LECTURE #9

Note Title 2/2/2009

1. HOLES
2. $\sigma_0(T)$ T-DEPENDENCE
3. $\sigma(\omega)$ TOO SIMPLE
4. CV T-DEPENDENCE
5. INSULATORS

BRAVAIS LATTICE:

ARRANGEMENT OF ATOMS IN SPACE WITH THE FOLLOWING PROPERTIES

1. SAME "VIEW"

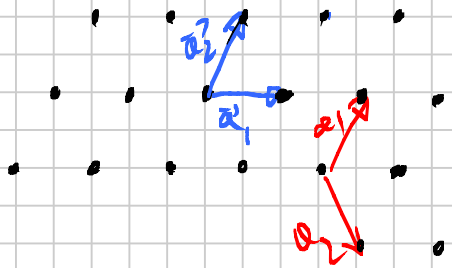
(2) $\vec{R} = n_1 \vec{a}_1 + n_2 \vec{a}_2 + n_3 \vec{a}_3$

$n_1, n_2, n_3 \in \mathbb{Z}$ (INTEGERS)

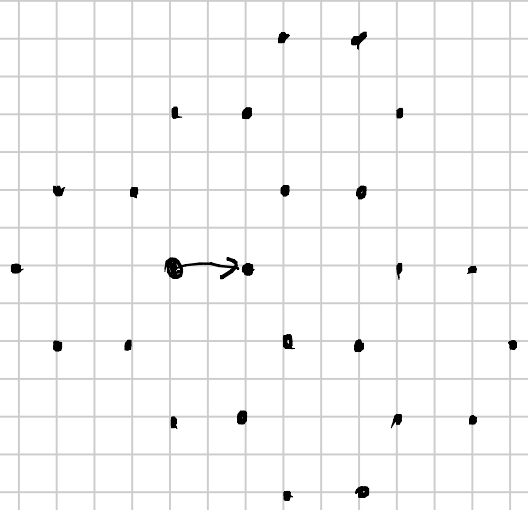
$\vec{a}_1, \vec{a}_2, \vec{a}_3$ — 3 NON-PARALLEL VECTORS

