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Material dynamics at extreme pressures and strain rates¹ BRUCE A. REMINGTON, LLNL — Solid state experiments at very high pressures and strain rates are possible on high power laser facilities, albeit over small spatial and time scales. A shockless drive has been developed on the Omega laser that spans peak pressures of 0.1 - 2 Mbar (10 - 200 GPa). VISAR measurements establish the high strain rates, 1.e6 - 1.e8 1/s. Solid-state strength is inferred using the Rayleigh-Taylor instability as a "diagnostic." Temperature, compression, and phase can be deduced from EXAFS measurements. Lattice response, phase, and grain size can be inferred from x-ray diffraction. Deformation mechanisms and integral response can be identified by examining recovered samples. We will review our work in laserbased materials science, then present our plan for reaching much higher pressures, P > 10 Mbar (1000 GPa), in the solid state on the NIF laser facility.

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