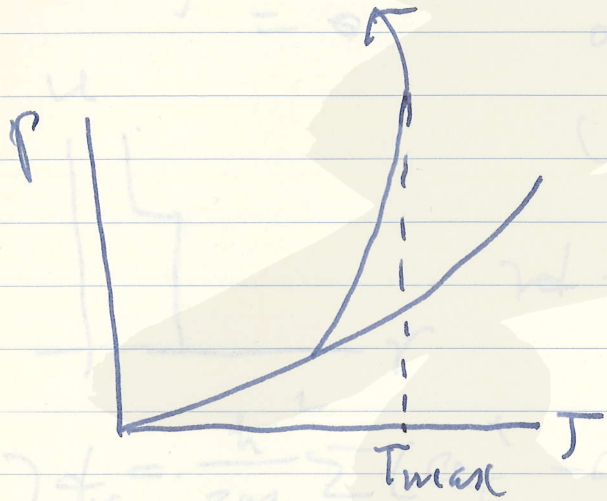
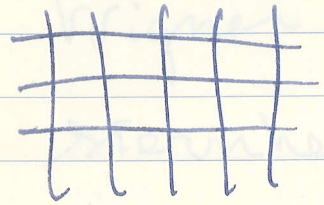
T_b/T_f (1気圧)

Ne	1.11	Li	3.5
A	1.04	Na	3.1
Kr	1.03	K	3.1
Xe	1.03	Rb	3.1
		Cs	3.2



Lindemann (1910)
Simon (1929)
Born (1939)
Kirwood - Monroe
Lenard - Jones
Devonshire (1939)
Kac, Uhlenbeck, Hemmer
Van der Waals limit

lattice model

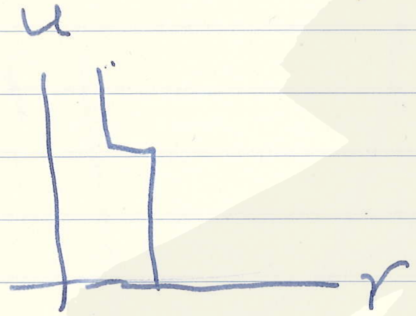


$$\mathcal{H} = \sum_{i<j} v_{ij}\, n_i n_j$$

$n_i = 0$ or 1

$v_{ij} = v > 0$ $\quad i, j$ nearest-neighbor

$\quad = 0$ otherwise



Yang & Lee (1952)

$$\mathcal{H} = \sum v_{ij}\, \sigma_i \sigma_j$$

$$\mathcal{H}_K = \frac{\hbar^2}{2m} \sum_{\langle ij \rangle} (a_i^\dagger - a_j^\dagger)(a_i - a_j)$$

$$\left.\begin{aligned} a_i^\dagger a_i + a_i a_i^\dagger &= 1 \\ [a_i, a_j] &= 0 \quad i \neq j \end{aligned}\right\}$$

$$a_i = \frac{1}{2}(\sigma_i^x + i\sigma_i^y)$$

$$\mathcal{H} = \sum v_{ij}\, \sigma_i^z \sigma_j^z - \frac{\hbar^2}{md^2} \sum (\sigma_i^x \sigma_j^x + \sigma_i^y \sigma_j^y)$$

1 $\quad 10^2 \quad 10^4 \quad 10^6 \quad 10^8 \quad 10^{10} \quad 10^{12} \quad 10^{14} \quad 10^{16} \quad 10^{18}$ bar

[illegible] $\quad$ 地 [illegible] $\quad$ 太陽の[illegible] $\quad$ [illegible]

Wigner electron solid

Sternheimer 1950