



## Differential of internal energy

Write down the total differential of the internal energy as a function of entropy and volume,  $u(s,v)$ . Compare to the first Gibbs equation (the one with the internal energy) and determine the partial derivatives of the total differential. They are equal to:

The total differential of the internal energy as a function of entropy and volume,  $u(s,v)$  is:  $du(s,v) = \left(\frac{\partial u}{\partial s}\right)_v ds + \left(\frac{\partial u}{\partial v}\right)_s dv$ . Comparing to:  $du = Tds - Pdv$  results in  $\left(\frac{\partial u}{\partial s}\right)_v = T$  and  $\left(\frac{\partial u}{\partial v}\right)_s = -P$ . Note the - for the pressure!