BOSTON UNIVERSITY

Boston University College of Arts & Sciences
Center for Space Physics

2025 SPACE PHYSICS SEMINAR SERIES

Modern perspectives and challenges in magnetic reconnection

Magnetic reconnection is the reconfiguration of the topology of the magnetic field in a plasma. It is typically associated with the efficient conversion of magnetic energy, resulting, for example, in solar flares, and the generation of supra-thermal particle populations. Reconnection is widely present throughout the magnetized universe: from laboratory plasmas and the Earth's magnetosphere to magnetar flares and gamma-ray bursts. It is also thought to be a key ingredient of plasma turbulence, where it may determine much of the energy dissipation.

The importance of reconnection across multiple areas has meant that it has been the subject of intense investigation over the last 70 years. Broadly speaking, the main questions are: what triggers reconnection (the onset problem); how fast it can proceed (the rate problem); and how is the magnetic energy divided amongst the different possible channels (the energy partition problem). While much progress has been made, investigations are hampered by the fundamental nonlinear character of the problem and its intrinsic multi-scale nature: both conspire to make analytical and numerical calculations extremely challenging, and prompt researchers to seek to simplify the problem as much as possible.

This talk reflects on these challenges, how they have constrained the research that has been done to date, and possible theoretical frameworks to move the field forward.

Thursday, January 30th

3:30 - 4:30 p.m.

725 Commonwealth Ave | Room 502

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Photo by Berenice Abbott