2D Anderson Localization belongs to KPZ Universality Class

G. Lemarié

MajuLab, CNRS-UCA-SU-NUS-NTU International Joint Research Unit, Singapore.
Centre for Quantum Technologies, National University of Singapore, Singapore.
Laboratoire de Physique Théorique, Université de Toulouse, CNRS, UPS, France.

In this talk, I will present our recent findings on two-dimensional Anderson localization, demonstrating its connection to the Kardar-Parisi-Zhang (KPZ) universality class. The KPZ equation [1], which describes the growth of rough interfaces. It is well-known for its universal scaling exponents and distributions, which have been found to apply to a variety of classical and quantum systems. Following early studies [2], our numerical analysis reveals key properties of the KPZ universality class in the fluctuations of the density logarithm of 2D Anderson localized wave packets [3], as illustrated in Fig. 1, as well as in eigenstates [4] and the conductance logarithm [5,6]. This analogy provides Anderson localization with a wealth of predictions in a regime difficult to access analytically.

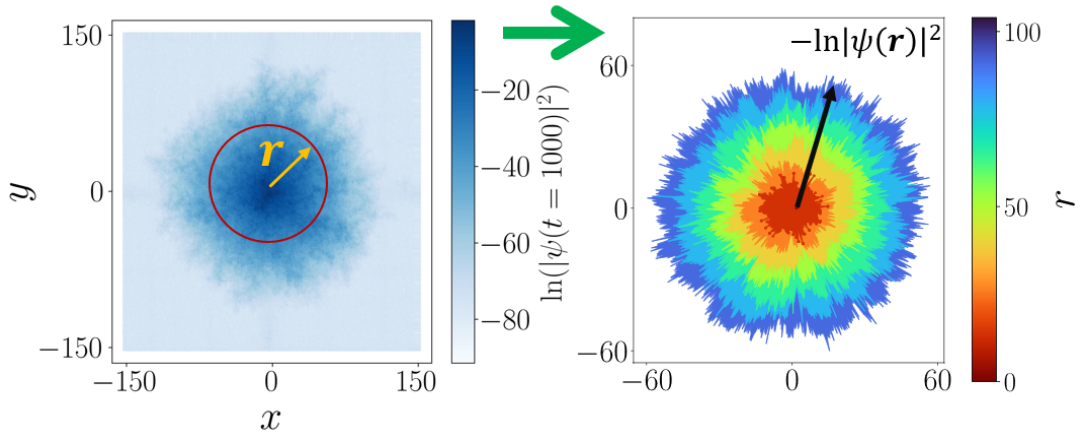

Figure 1: The figure, adapted from [3], illustrates a localized wave packet in two dimensions (left panel). The growth of fluctuations in the logarithm of the wave density with respect to the distance r to the localization center mirrors the evolution of a rough interface over time, as described by KPZ physics (right panel).

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[3] Mu, S., Gong, J. & Lemarié, G., Phys. Rev. Lett. **132**, 046301 (2024).
[4] Mu, S., Izem, N., Gergeot, B., Gong, J. & Lemarié, G., in preparation (2024).
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[6] Swain, N., Adam, & Lemarié, G., in preparation (2024).