

PHYSICAL MATHEMATICS SEMINAR

PHASE TRANSITIONS IN NON-RECIPROCAL MATTER

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ABSTRACT:

Out of equilibrium, the lack of reciprocity is the rule rather than the exception. Non-reciprocal interactions occur, for instance, in networks of neurons, directional growth of interfaces, and synthetic active materials. While wave propagation in non-reciprocal media has recently been under intense study, less is known about the consequences of non-reciprocity on the collective behavior of many-body systems. Here, we show that non-reciprocity leads to time-dependent phases where spontaneously broken symmetries are dynamically restored. The resulting phase transitions are controlled by spectral singularities called exceptional points. We describe the emergence of these phases using insights from bifurcation theory and non-Hermitian quantum mechanics. Our approach captures non-reciprocal generalizations of three archetypal classes of self-organization out of equilibrium: synchronization, flocking and pattern formation. Collective phenomena in these non-reciprocal systems range from active time-(quasi)crystals to exceptional-point enforced pattern-formation and hysteresis.

TUESDAY, NOVEMBER 10, 2020
2:30 PM – 3:30 PM

<http://math.mit.edu/seminars/pms/>

<https://mit.zoom.us/j/97273690529>
Meeting ID: 972 7369 0529