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*Graded modules over simple Lie algebras with a group grading*

The Cartan decomposition of a semisimple Lie algebra with respect to a Cartan subalgebra can be regarded as a grading by a free abelian group. Gradings on Lie algebras by various abelian groups arise in the theory of symmetric spaces, Kac-Moody algebras, and color Lie superalgebras. In the 1960s, V. Kac classified all gradings by cyclic groups on finite-dimensional simple Lie algebras over complex numbers. Recently, with efforts of several authors, the classification of gradings by an arbitrary abelian group  $G$  has been obtained for any classical simple Lie algebra  $L$ , except of type  $D_4$ , over an algebraically closed field of characteristic different from 2. Given such a grading on  $L$ , it is natural to study graded  $L$ -modules. In characteristic 0, any finite-dimensional graded  $L$ -module is a direct sum of simple graded  $L$ -modules. We will describe finite-dimensional simple graded  $L$ -modules and consider the following related problem: which of the finite-dimensional  $L$ -modules admit a  $G$ -grading making them graded modules? This is a joint work with Alberto Elduque.