

## PHYSIKALISCHES KOLLOQUIUM

**Wintersemester 2026/27**

Das Kolloquium findet (soweit nicht anders angegeben) **jeweils montags um 14:15 Uhr im Röntgen-Hörsaal** des Physikalischen Instituts, Hubland Campus Süd, Universität Würzburg **und online via Zoom** statt.

Zugangsdaten siehe <https://www.physik.uni-wuerzburg.de/aktuelles/veranstaltungen-aus-der-physik/physikalisches-kolloquium/>

**01.02.2027**

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### **Hamiltonian Description of Nonreciprocal Interactions**

#### **Abstract**

In a vast class of systems, which includes members as diverse as sedimenting particles and bird flocks, interactions do not stem from a potential, and are in general nonreciprocal. Thus, it is not possible to define a conventional energy function, nor to use analytical or numerical tools that rely on it. Here, we overcome these limitations by constructing a Hamiltonian that includes auxiliary degrees of freedom; when subject to a constraint, this Hamiltonian yields the original nonreciprocal dynamics. We show that Glauber dynamics based on the constrained Hamiltonian reproduce both stationary and nonstationary states of the original Langevin dynamics, as we explicitly illustrate for dissipative XY spins with vision-cone interactions. Further, the symplectic structure inherent to our construction enables us to apply the well-developed notions of Hamiltonian engineering, which we demonstrate by varying the amplitude of a periodic drive to tune the spin interactions between those of a square and a chain lattice geometry. Overall, our framework for generic nonreciprocal pairwise interactions paves the way for bringing to bear the full conceptual and methodological power of conventional statistical mechanics and Hamiltonian dynamics to nonreciprocal systems.

Für die Dozentinnen bzw. Dozenten der Fakultät

Prof. Dr. Trauzettel, Dr. Ünzelmann, Hr. Müller