

# Supercharacter theories for Sylow $p$ -subgroups

## ${}^3D_4^{syl}(q^3)$ , $G_2^{syl}(q)$ and ${}^2G_2^{syl}(3^{2m+1})$

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Classifying the conjugacy classes of the upper unitriangular group  $U_n(q)$  (of Lie type  $A_{n-1}$ ) for all  $n$  and  $q$  is known to be a “wild” problem. P. Diaconis and I.M. Isaacs (2008) introduced a coarser approximation of the character theory, called the *supercharacter theory*. In this talk, I will present an overview of the results of my thesis. I will give the constructions of the supercharacter theories for Sylow  $p$ -subgroups  ${}^3D_4^{syl}(q^3)$ ,  $G_2^{syl}(q)$  and  ${}^2G_2^{syl}(3^{2m+1})$ . Then I will briefly introduce the character tables of Sylow  $p$ -subgroups  ${}^3D_4^{syl}(q^3)$ ,  $G_2^{syl}(q)$  ( $p > 3$ ) and  ${}^2G_2^{syl}(3)$ , and the monomial modules of the Sylow  $p$ -subgroups  $E_6^{syl}(q)$ ,  $F_4^{syl}(q)$ ,  ${}^2E_6^{syl}(q^2)$  and  $E_7^{syl}(q)$ .