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Plans for a 3D reconnection experiment PAUL BELLAN, Caltech — Plasma-filled, current-carrying magnetic flux tubes are the essence of tokamaks, RFP's, spheromaks, solar coronal loops, and astrophysical jets. Relevant behaviors/issues are magnetic helicity content and injection, motion of the tube axis (hoop force, kinking), plasma confinement (balance between hydrodynamic pressure and pinch force), axial jet flows (acceleration and stagnation), waves, particle orbits, reconnection, and open v. closed field lines. These behaviors/issues and their mutual interaction are being investigated via Alfven time-scale imaging and conventional diagnostics in highly reproducible experiments having the simplest relevant geometry. High-speed movies clearly show flux tube kinking, motion of the flux tube axis due to hoop force, axial jet flows, an unusual particle orbit associated with flows counter to the electrical current, and reconnection between adjacent co- or counter-helicity flux tubes. A new experiment now under construction will have two slightly offset plasma-filled, current carrying flux tubes locally reconnect in 3D to form a single long flux tube. The setup requires two floating power supplies to drive the pre-reconnection currents as post-reconnection the power supplies become series-connected. A means for overcoming the topologically unavoidable mutual repulsion between the pre-reconnection currents is also required. It is anticipated that Alfven waves will radiate from the 3D localized reconnection region.

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