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Marshall N. Rosenbluth Outstanding Doctoral Thesis Award: Magnetorotational turbulence and dynamo

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Accretion disks are ubiquitous in astrophysics and power some of the most luminous sources in the universe. In many disks, the transport of angular momentum, and thus the mass accretion itself, is thought to be caused by the magnetorotational instability (MRI). As the MRI saturates into strong turbulence, it also generates ordered magnetic fields, acting as a magnetic dynamo powered by the background shear flow. However, despite its importance for astrophysical accretion processes, basic aspects of MRI turbulence—including its saturation amplitude—remain poorly understood. In this talk, I will outline progress towards improving this situation, focusing in particular on the nonlinear shear dynamo and how this controls the turbulence. I will discuss how novel statistical simulation methods can be used to better understand this shear dynamo, in particular the distinct mechanisms that may play a role in MRI turbulence and how these depend on important physical parameters.