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Unraveling the physics of magnetic reconnection: the interaction of laboratory and space observations with models JAMES DRAKE, University of Maryland — Reconnection leads to impulsive conversion of magnetic energy into high-speed flows, plasma heating and the production of energetic particles. A major challenge has been to account for the enormous range of spatial scales in systems undergoing reconnection. Progress on the topic has been facilitated by the observations in space and the laboratory with models bridging the divide. Understanding the mechanisms for fast reconnection is a historical example. However, in this talk I will focus on reconnection in asymmetric systems – those with large ambient gradients in the pressure or density. The interest in the topic has been driven by efforts to understand when and where reconnection takes place in the laboratory (tokamaks) and in space (planetary magnetospheres and the solar wind). Ideas on reconnection suppression due to diamagnetic drifts have produced a unified picture of the conditions required for reconnection onset over a wide range of environments. Observations from the MMS mission have provided an extraordinary window into reconnection at the Earth's magnetopause, including the mechanisms for magnetic energy dissipation and the role of turbulence. Finally, the prospects for establishing the mechanisms for energetic particle production will be addressed.

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