Abstract Submitted
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The Nanoscale Caterpillar - or how to achieve precise motion with random sticky feet[1] SOPHIE MARBACH, Courant Institute, FAN CUI, JEANA ZHENG, DAVID PINE, NYU Physics, MIRANDA HOLMES-CERFON, Courant Institute — Beating equilibrium diffusion is a paradigm challenge that biological or artificial systems of small particles have to face to achieve complex functions. Some cells (like leucocytes) use ligand-receptor contacts (sticky feet) to crawl and roll along vessels. Sticky DNA (another type of sticky feet) is coated on colloids to design programmable interactions and long-range assembly features. The dynamics of such sticky motion are complex as sticky events (attaching/detaching) often occur on very short time scales that affect the overall motion of the particle on much longer time scales, and makes predictions challenging. Furthermore, the equilibrium statistics of these systems (how many feet are attached in average) are extremely entangled and inaccessible experimentally. Here we present advanced modeling and experimental results on a model system, and we find predictions in several cases (with different geometries of sticky feet). We rationalize what parameters control average feet attachment, long term diffusion and how they can be compared to other existing systems. We investigate furthermore how various motion modes (rolling, sliding or skipping) may be favored compared to each other.

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Sophie Marbach
Courant Institute

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