Many-body delocalisation as symmetry breaking

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I will discuss minimal models for quantum chaos and many-body localisation. The models are Floquet quantum circuits for lattice spin systems, in which time evolution is generated by unitary gates that couple neighbouring sites. In particular, I will examine the circumstances in which a version of the so-called diagonal approximation (originally developed for the semiclassical limit in low-dimensional chaotic systems) can be applied to these systems. Within this framework I will show that the many-body delocalisation transition can be seen as a form of symmetry breaking transition, having many of the features generally associated with conventional phase transitions in classical statistical mechanical models.

[1] S. Garratt and J. T. Chalker, Phys. Rev. Lett. 127, 026802 (2021).