I will discuss recent work with Chantal David, Alexander Dunn, and Joshua Stucky, in which we prove that a positive proportion of Hecke L-functions associated to the cubic residue symbol modulo squarefree Eisenstein integers do not vanish at the central point. Our principal new contribution is the asymptotic evaluation of the mollified second moment with power saving error term. No asymptotic formula for the mollified second moment of a cubic family was previously known (even over function fields). Our new approach makes crucial use of Patterson's evaluation of the Fourier coefficients of the cubic metaplectic theta function, Heath-Brown's cubic large sieve, and a Lindelöf-on-average upper bound for the second moment of cubic Dirichlet series that we establish. The significance of our result is that the (unitary) family considered does not satisfy a perfectly orthogonal large sieve bound. This is quite unlike other families of Dirichlet L-functions for which unconditional results are known (the symplectic family of quadratic characters and the unitary family of all Dirichlet characters modulo q). Consequently, our proof has fundamentally different features from the corresponding works of Soundararajan and of Iwaniec and Sarnak.