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**Bursts of active transport in living cells** BO WANG, JAMES KUO, SUNG CHUL BAE, STEVE GRANICK, University of Illinois — This study of cargo motion in living cells, performed with nm resolution and an unprecedented large database, shows that the instantaneous speed of active transport deviates pervasively from the average speed yet with striking statistical regularity over several decades of time and space. The experimental approach involves single-particle tracking and special wavelet-based methods to discriminate active transport from passive diffusion, thus quantifying the instantaneous speed of endosomal and lysosomal active transport in living cells at times just longer than the motor stepping time. Pervasive bursts of acceleration stem from viscoelastic relaxation of the cytoplasm, the individual bursts displaying a time-averaged shape that we interpret to reflect stress buildup followed by rapid release. These statistical regularities did not change in response to changing the experimental conditions, specifically to changing the cell line and motor type, or to overexpressing microtubule binding proteins, thus indicating redundancy in regulation of cellular active transport. The power law of scaling is the same as seen in driven jammed colloids, powders, and magnetic systems, and is consistent with a simple heuristic argument. The implied regulation of active transport by environmental obstruction in the cytoplasm extends the classical notion of "molecular crowding."

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