

Challenge 1	Existing Research Capabilities	Gaps	Opportunities
<p>Explore multi-island reconnection and particle acceleration</p>	<p>Satellites in the magnetosphere (Themis, Cluster) and looking at the sun (Stereo, SDO, RHESSI, etc.). In situ measurements close to the sun with SP+. Ongoing studies of ion heating and multi-island interactions in the MST reversed field pinch. Exploration of secondary island formation and particle acceleration in mostly 2-D kinetic simulations.</p>	<p>Large-scale simulations have a limited but important contribution because 3-D kinetics severely constrains our ability to separate scales. Existing dedicated laboratory reconnection experiments are too geometrically constrained to explore this regime.</p>	<p>Explore the new paradigm that reconnection and particle acceleration in natural systems involve multi-island dynamics. Marshall and focus the analysis of existing observational evidence. Form a National Working Group to explore the possibility of constructing a laboratory reconnection experiment to explore particle acceleration in a multi-island environment.</p>

Challenge 2	Existing Research Capabilities	Gaps	Opportunities
<p>Magnetic reconnection in the relativistic, pair-producing, radiative regime</p>	<p>Satellite observations of solar, stellar and magnetar flares and jets through x-ray and gamma-ray observations. Active exploration of relativistic reconnection in simulations. First exploration of relativistic reconnection using intense lasers.</p>	<p>No dedicated laboratory program whose goal is the exploration of relativistic reconnection. No existing simulation models of reconnection with models of pair production and radiation.</p>	<p>Explore the possibility to establishing a dedicated laboratory program exploring relativistic reconnection using intense lasers. Benchmark emerging theoretical models of relativistic reconnection with laboratory results.</p>

Challenge 3	Existing Research Capabilities	Gaps	Opportunities
<p>Explosive onset of magnetic reconnection</p>	<p>Satellites in the magnetosphere (Themis, Cluster) and looking at the sun (Stereo, SDO, RHESSI, etc.). In situ measurements close to the sun with SP+. Exploration of the onset of reconnection in the DIII-D tokamak, the MST reversed field pinch and VTF. Ongoing modeling effort exploring reconnection onset both as a local collisionless/collisional transition and as global geometrical transitions.</p>	<p>Studies of onset in the various environments (solar, magnetospheric, laboratory) remain somewhat disconnected.</p>	<p>Form a national consortium to bring together information from the broad range of observations from different systems on the onset issue. Increase the simulation support of the ongoing laboratory experiments.</p>