

of A in G and the way it is embedded in G have been found to be very informative about the structure of G. Problems of this type are studied by many mathematicians under the assumption that $|G|$ and $|A|$ are relatively prime. There exist certain very useful relations between the groups G and A which facilitate the applications of some inductive arguments. In the case of a noncoprime action it less so. It is conjectured that the Fitting length of G is bounded above by the number of primes dividing the order of A when G is solvable, A is nilpotent and $C_G(A) = 1$, in other words A acts fixed point freely on G. The aim of this seminar is to present recent contributions to this problem.