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Waiting times and power spectra: self-organized criticality and phase transitions

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Some of the old questions in power-law statistics in natural systems can now be answered due to recent advances in connecting simple cellular automata models of critical systems to a variety of continuum theories. In this talk some of these will be reviewed, with two particular applications in mind. The first one is temporal statistics, often most in the form of "waiting times" between bursts of activity. Here the essential issues concern the underlying Langevin dynamics, and the roles of boundary conditions and dimensionality and most importantly that of the "driving". What can be said of cases which correspond to "self-organized criticality" (SOC), in particular? Then, the same set of tools is applied to the question of power spectra of activity in avalanching systems, such as one meets in particular in the SOC context. The main question is, whether the 1/f-noise in SOC systems is rather trivial (1/f^2) as is usually thought - or not. I will overview some (very) recent advances and outline their applications.

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