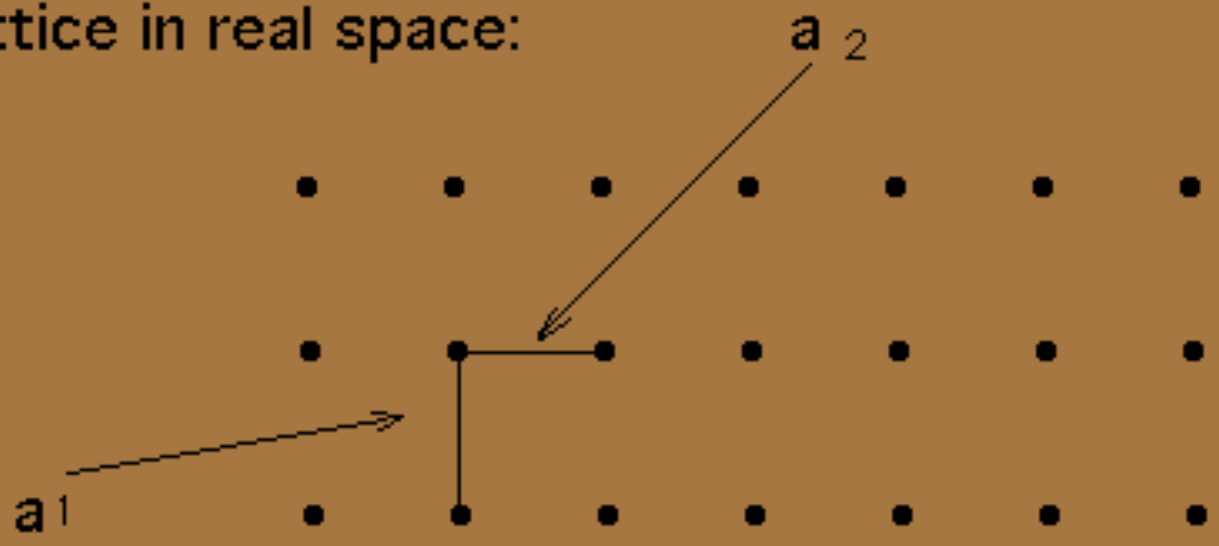
The reciprocal lattice:

Lattice in real space:

The reciprocal lattice:

Lattice in real space:



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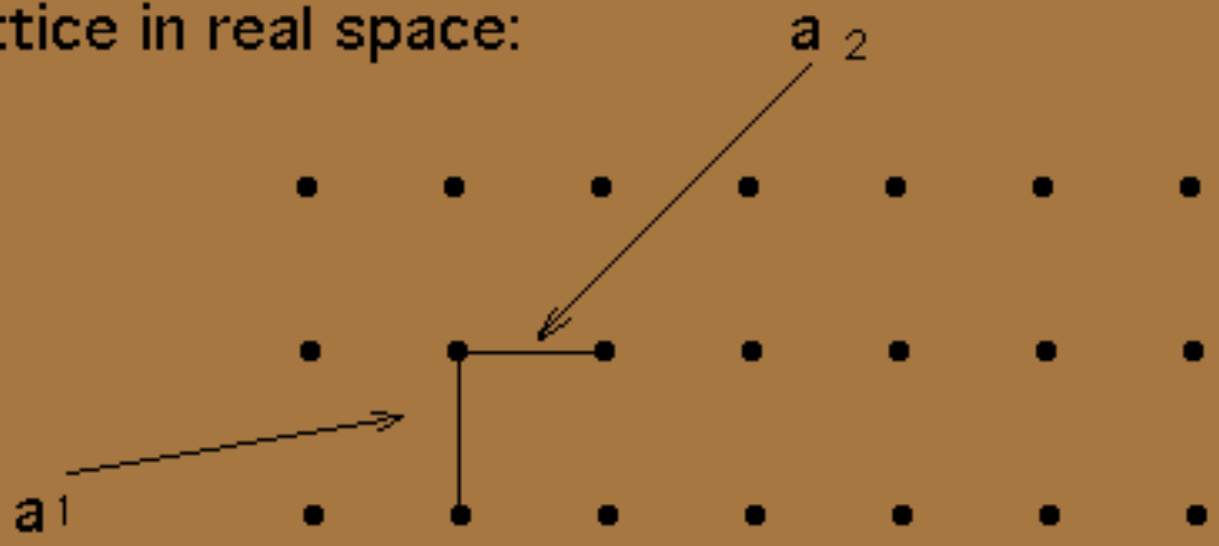
Lattice in real space:



