One of the most fundamental tenets of astrophysical plasma physics is that magnetic fields can be stretched and amplified by flowing plasmas. In the right geometry, this can even lead to the self-generation of magnetic fields from flow through the dynamo process, a positive feedback instability where seed magnetic fields are stretched and amplified by flow in such a way as to reinforce the initial seed. This happens only when plasma is highly conducting, fast flowing, and when the magnetic field is weak. Laboratory plasmas exploring this parameter regime are surprisingly rare.

A new experiment, the Madison Plasma Dynamo Experiment (MPDX) is now operating in this unique regime. MPDX is a 3 meter diameter plasma experiment confined by an array of strong permanent magnets at the plasma edge. The plasma is stirred using biased electrodes in the edge and momentum is viscously transported inward to the unmagnetized core plasma where, eventually, a dynamo will be generated from a two-vortex boundary driven flow.