

From Gauss to Zipf: Statistics of Complex Systems

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Complex systems are typically characterized by non-Gaussian statistics that are often fat tailed and power-law-like. To understand the origin of these statistics, we present a simple theory of driven out-of-equilibrium systems which are often at the core of complex adaptive systems. We review that driven systems that are composed of a driving process and a relaxation process, generically produce power law distributions for low driving rates. From the interplay of the driving rate with the relaxation processes we are able to understand the dynamical origin of a variety of distribution functions, including the power law, the Gamma, the Weibull, the Tsallis, the stretched exponential, the log-normal and many more distribution functions. We show simple examples where these insights are practically applicable, such as in understanding statistics of search processes, sentence formation, fragmentation phenomena, or the energy distribution of cosmic rays.

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Am Faßberg 11, Göttingen**

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