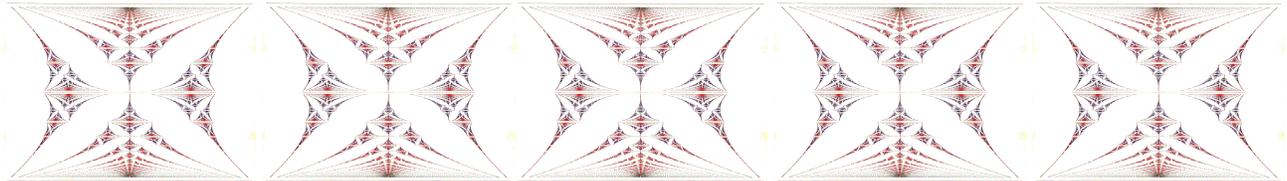


COLLOQUIUM

MATHEMATICS AND STATISTICS
QUEEN'S UNIVERSITY



LYAPUNOV EXPONENTS, SMALL DENOMINATORS, ARITHMETIC SPECTRAL TRANSITIONS, AND UNIVERSAL HIERARCHICAL STRUCTURE OF QUASIPERIODIC EIGENFUNCTIONS

Abstract. A very captivating question in solid state physics is to determine/understand the hierarchical structure of spectral features of operators describing 2D Bloch electrons in perpendicular magnetic fields, as related to the continued fraction expansion of the magnetic flux. In particular, the hierarchical behavior of the eigenfunctions of the almost Mathieu operators, despite significant numerical studies and even a discovery of Bethe Ansatz solutions has remained an important open challenge even at the physics level.

I will present a complete solution of this problem in the exponential sense throughout the entire localization regime. Namely, I will describe, with very high precision, the continued fraction driven hierarchy of local maxima, and a universal (also continued fraction expansion dependent) function that determines local behavior of all eigenfunctions around each maximum, thus giving a complete and precise description of the hierarchical structure. In the regime of Diophantine frequencies and phase resonances there is another universal function that governs the behavior around the local maxima, and a reflective-hierarchical structure of those, a phenomena not even described in the physics literature.

These results lead also to the proof of sharp arithmetic transitions between pure point and singular continuous spectrum, in both frequency and phase, as conjectured since 1994. The talk is based on papers joint with W. Liu.

Svetlana Jitomirskaya (UC Irvine)

Svetlana Jitomirskaya earned her Ph.D. in Mathematics from Moscow State University in 1991 under the supervision of Ya.G. Sinai with a thesis on *Spectral and Statistical Properties of Lattice Hamiltonians*. Her awards include the A.P. Sloan Research Fellowship (1996-2000), the AMS Satter Prize (2005), the EPSRC Fellowship at Cambridge University (2008), the Simons Fellowship (2014-2015), and the Aisenstadt Chair at the CRM in Montréal (2018). Prof. Jitomirskaya was also an invited speaker at the 2002 International Congress of Mathematicians in Beijing. She solved (with Artur Avila) the famous *Ten Martini Problem* in 2009. Her research focuses on Mathematical Physics and Dynamical Systems.

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2:30pm · JANUARY 19 · 2018