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Stochastic processes for fractional kinetics with application to anomalous diffusion in living cells

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Fractional kinetics is derived from Gaussian processes when the medium where the diffusion takes place is characterized by a population of length-scales [1]. This approach is analogous to the generalized grey Brownian motion [2], and it can be used for modelling anomalous diffusion in complex media. In particular, the resulting stochastic process can show sub-diffusion, ergodicity breaking, p variation, and aging with a behaviour in qualitative agreement with single-particle tracking experiments in living cells. Moreover, for a proper distribution of the length-scales, a single parameter controls the ergodic-to-nonergodic transition and, remarkably, also drives the transition of the diffusion equation of the process from nonfractional to fractional, thus demonstrating that fractional kinetics emerges from ergodicity breaking [3].

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