

RESEARCH ANNOUNCEMENTS

THE RESTRICTED SIMPLE LIE ALGEBRAS WITH A TWO-DIMENSIONAL CARTAN SUBALGEBRA¹

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The classification of the finite-dimensional simple Lie algebras over an algebraically closed field of prime characteristic p is still an open problem after 40 years of investigation (going back to the pioneering work of Jacobson and Zassenhaus). The problem can be made more tractable by considering only restricted Lie algebras (i.e., Lie p -algebras), these being Lie algebras with an extra mapping $x \mapsto x^p$ satisfying certain hypotheses, in particular $(\text{ad } x)^p = \text{ad } x^p$ (see [3, p. 187]); throughout the subject's history this restriction has proved fruitful, being a good indicator of the general shape of nonrestricted results as well. It is also customary to exclude some small p . But even with these two hypotheses the problem remains very much open, although progress to date (some of it mentioned below) and the new contribution announced here, namely, the classification of the algebras of the title, give cause for optimism.

From now on let L denote a finite-dimensional simple restricted Lie algebra over an algebraically closed field F of characteristic $p > 7$ (some of the results cited below hold in more generality). The known L are of two kinds: either classical, i.e., algebras of the usual types A_n, \dots, G_2 , these being analogues of the finite-dimensional simple Lie algebras over \mathbb{C} , or of Cartan type, i.e., one of the algebras W_n, S_n, H_n or K_n , these being analogues (previously known but first described in this way by Kostrikin and Šafarevič [7]) of the infinite-dimensional simple Lie algebras over \mathbb{C} corresponding to Lie pseudogroups. In particular, W_n is the np^n -dimensional Jacobson-Witt algebra

$$\text{Der}\{F[x_1, \dots, x_n]/(x_1^p, \dots, x_n^p)\};$$

for the definition of S_n, H_n, K_n see [7], [8].

Kostrikin and Šafarevič conjectured [7] that every L is of either classical or Cartan type. For rank 1 (where as usual L is said to have rank r if it has a Car-

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