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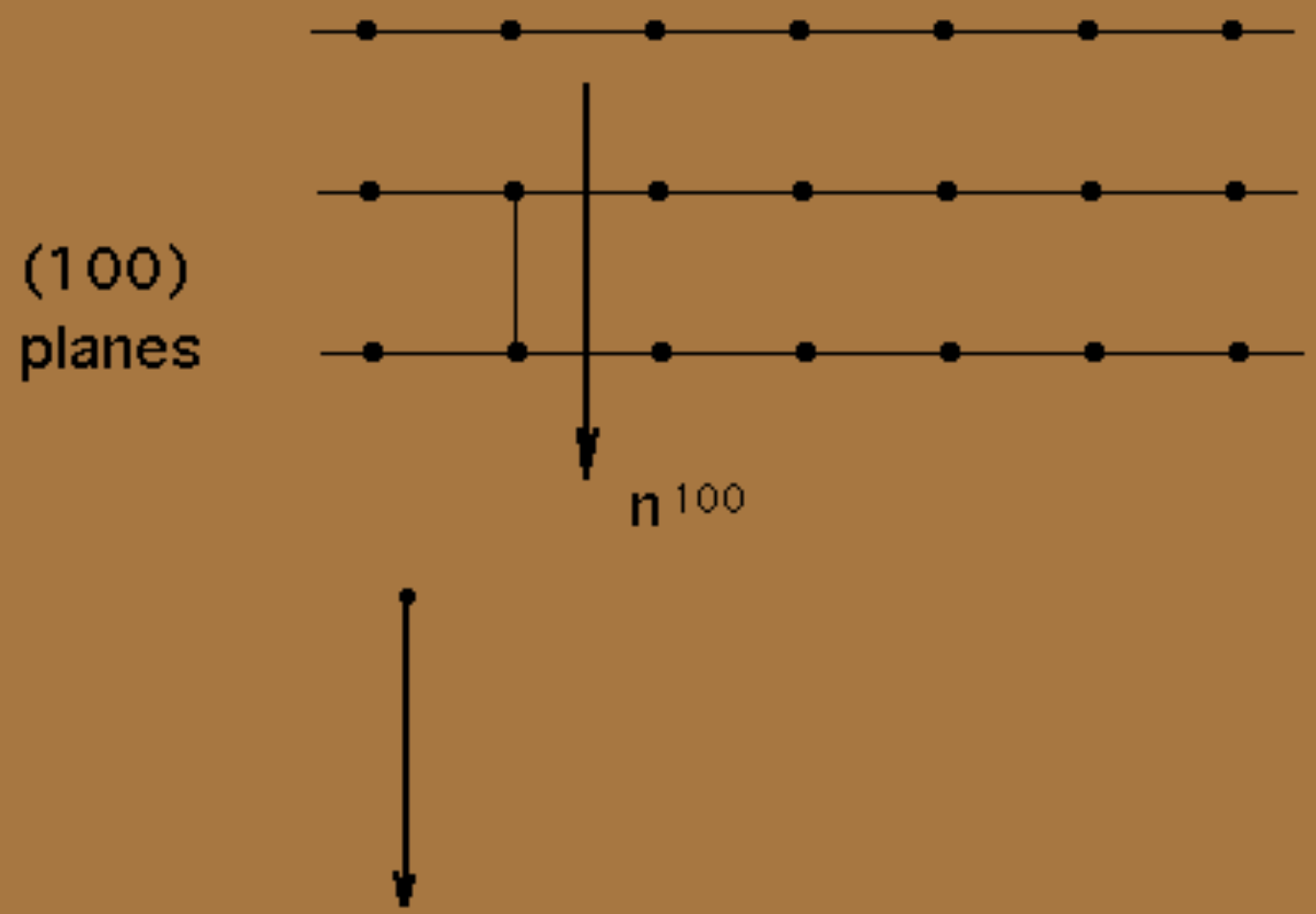

