

# Critical dynamics far from equilibrium: upturns from surface kinetic roughening

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The collective properties that characterize dynamical complex systems often emerge via non-equilibrium analogues of equilibrium critical phenomena, where fluctuations are key [1]. A prime example is surface kinetic roughening, where frequently external driving and dissipation act at comparable time scales so that criticality emerges spontaneously without parameter tuning; strong correlations pervade spatiotemporal dynamics and are encoded in universal scaling behavior, irrespective of parameter values [1]. Being ubiquitous across system nature and physical scales, perhaps not surprisingly some of the main instances of surface kinetic roughening ---like the celebrated 1D Kardar-Parisi-Zhang (KPZ) universality class [1,2]---are recently proving relevant to non-interfacial systems, from e.g. active [3] to quantum [4] matter, synchronization of nonlinear oscillators [5], etc.

With a view on the rich structure recently unveiled by this paramount universality class, we will address issues that contribute to our understanding of critical dynamics far from equilibrium. For instance, the extent to which critical exponent values identify universality classes, the roles at this that can be played by the statistics of fluctuations and by the dynamic scaling ansatz, and critical phenomena in high-dimensional systems. Examples will be drawn from recent work, mostly on KPZ-related systems: Burgers models [6], the tensionless KPZ equation [7], the non-conserved critical dynamics of the Ising model [8], or KPZ and related equations on high-dimensional networks [9].

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