PRIMITIVE VECTORS

2D BRAVAIS



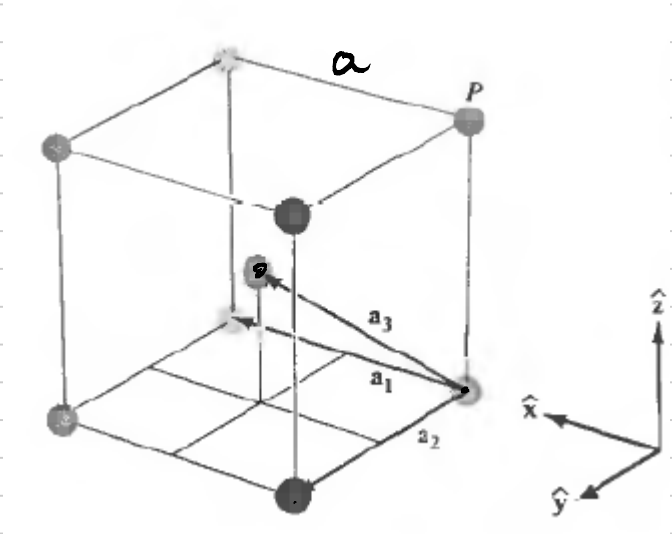
NOT A BRAVAIS LATTICE



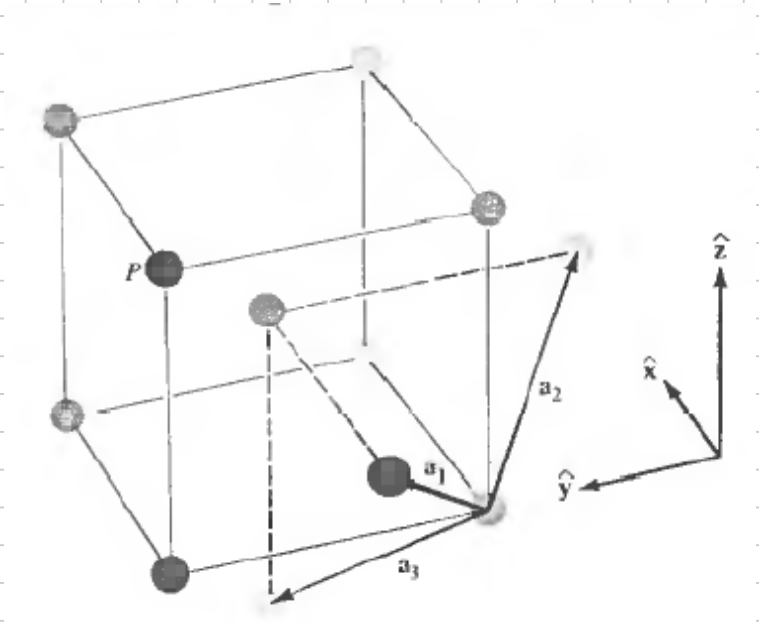
BCC BODY-CENTERED CUBIC

Li Na K Fe

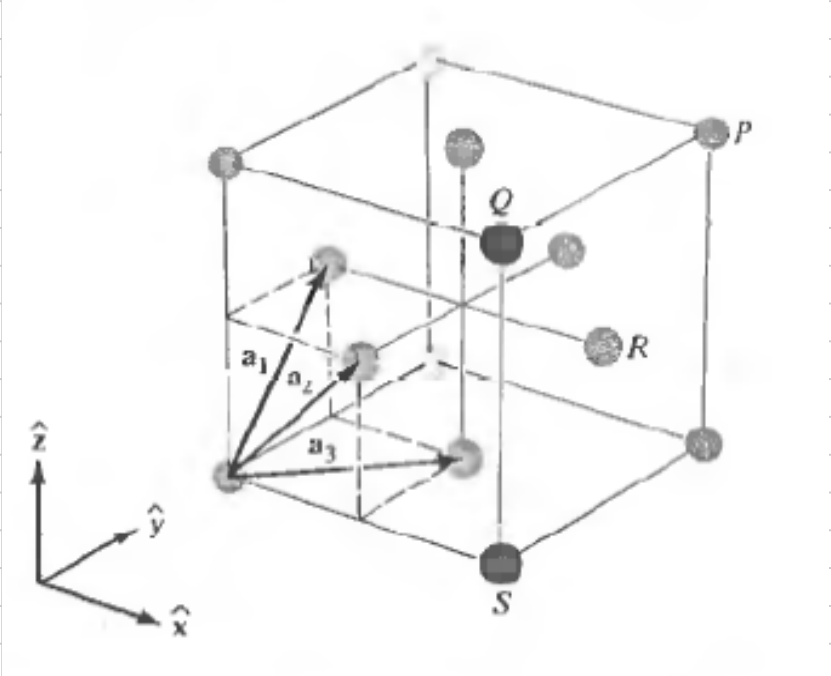
$$\vec{a}_1 = a(1,0,0)$$
$$\vec{a}_2 = a(0,1,0)$$
$$\vec{a}_3 = a\left(\frac{1}{2},\frac{1}{2},\frac{1}{2}\right)$$



$$\vec{a}_1 = \frac{a}{2}(\bar{1}\,1\,1)$$
$$\vec{a}_2 = \frac{a}{2}(1\,\bar{1}\,1)$$
$$\vec{a}_3 = \frac{a}{2}(1\,1\,\bar{1})$$



