Abstract: During this talk I will give an overview of laser-based experimental methods used to compress materials to TPa pressures, and over nanosecond timescales (1 TPa = 1 million atmospheres). The primary technique employed to measure the rapidly evolving material states in these experiments is velocity interferometry using a line-imaging VISAR system (VISAR: Velocity Interferometry System for Any Reflector). Sample velocities of km/s are determined to % accuracy and with a temporal and spatial resolution of ~30 ps and ~30 μm, respectively. VISAR also measures sample reflectivity in time and, with some modifications, can be used as a pyrometer to determine temperature at the shock front. VISAR measurements on the National Ignition Facility on multi-stepped targets allow material states to be determined at P-T conditions relevant to the cores of large rocky exoplanets. By using ramp-compression techniques on NIF we have generated pressures over 5-TPa in carbon and 1.4-TPa in iron, and measured sound speed and compressibility along a near isentropic compression path. Ramp compression produces less dissipative heating, thus enabling higher compression and lower temperature than shock compression, and ensures samples stay within the solid state to TPa pressures.