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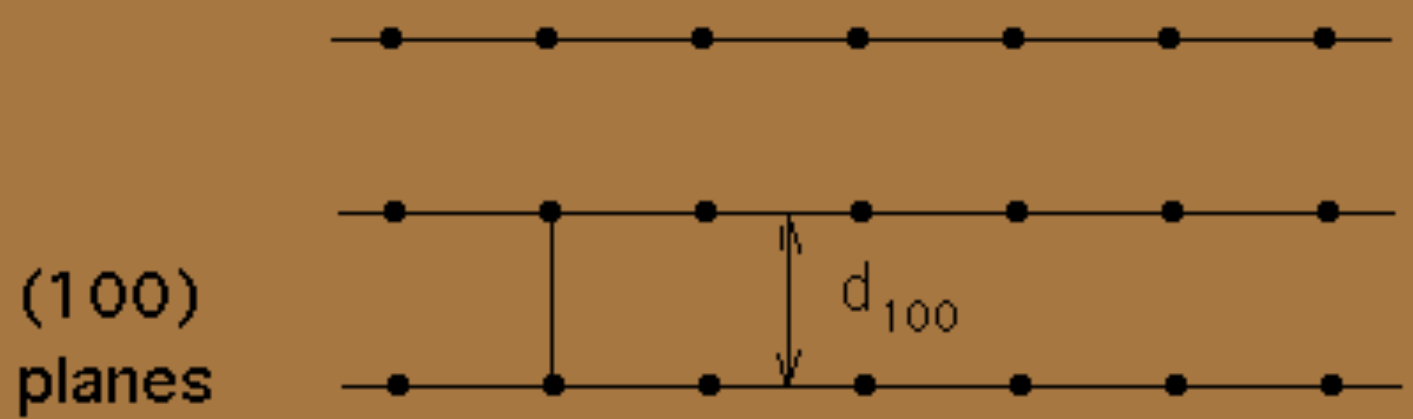

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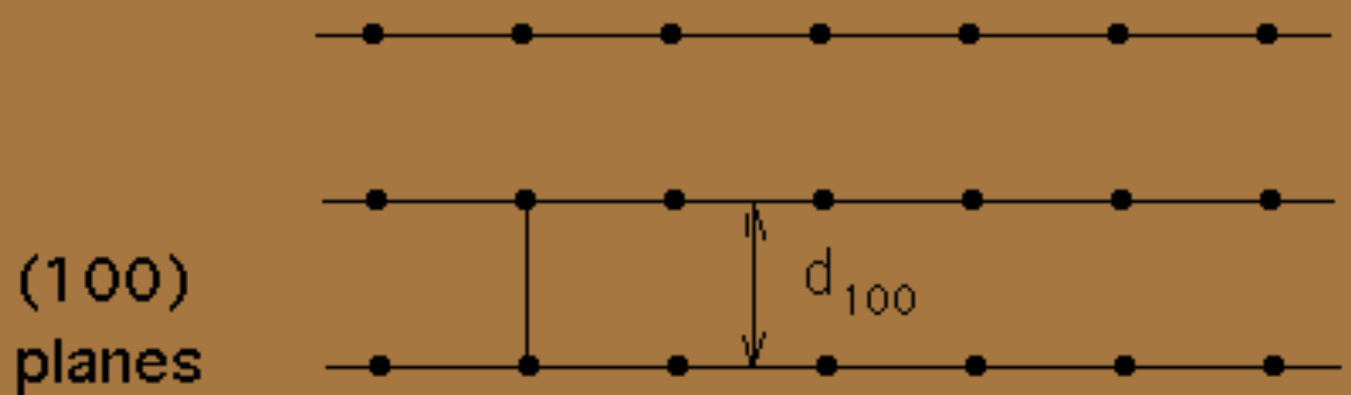

