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Experimental Evidence of Strong Anomalous Diffusion in Living Cells DAPHNE WEIHS, NAAMA GAL, Biomedical Engineering, Technion — We show that transport of polymeric particles within living cancer cells exhibits strongly anomalous diffusion. Particle motion demonstrated super-diffusion, indicating active cellular transport of particles likely due to molecular motors. We also calculated a range of time-dependent displacement moments and extracted scaling exponents $\lambda(q)$ for each moment order q. Those were non-linear with q, indicating non-scale-invariant motion. Also, $\lambda(q)/q$ was non-decreasing, fulfilling conditions for strong anomalous diffusion, presented here experimentally for the first time. Specifically, $\lambda(q)$ exhibited bi-linearity, with slopes of $\sim$0.6 and $\sim$0.8 at low and high q-values. That bi-linearity indicates that particle motion is composed of sub-diffusive regimes separated by active flights; those were sub-ballistic and not separable using a directionality criterion. We suggest that sub-ballistic flights are associated with the small particles used in this work (100-200 nm); those diffuse through the cytoplasm while being actively transported. Results are discussed in terms of particle interactions with their microenvironment and its dynamics.

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