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A Granular Smoluchowski-Feynman Ratchet DEVARAJ VAN DER MEER, PETER ESHUIS, University of Twente, KO VAN DER WEELE, University of Patras, DETLEF LOHSE, University of Twente — We experimentally study the Brownian motion of a mill with four vanes that is allowed to rotate freely in a vibrofluidized granular gas. At mild driving, when the granular temperature of the gas is low, the mill is found to move around a distinct equilibrium position. If we increase the driving strength, the mill starts to move between equivalent equilibrium states and explores more and more of its phase space by revolving faster. At very high driving, the mill interacts back with the granular heat bath in which it is submersed. By breaking the spatial symmetry, the mill is turned into a ratchet of the Smoluchowski-Feynman type and starts moving with a finite, non-zero average rotation speed. All these phenomena are analyzed in terms of a diffusion coefficient and the complete probability distribution functions of both position and speed.

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