It was shown recently (Berdichevsky, 2017, JHPS, 106, 95-132) that 2D dynamics of edge dislocations has surprisingly simple structure for small strain rates: all dislocation coordinates split into two categories, driving variables and slave variables; for 2D edge dislocations, there is the only driving parameter, dislocation polarization, while all other variables are slave, i.e. in slow evolution they are functions of the driving parameter. This picture changes when avalanches occur: all variables change independently and fast. In 3D dislocation dynamics the driving parameters are the components of symmetric dislocation polarization tensor. The emerging simple structure of dislocation phase space allows one to attempt to complete thermodynamics of plasticity. The resulting theory involves entropy and temperature of dislocation microstructure. They have simple physical meaning being associated with statistical characteristics of slip avalanches (Berdichevsky, 2018, Int. J. Eng. Sci., 128, 24-30). In this talk I will review these results and outline the corresponding thermodynamic theory of stress-strain curves.