FACE - CENTERED CUBIC



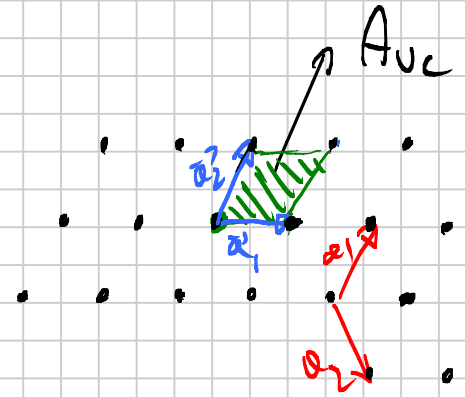
$$\vec{a}_1 = \frac{a}{2}(011)$$

$$\vec{a}_2 = \frac{a}{2}(101)$$

$$\vec{a}_3 = \frac{a}{2}(110)$$

Ag, Cu, Au

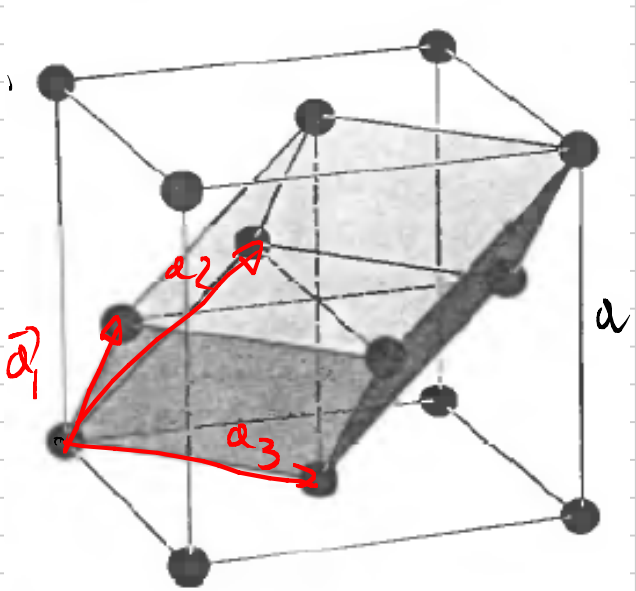
PRIMITIVE UNIT CELL FOR A LATTICE



1 ATOM / UNIT CELL

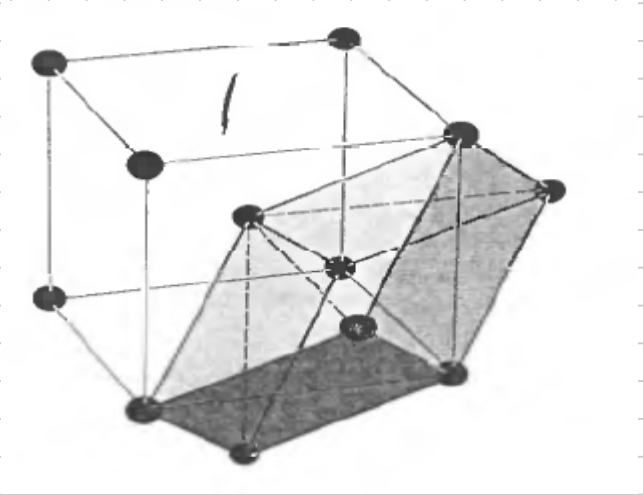
$$\frac{1}{A_{UC}} = \frac{\#\ \text{ATOMS}}{A} = \text{DENSITY}$$