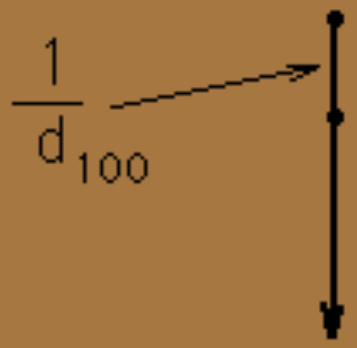

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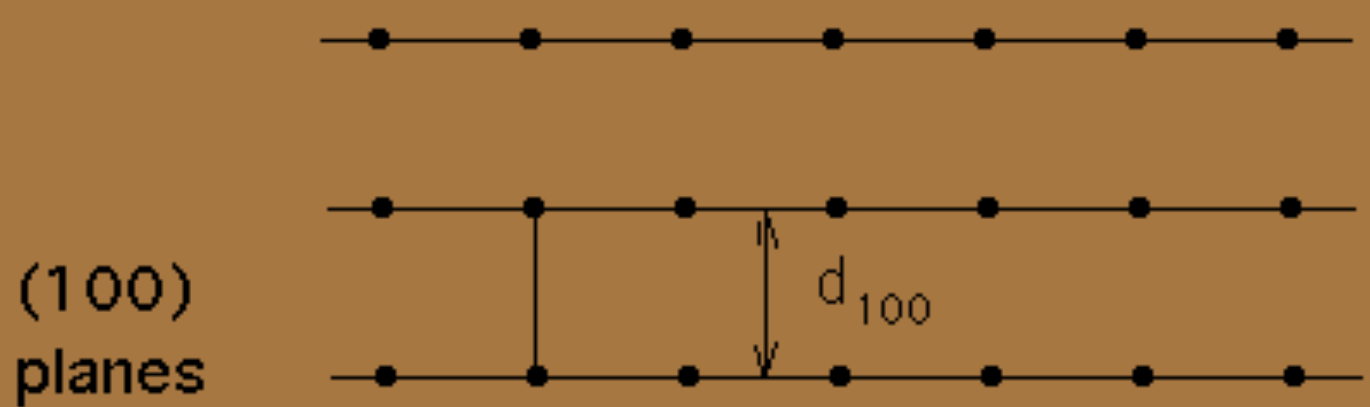

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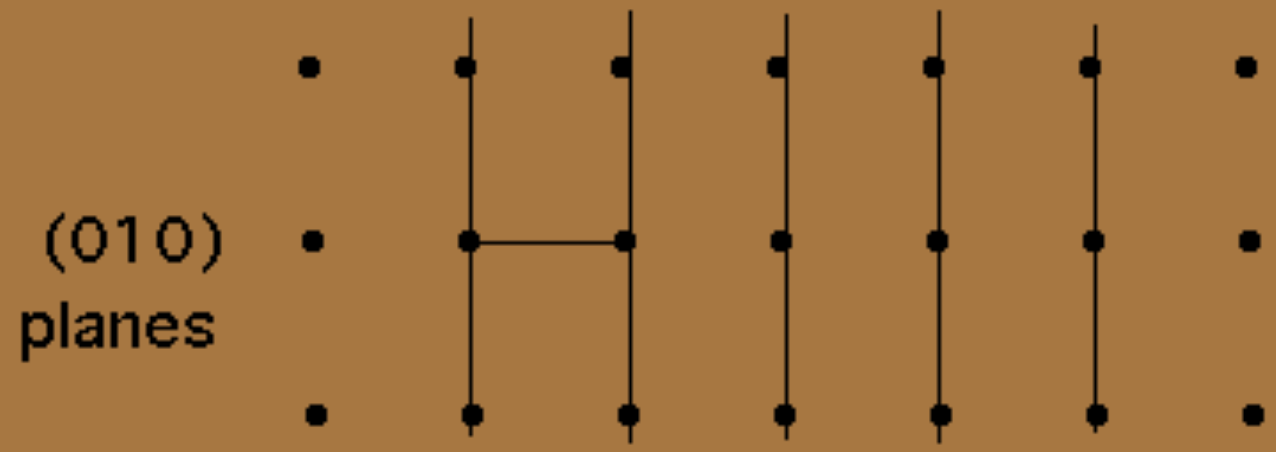

