Abstract: A fundamental problem in the area of quantum chaos is to understand the distribution of high eigenvalue eigenfunctions of the Laplacian on certain Riemannian manifolds. A particular case which is of interest to number theorists concerns hyperbolic manifolds arising as a quotient of the upper half-plane by a discrete "arithmetic" subgroup of $SL_2(R)$ (for example, $SL_2(Z)$, and in this case the corresponding eigenfunctions are called Maass cusp forms). In this case, Rudnick and Sarnak have conjectured that the high energy eigenfunctions become equi-distributed. I will discuss some recent progress which has led to a resolution of this conjecture, and also on a holomorphic analog for classical modular forms. I will not assume any familiarity with these topics, and the talk should be accessible to graduate students.

NOTE: After the Ramanujan colloquium, Professor Soundararajan will give two Number Theory Seminars on related topics at 10:40am, Thursday March 25 and Friday March 26 in LIT 339 (The Atrium).