FCC



$$V_{uc} = \frac{a^3}{4}$$

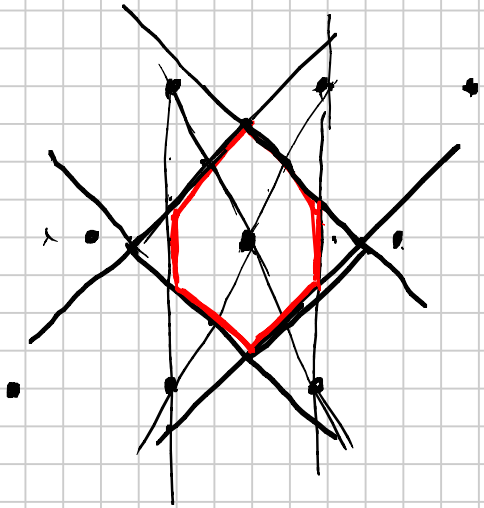
BCC



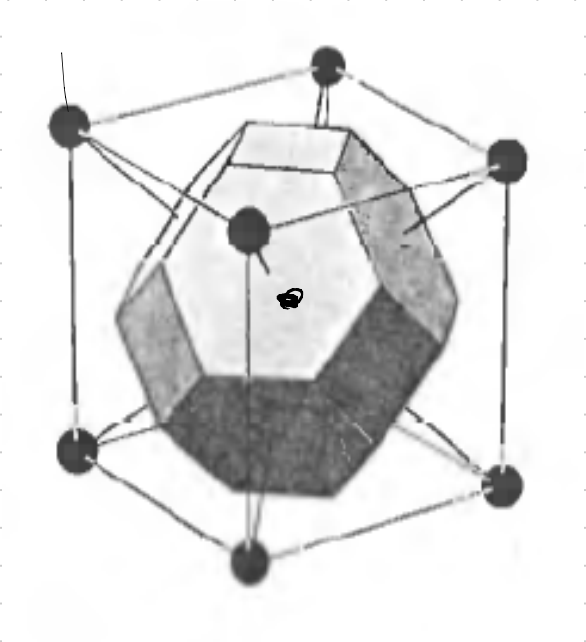
$$V_{uc} = \frac{a^3}{2}$$

UNIT CELL WITH ATOM AT THE CENTER

WIGNER - SEITZ CELL



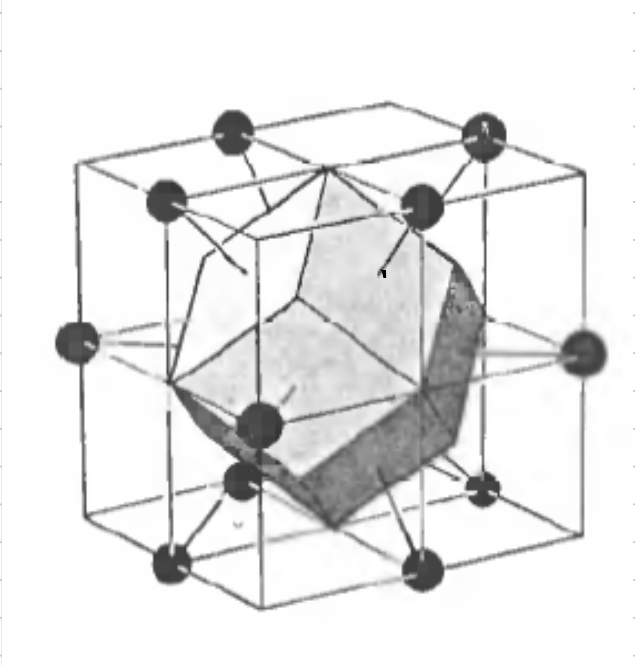
BCC



TRUNCATED OCTAHEDRON

8 FIRST NEIGHBRS

8 COORDINATION #



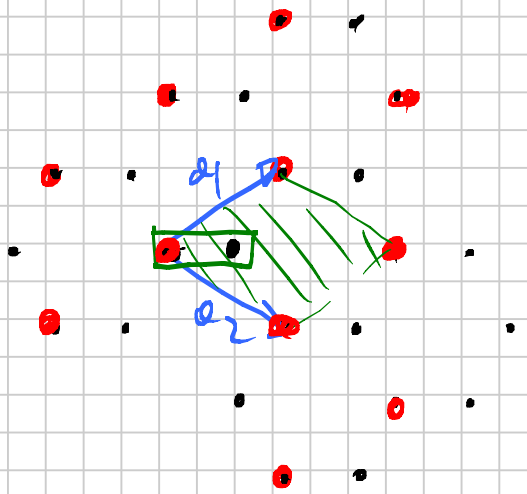
FCC 12 FIRST NEIGHBRS

RHOMBIC DODECAHEDRON

CENTER DIAMOND

DIRECTION $\vec{v}_1 = \frac{a}{2}(1\,1\,0)$

LATTICE WITH BASIS



- BRAVAIS
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$\vec{b}_R = 0$

$\vec{b}_B = (2, 0)$

2 ATOMS UNIT CELL