

COLLOQUIUM

Salle des Conférences de l'IECN

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Random matrices: some current developments

In classical quantum mechanics the eigenvalues of the Hamiltonian provide labels for the states of the system. Physicists observed many years ago that in a large interval of a relatively large eigenvalue the distribution of the eigenvalues in the interval resembled the distribution of eigenvalues of a random matrix having symmetry properties similar to the Hamiltonian. Moreover, performing an ensemble average, then varying the size of the matrices, the resulting limiting distribution had remarkable similarities to the statistics of the physical system.

In recent years, Katz and Sarnak have done similar statistical analyses of random matrices from families of the classical compact Lie groups and applied the results to algebraic geometry of curves over finite fields. While Rudnick, Sarnak et al have studied the statistical properties of zeroes of L-functions over number fields.

In this lecture I shall present some of the historical motivation for these investigations, describe some of the ideas used to obtain the limiting distribution, and explain the applications to number theory in a particular case.