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Ratcheting of Granular Polymer with a Spatial Gradient of Excitation[1] Y.-C. LIN, Inst. of Physics, Academia Sinica, Taipei, Taiwan (IoP-AS), C.-C. CHANG, IoP-AS, J.-R. HUANG, Nat'l Taiwan Normal University, W.-T. JUAN, J.-C. TSAI, IoP-AS — We study the migration of a short granular chain in response to a sinusoidal vibration whose intensity varies linearly with position. The spatial asymmetry induces ratcheting of the chain that can go, counter-intuitively, either in the direction of lowering the vibration or in favour of its increase, depending upon the position. This spatial divide signals a transition of granular dynamics involving finite-amplitude instabilities. We also demonstrate the roles of cooperative movements both by time-resolving the 3D motion of this macroscopic polymer, and by measuring the persistence and magnitude of its migration that go far above simple predictions based on spatially biased random kicks at the theoretical upper limit.

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