

Why is Thermodynamics difficult?

- 300^{yr} old steam engine
- kinetic theory + Assumptions
- Statistical Mechanics, QM, Partition function Q, Z

Generality $\sum_i J_i d\beta_i \leftarrow$

Specific: gases, ideal gases

$$dw = \ominus pdv$$

$$T dx$$

$$\sigma dA$$

$$B dM$$

energy U

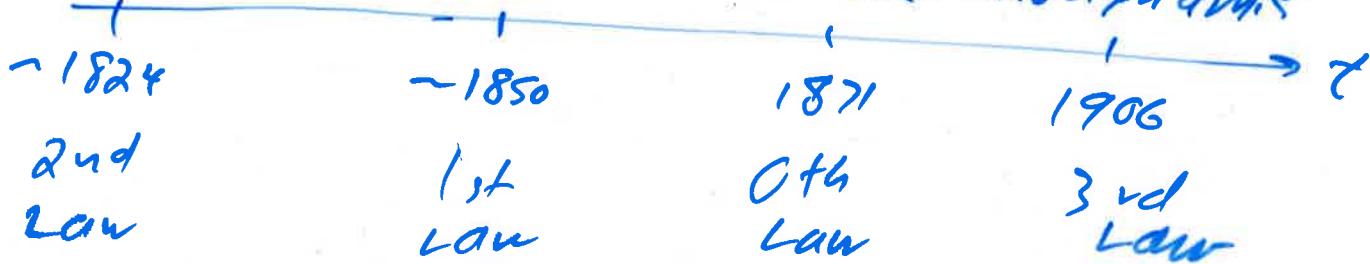
entropy S

enthalpy H

Helmholtz free energy
(A, F)

\rightarrow

Time line for laws of thermodynamics



Engel's Conservation