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Evolutionary games of condensates in driven and dissipative bosonic systems[1] JOHANNES KNEBEL, MARKUS F. WEBER, TORBEN KRÜGER, ERWIN FREY, Ludwig Max Univ Muenchen — Condensation is a collective behavior of particles observed in both classical and quantum physics. For example, when an equilibrated, dilute gas of bosonic particles is cooled to a temperature near absolute zero, the ground state becomes macroscopically occupied (Bose-Einstein condensation). Whether novel condensation phenomena occur far from equilibrium is a topic of vivid research. Only recently has it been proposed that a driven and dissipative gas of bosons can condense not only into a single, but also into multiple non-degenerate states. This phenomenon may occur when a system of non-interacting bosons is weakly coupled to a reservoir and is driven by an external time-periodic force (Floquet system). Coherence becomes negligible and the condensation is described by a Pauli master equation, which also arises in the evolutionary dynamics of classical agents. In our work, we apply concepts from evolutionary dynamics to determine the states that become condensates. This condensate selection is guided by the vanishing of relative entropy production. We find that the system of condensates never comes to rest: The occupation numbers of condensates oscillate, which we demonstrate for a rock-paper-scissors game of condensates.

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