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The Kardar-Parisi-Zhang universality class for driven interfaces and... integrable spin chains?

Wednesday, June 4, 2025 9:30 AM (1h 30m)

The Kardar-Parisi-Zhang (KPZ) universality class, originally formulated to describe driven systems such as growing interfaces, has undergone several paradigm shifts. One major breakthrough was the discovery of exact solutions for the 1D KPZ class, achieved thanks to its underlying integrability [1]. However, more recently, the KPZ framework appears to be entering a new phase, extending unexpectedly to integrable spin chains at thermal equilibrium [2]. Although this connection was nearly dismissed when clear discrepancy in full counting statistics was reported, the speaker and collaborators numerically found that various two-point quantities agree precisely with KPZ exact solutions [3], even though higher-order quantities remain clearly different.

In my talk, I will first review some of the main outcomes of the 1D KPZ exact solutions, often referring to the corresponding experimental observations that the speaker and collaborators have reported [1]. Then I will present our recent numerical results on integrable spin chains, showing the aforementioned partial yet definite emergence of the KPZ class therein [3]. This partial emergence of the KPZ class is yet to be understood; therefore, this talk will serve as an introduction to the discussion session scheduled in the afternoon.

[1] For a review, see, e.g., K. A. Takeuchi, Physica A 504, 77 (2018).

[2] For reviews, see, e.g., V. B. Bulchandani et al., J. Stat. Mech. (2021), 084001; S. Gopalakrishnan and R. Vasseur, Annu. Rev. Condens. Matter Phys. 15, 159 (2024).

[3] K. A. Takeuchi, et al., Phys. Rev. Lett. 134, 097104 (2025).

Presenter: TAKEUCHI, Kazumasa