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The Skeleton of Chaotic Eigenstates

Abstract: The correspondence between Classical and Quantum Mechanics is well understood in integrable systems but it still an open problem when the system is no longer integrable and chaos takes place. The field that studies the quantum manifestations of classically chaotic systems is usually known as "Quantum Chaos" [1]. Periodic Orbits (OPs) have a dramatic influence on the classical dynamics of a chaotic system, when the motion is no longer confined to invariant tori due to their breakdown according to KAM Theorem. The influence of the periodic orbits (POs) on the density of states of a chaotic system has been known for a very long time since Gutwiller's celebrated Trace Formula [2]. Unfortunatelly, this expression is not usefull for practical reasons, as the number of POs that must be considered increases exponentially. One of the most surprising phenomena in Quantum Chaos is scarring. Scar functions were originally defined as eigenstates that had an enhanced probability density concentrated over unstable POs [2]. This definition was later generalized to groups of eigenstates [3]. More recently, it has been demonstrated that scarring does not only take place over the unstable POs but also over their invariant manifolds [4]. Scarring allows one to identify classical structures that create the eigenstates of a system, thus identifying the classical skeleton of purely quantum objects [5]. In this talk, we will briefly summarize the history of scar functions and discuss some of their most important properties.

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Lugar: ***Sala de Conferencias de Serrano 121***
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