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Vyjayanthi Chari, Department of Mathematics, University of California Riverside, Riverside, CA 92521-0135, and **Jacob Greenstein*** (jacob.greenstein@ucr.edu), Department of Mathematics, University of California Riverside, Riverside, CA 92521-0135. *Free Lie algebras and representations of current algebras.*

We realize the polynomial current algebra of a Kac-Moody algebra as a quotient of a semi-direct product of the Kac-Moody Lie algebra and the free Lie algebra of the Kac-Moody algebra. We use this realization to study the representations of the current algebra. In particular we see that every ad-invariant ideal in the symmetric algebra of the Kac-Moody algebra gives rise in a canonical way to a representation of the current algebra. These representations include certain well-known families of representations of the current algebra of a simple Lie algebra. Another family of examples, which are the classical limits of the Kirillov-Reshetikhin modules, are also obtained explicitly by using a construction of Kostant. Finally we study extensions in the category of finite dimensional modules of the current algebra of a simple Lie algebra. (Received September 09, 2005)