1086-11-764 **Stephan Ramon Garcia*** (stephan.garcia@pomona.edu), Department of Mathematics, Pomona College, 610 N. College Ave., Claremont, CA 91711. *Supercharacter theory and Ramanujan's sum.*

We demonstrate that many of the fundamental algebraic properties of Ramanujan sums can be deduced using the theory of *supercharacters*, recently developed by Diaconis-Isaacs and André to study the representation theory of the unipotent matrix groups $U_n(q)$. This new machinery frequently yields one-line proofs of difficult identities and provides many novel formulas. We also discuss generalizations which encompass Gauss and Kloosterman sums, as well as several related classes of exponential sums which produce visually striking patterns. (Received September 12, 2012)