From the Manhattan Project to Elliptic Curves

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007 Kemeny, 3:30PM
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Abstract

Physicists developed Random Matrix Theory (RMT) in the 1950s to explain the energy levels of heavy nuclei. A fortuitous meeting over tea at the Institute in the 1970s revealed that similar answers are found for zeros of L-functions, and since then RMT has been used to model their behavior. The distribution of these zeros is intimately connected to many problems in number theory, from how rapidly the number of primes less than X grows to the class number problem to the bias of primes to be congruent to $3 \bmod 4$ and not $1 \bmod 4$. We report on recent progress on understanding the zeros near the central point, emphasizing the advantages of some new perspectives and models. We end with a discussion of elliptic curves. We'll mix theory and experiment and see some surprising results, which lead us to conjecture that a new random matrix ensemble correctly models the small conductor behavior.

This talk should be accessible to graduate students.