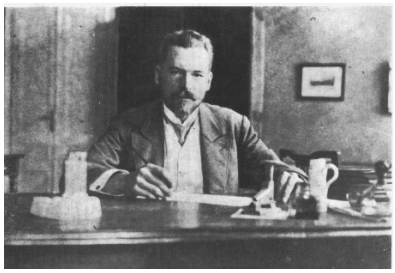

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Variational Approach to KPZ: Fluctuation Theorems, Large Deviation Function, and Probability Distribution Function

Thursday, 3 December 2020 13:30 (20 minutes)

The KPZ equation is - as known - a stochastic field theory that describes the kinetic roughening of surfaces and interfaces, plus many other nonequilibrium processes that belong to its universality class. For $\lambda \neq 0$, the systems described are intrinsically unstable and "lack of stationary probability distribution". This can be readily inferred from the structure of the functional from which the deterministic KPZ equation stems in a variational formulation [1]. In fact, the time behavior of the aforementioned functional resembles that of a particle in a gravitational field [2]. A path-integral scheme has been set up in [3] that allows obtaining detailed and integral fluctuation theorems - as well as a Large Deviation Function for entropy production - for the KPZ equation, "regardless of the substrate dimensionality" [4]. After reviewing these issues, we close by discussing an explicit expression of the probability distribution for the KPZ system.

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[3] H.S. Wio, R.R. Deza and J.A. Revelli, "Fluctuation theorems and large deviation functions in systems not featuring a steady state", J. Stat. Mech. (2020) 024009.
[4] H.S. Wio, M.A. Rodriguez and R. Gallego, "Variational approach to KPZ: Fluctuation theorems and large deviation function for entropy production", Chaos 30, (2020) 073107.

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