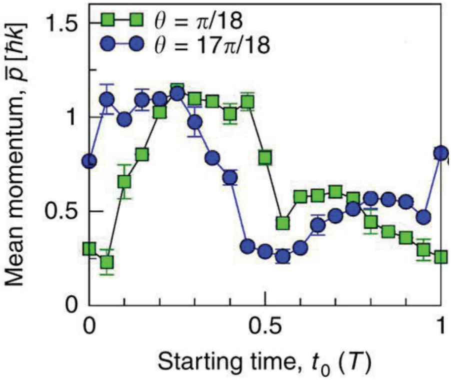
Research (What is it about?)	**Coherent quantum rocking ratchet**
UNN authors	*Denisov S., Hänggi P.*
We find (The result)	Controllable dissipationless, fully coherent quantum transport of ultra-cold atoms is realized experimentally in dynamically symmetric system with the biharmonically modulated periodic potential.
Abstract	The ratchet phenomenon is a means to get directed transport without net forces. Originally conceived to rectify stochastic motion and describe operational principles of biological motors, the ratchet effect can be used to achieve controllable coherent quantum transport. This directed transport is an ingredient of several perspective quantum devices ranging from quantum information processing with atom chips to high-precision BEC-gravimetry. There exists a variety of different ratchet devices, with setup-sensitive conditions for occurrence of directed transport. Of prime importance in this context is the identification of the dynamical symmetries which prevent the appearance of the directed motion. A proper choice of the system parameters, especially of the driving field, leads to the breaking of all no-go symmetries to yield an average net current. An intriguing phenomenon was predicted in numerical simulations of quantum coherent ratchets. Namely, the ratchet current can be substantially boosted by tuning specific Floquet states of a periodically driven potential into an avoided crossing. It was also predicted that these transport resonances follow an universal bifurcation scenario upon increasing the driving strength. We realized ratchet experimentally by loading a rubidium atomic Bose–Einstein condensate into a periodic optical potential subjected to a biharmonic temporal drive. The achieved long-time coherence allows us to resolve resonance enhancement of the atom transport induced by avoided crossings in the Floquet spectrum of the system. By tuning the strength of the temporal modulations, we observe a bifurcation of a single resonance into a doublet.

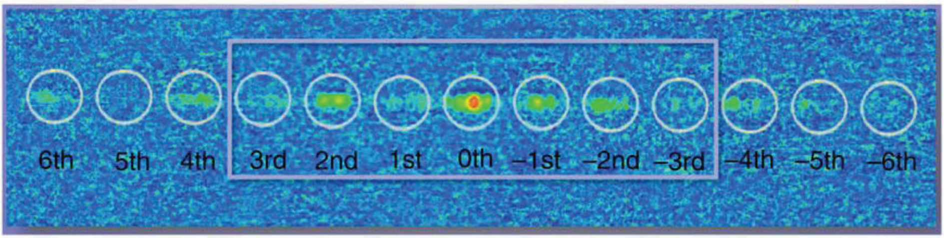
Representative articles 2016-2017, quartiles	2. *Grossert C., Leder M., Denisov S., Hänggi P., Weitz M.* Experimental control of transport resonances in a coherent quantum rocking ratchet. Nature Commun. **7**:10440 (2016).	Q1
	Q-index (Qi) of the result	**4**

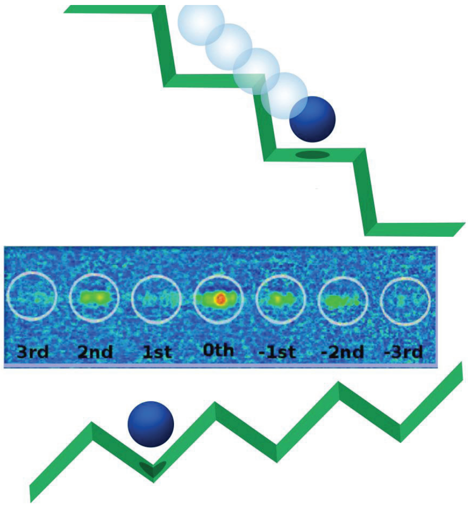
In collaboration	Institut für Angewandte Physik der Universität Bonn, Wegelerstr. 8, 53115 Bonn, Germany Institut für Physik, Universität Augsburg, Universitätsstr. 1, 86159 Augsburg, Germany Nanosystems Initiative Munich, Schellingstr. 4, D-80799 München, Germany Sumy State University, Rimsky-Korsakov Street 2, 40007 Sumy, Ukraine



Original experimental data: nonzero mean momentum of rubidium atoms after 15 ms of free expansion time as a function of the starting time t_0 measured for two different values of phase of biharmonic potential.

Original experimental data: time-of-flight image recorded after 15 ms of free expansion time, showing the atomic velocity distribution after 100 modulation periods. The white circles mark the position of the visible diffraction peaks.





A graphic illustration of the effect above.