

Appendix: A quick run through history and some big names

Thermodynamics  $\rightarrow$  Kinetic Theory  $\rightarrow$  Statistical Mechanics

Boyle (1627-1691)

Carnot (1796-1832)

Joule, Thompson

Bernoulli ( $\sim 1740$ ): Kinetic theory of gases in "Hydrodynamica"

Maxwell ( $\sim 1859$ ): Distribution of molecular speeds in a gas

Maxwell ( $\sim 1860$ ) + Boltzmann (1844-1906):  
"Equipartition of energy"  $\frac{1}{2}kT$  per quadratic degree of freedom per particle

Van der Waals ( $\sim 1873$ ): Gas law (phase transition)

Boltzmann ( $\sim 1877$ ) / Gibbs (1839-1903):

$$S = k \ln W \quad \text{established Statistical Mechanics}$$

Planck ( $\sim 1900$ ): Black-body radiation, gas of photons

[See Planck, "Treatise on Thermodynamics" (Dover)]

Einstein ( $\sim 1907$ ) and Debye: Heat capacity of solids (got  $C \rightarrow 0$  as  $T \rightarrow 0$ , so  $S \rightarrow 0$ )

Quantum Statistics

Bose, Einstein ( $\sim 1924$ ): Boson-Einstein statistics (for bosons) after studying Planck's black-body formula

Einstein ( $\sim 1925$ ): Bose-Einstein condensation

Pauli: Exclusion Principle (electrons, thus fermions)

Fermi, Dirac ( $\sim 1926$ ): Fermi-Dirac Statistics

[See Fermi, "Thermodynamics" (Dover)]

[See Pauli Lectures on Physics,

"Thermodynamics & Kinetic Theory of Gases"  
"Statistical Mechanics"]

Sommerfeld ( $\sim 1928$ ): Free electron gas model of metals [Fermi sphere, Fermi surface]

[See also Schrödinger, "Statistical Thermodynamics" (Dover)]

Generations of Great Physicists helped develop the subject and wrote about it!

- Now, it is your turn to study what Statistical Mechanics is about!