How statistics appears from sample space reducing processes — all of it — from Gauss to Zipf

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Sample space reducing (SSR) processes are simple path dependent processes that offer an analytical understanding of the origin and ubiquity of power-laws in countless path-dependent complex systems. SSR processes exhibit generic power-laws — Zipf's law in particular. We show that SSR processes exhibit a much wider range of statistical diversity. Assuming that noise in the system is not uniformly strong within a system (or across its life-span), but depends on the current state the system is in, we demonstrate that practically any distribution function can be naturally derived from SSR processes: No noise gives Zipf's law, constant noise leads to exact power-laws, linear noise functions gives exponential or Gamma distributions, a quadratic noise function yields the normal distribution. Also the Weibull, Gompertz and Tsallis-Pareto distributions arise as a natural consequence from relatively simple noise functions. We shortly discuss the areas of application of SRR processes that range from fragmentation processes, language formation, cascading processes and search processes in general.