



# GRADUATE PROGRAM THEORETICAL PHYSICS

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## COLLOQUIUM

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**Jamal Sakhr  
Harvard University**

**Thursday, June 15, 2006  
1:30 pm  
Middlesex College, Rm 204**

### **Wigner Statistics and Classical Conservative Chaos**

Over the last 30 years, the quantum manifestations of classical chaos ('quantum chaos') has been a subject of intense interest. A pioneering paper was published by Bohigas, Giannoni, and Schmit in 1984, which initiated an entire subfield of 'quantum chaos' research. In their paper, they put forward a now famous conjecture which essentially purported that the spectral statistics of quantum systems whose classical analogs are hard chaotic systems are universal and obey the statistical laws that govern the behavior of eigenvalues from ensembles of large symmetric random matrices. The short-range statistics are the so-called Wigner statistics. Since 1984, Wigner statistics have been repeatedly observed in many numerical studies and are now widely accepted as 'quantum signatures of classical chaos'. Despite the fact that the BGS conjecture is by now numerically well-established, a rigorous proof is still lacking. In this talk, I will introduce a new insight based on some recent calculations that involve a statistical analysis of classical trajectories evolving on the Poincare surface of section. These calculations are motivated by a stunning result from the theory of spatial point processes. The results clearly show that there is a beautiful correspondence that exists for the shortest-range statistics but unfortunately this correspondence is lost at longer ranges. These results challenge certain statements made by several authors that no analogous universality exists in classical mechanics that underlies the universality observed in the behavior of quantum systems.

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*Coffee and cookies will be available following the talk.*