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Modeling Supernova Shocks with Intense Lasers.

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Large-scale directional outflows of supersonic plasma are ubiquitous phenomena in astrophysics, with specific application to supernovae. The traditional approach to understanding such phenomena is through theoretical analysis and numerical simulations. However, theoretical analysis might not capture all the relevant physics and numerical simulations have limited resolution and fail to scale correctly in Reynolds number and perhaps other key dimensionless parameters. Recent advances in high energy density physics using large inertial confinement fusion devices now allow controlled laboratory experiments on macroscopic volumes of plasma of direct relevance to astrophysics. This talk will present an overview of these facilities as well as results from current laboratory astrophysics experiments designed to study hydrodynamic jets and Rayleigh-Taylor mixing. This work is performed under the auspices of the U. S. DOE by Lawrence Livermore National Laboratory under Contract No. W-7405-ENG-48, Los Alamos National Laboratory under Contract No. W-7405-ENG-36, and the Laboratory for Laser Energetics under Contract No. DE-FC03-92SF19460.