

962-11-852

**Brian J Conrey\*** (conrey@aimath.org), 360 Portage Ave., Palo Alto, CA 94306, and **Jonathan P Keating, Michael Rubinstein** and **Nina C Snaith**. *Central vanishing of quadratic twists of modular L-functions*. Preliminary report.

In this talk we present some evidence that methods from random matrix theory can give insight into the frequency of vanishing for quadratic twists of modular L-functions. The central question is the following: given a holomorphic newform  $f$  of weight  $k$  and level  $N$  with integral coefficients and associated  $L$ -function  $L_f(s)$ , for how many fundamental discriminants  $d$  with  $|d| \leq x$ , does  $L_f(s, \chi_d)$ , the  $L$ -function twisted by the real, primitive, Dirichlet character associated with the discriminant  $d$ , vanish at the center of the critical strip to order at least 2? This question is of particular interest in the case ( $k = 2$ ) that the  $L$ -function is associated with an elliptic curve, in light of the conjecture of Birch and Swinnerton-Dyer which asserts that the order of vanishing of the  $L$ -function is the same as the rank of the group of rational points on the associated elliptic curve. Goldfeld has conjectured that, asymptotically, 1/2 of the quadratic twists of an elliptic curve will have rank 0 and 1/2 will have rank 1. Consequently, few of the twists should have rank 2 or higher. Our heuristics are an attempt to determine more precisely how frequently this phenomenon happens. (Received September 27, 2000)