

Anomalous is Ubiquitous

I. Eliazar

Holon Institute of Technology, 52 Golomb Str., POB 305, Holon 58102, Israel

Brownian motion is widely considered the quintessential model of diffusion processes – perhaps the most elemental random transport processes in Science and Engineering. Yet so, examples of diffusion processes displaying highly non-Brownian statistics – commonly termed “Anomalous Diffusion” processes – are omnipresent both in the natural sciences and in engineered systems. The scientific interest in Anomalous Diffusion and its applications is growing exponentially in the recent years. In this talk we first review the key statistics of Anomalous Diffusion processes: sub-diffusion and super-diffusion, long-range dependence and the Joseph effect, Levy statistics and the Noah effect, and $1/f$ noise. Then, we present a theoretical modeling approach which provides a unified explanation for the prevalence of Anomalous Diffusion statistics. Our modeling approach is general and robust, is applicable in diverse fields of science and engineering, and it establishes that what is commonly perceived as “anomalous” is in effect ubiquitous.