



ICTS SPECIAL COLLOQUIUM

# Mathematical models of quantum chaos

I will report on recent progress towards fundamental conjectures in quantum chaos, which assert that the statistics of quantum energy levels should be governed by a Poisson point process if the system is completely integrable (Berry & Tabor, 1977) or by random matrix theory if the underlying classical dynamics is “chaotic” (Bohigas, Giannoni & Schmit, 1984). In the case of the Laplacian on flat tori, the question reduces to a natural problem on the distribution of values at integers of a quadratic form, which in turn is intimately related to the classical Oppenheim conjecture. We will also discuss the Laplacian on a compact hyperbolic surface and review some recent evidence for the emergence of random matrix statistics in the limit of high genus. This talk will straddle aspects of analysis, geometry, number theory as well as mathematical physics, and should be accessible to a broad audience.



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Jens Marklof holds the Henry Overton Wills Chair in Mathematics at the University of Bristol. His areas of expertise include dynamical systems and ergodic theory, quantum chaos, and the theory of automorphic forms. Marklof graduated from Hamburg (Dipl-Phys 1994) and Ulm (PhD 1997), and held research fellowships at Princeton University, Hewlett-Packard, the Isaac Newton Institute in Cambridge, the Institut des Hautes Etudes Scientifique and the Laboratoire de Physique Theorique et Modeles Statistiques near Paris. Marklof delivered a plenary address at the International Congress of Mathematical Physics in Prague 2009, and was an invited section speaker at the International Congress of Mathematicians in Seoul 2014. Major awards include the LMS Whitehead Prize in 2010 and an ERC Advanced Grant 2012-17. In 2015, Marklof was elected a Fellow of the Royal Society, the UK's national academy of sciences. He served as President of the London Mathematical Society from 2023 to 2025.

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Madhava Lecture Hall



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