

Zia, Royce: *"Persistent probability currents and their manifestations in non-equilibrium steady states"*

For many interesting phenomena in nature, from microscopic life to global climate, the fundamental hypothesis of equilibrium statistical mechanics does not apply. Instead, they are, arguably, better characterized by non-equilibrium steady states (NESS), evolving with dynamical rules which violate detailed balance (DB). In this talk, I will present the meaning behind DB and discuss its role in generating the sharp contrast between systems in NESS and ordinary equilibrium. In particular, DB violation leads to the existence of non-trivial, persistent probability currents as a principal characteristic of NESS. The consequences (e.g., manifestations in the form of physical observables) of these currents will be illustrated. An example is the notion of "probability angular momentum," which is related to antisymmetric parts of two point correlations. Beyond the present status, these currents may well be key players in an (to-be-realized) overarching framework for non-equilibrium statistical mechanics.