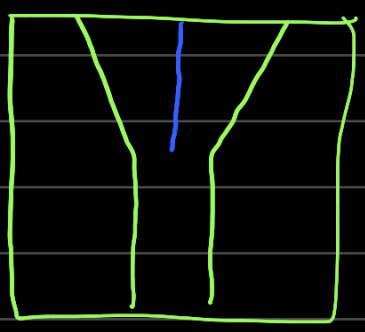
Day-22

→ Dislocation → 1D defect
(max. disturbance along a curve)

Edge and screw dislocation
Their linear combo. : mixed dislocation

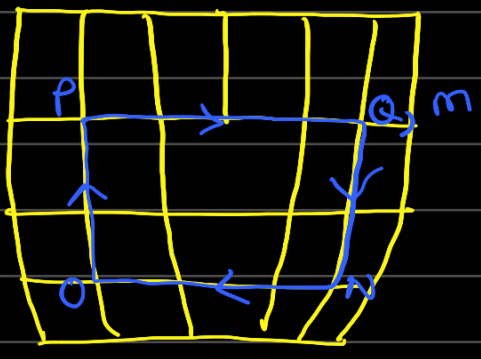


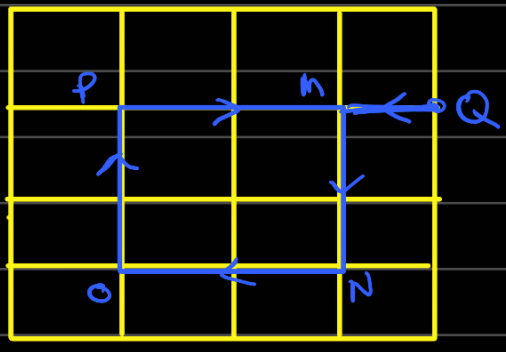
} Half plane

⊗ → line of atoms
(+ve line vector)

☆ Burgers' vector → many ways of defining, but we have to agree upon a convention.

☆ Burgers' circuit





'missing link' in perfect crystal (interatomic distance)

Full dislocation

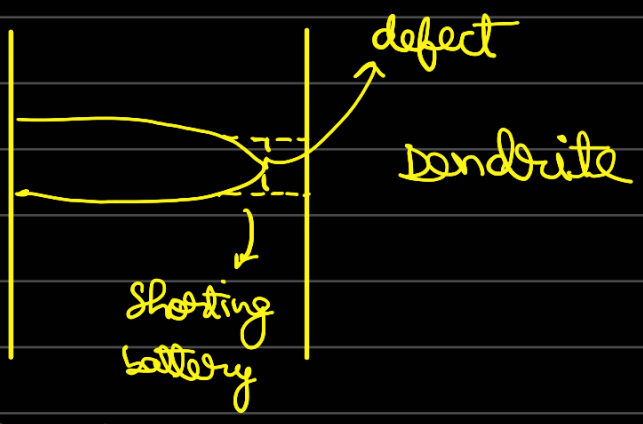
Qm → Burgers' vector

$\vec{b}$ (for energy, we care for $|\vec{b}|^2$)

→ Screw dislocation : $\vec{b} \parallel \hat{t}$

→ Circuit in defected crystal with same start (S) and finish (F).

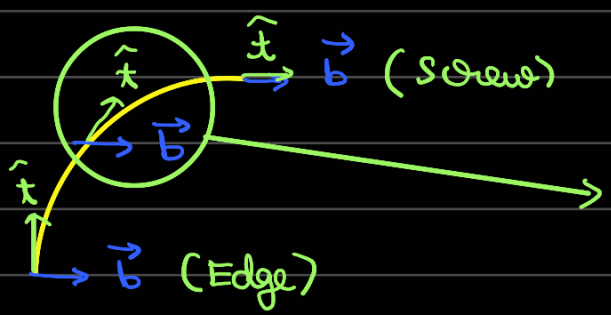
→ Dislocation density

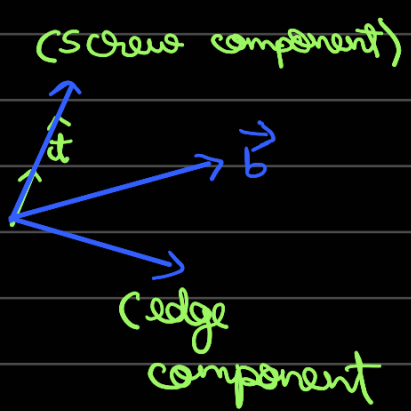


→ mixed Ds Loop :

Burgers' vector is invariant once a Ds is identified.

Quarter loop (from slide)





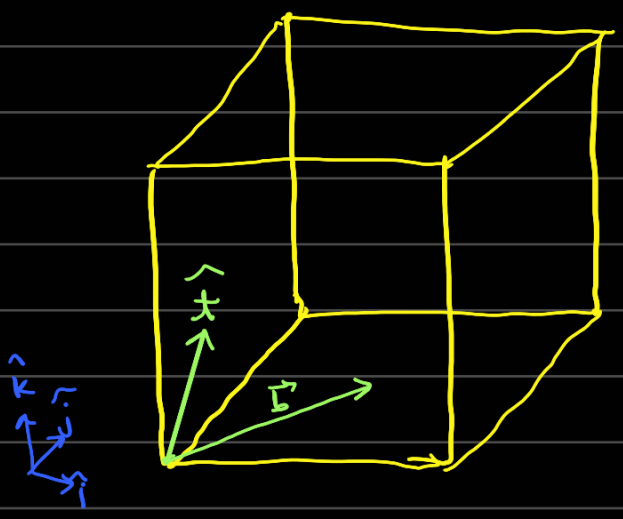
→ Cubic crystal

Mixed dislocation straight line

- along [1 1 2]
- $\vec{b} = 0.5\,[1\,1\,0]$

what are the $\vec{b}_{edge}$, $\vec{b}_{screw}$?

Ans:)



$$\hat{t} = \frac{1}{\sqrt{6}}[1\,1\,2]$$

$$\vec{b}.\hat{t} = \frac{1}{2\sqrt{6}} \times 2$$

$$= \frac{1}{\sqrt{6}}$$

$$|\vec{b} \times \hat{t}| = \sqrt{\frac{1}{2} - \frac{1}{6}}$$

$$= \frac{1}{\sqrt{3}}$$

$$\vec{b}_{screw} = \frac{1}{\sqrt{6}}[1\,1\,2] \times \frac{1}{\sqrt{6}} = \frac{1}{6}[1\,1\,2]$$

$$\vec{b}_{edge} = \frac{1}{2}[1\,1\,0] - \frac{1}{6}[1\,1\,2]$$

$$= \left[\frac{1}{3} \quad \frac{1}{3} \quad -\frac{1}{3}\right]$$

$$= \frac{1}{3}[1\,1\,\bar{1}]$$