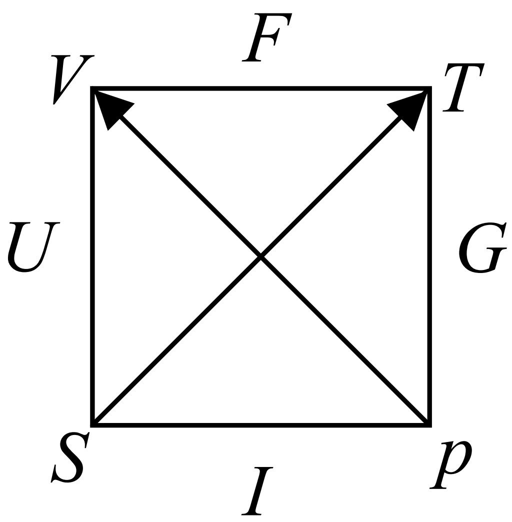
2.7 Small summary

What is temperature?
It is the driving force which leads to a maximization of the entropy.
The entropy is largest for equally occupied states. ⇒ Thermodynamic equilibrium
The entropy serves all relevant information about the micro states which are not considered in the energy.
This is a competition between maximization of entropy and minimization of energy.
⇒ At low temperatures the individual character of the particles is relevant.
⇒ For high temperatures this differences are not important: Fermions, Bosons ⇒ Boltzmann
Quantum mechanical properties are not relevant any more.
Consequences: (very small selection)

- The strength of the interaction of different components of a system and the temperature define the relaxation time which is needed to reach thermal equilibrium (⇒ Quasi Fermi potentials, forces, transport processes)
- Equipartition law (later)

When do we use which Potential?
The physical system defines the restrictions:

- The choice of the potential depends on the *kind of contact*
- Directly coupled to this question are the *conserved properties*



Potentials:

- U: Inner energy
- F: Free energy
- G: Gibb's energy (Free enthalpy)
- I: Enthalpy

Generalizes coordinates:

- S: Entropy
- V: Volume
- T: Temperature
- p: Pressure

The calculation of possible micro states, **i.e. the calculation of the partition function (sum of states)** can be done independent of the physical restrictions minimizing the calculation effort (Which ensemble do I like most, which ensemble is most easily solved,...). The following Legendre transformation allows to calculate the potential for every thermodynamic contact. For macroscopic systems there will never occur any failure (Later). ***Isn't that easy?!?***
Really doing the calculation of the partition function is extremely hard work and often impossible.