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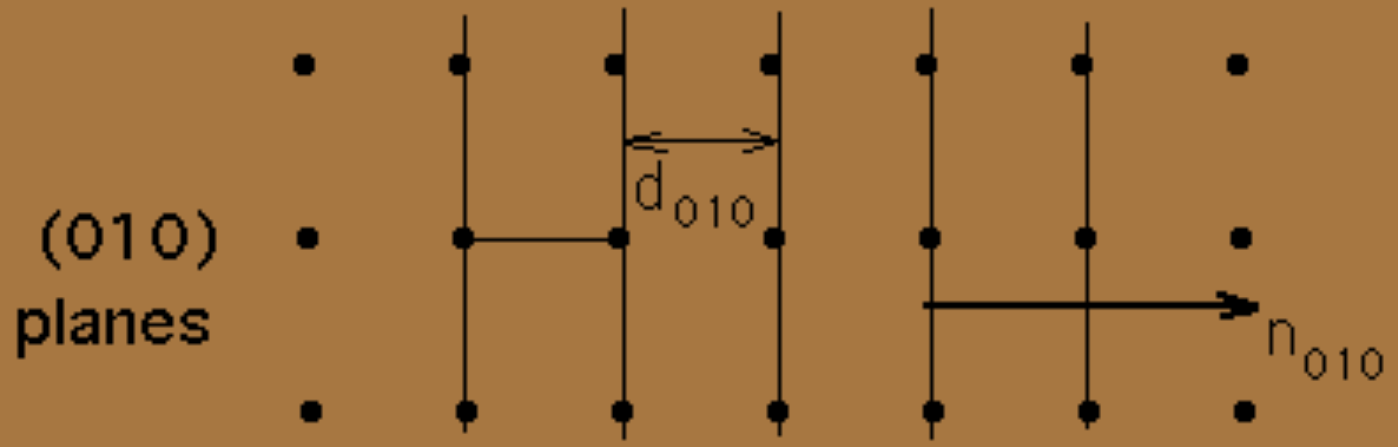

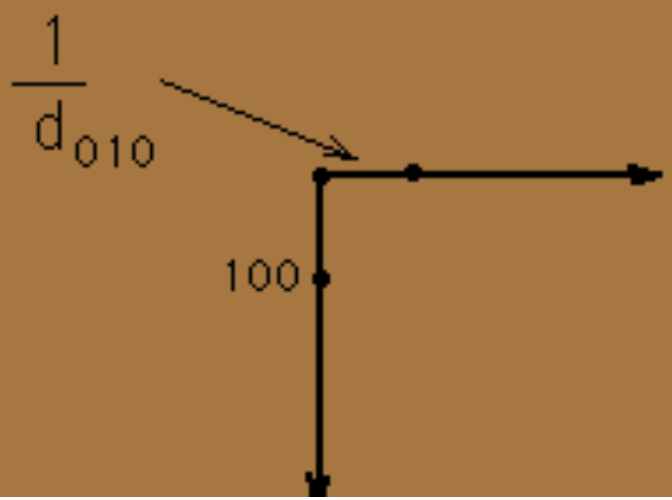

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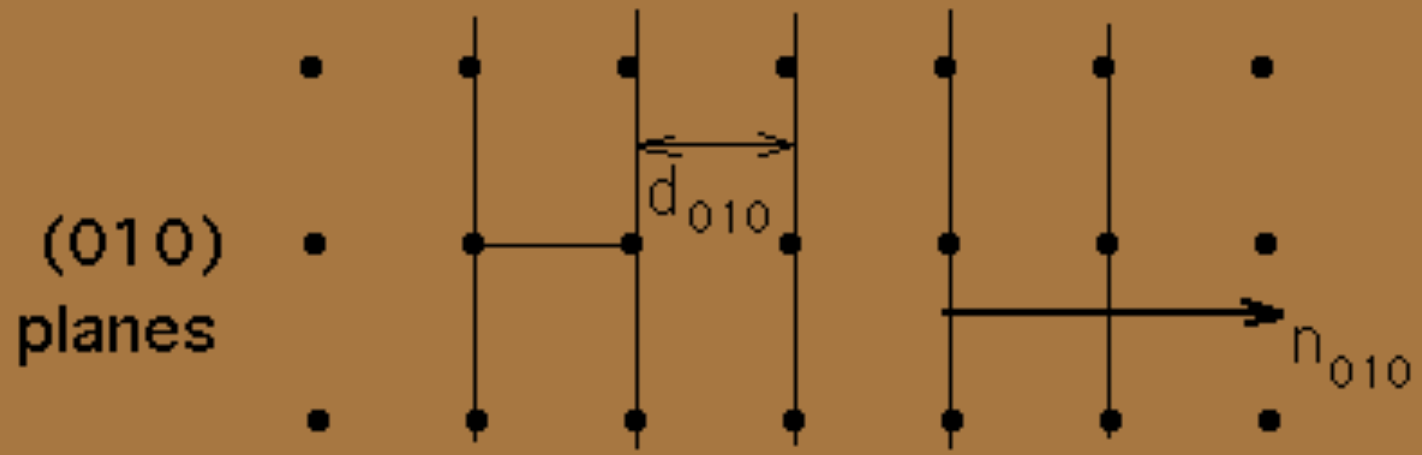

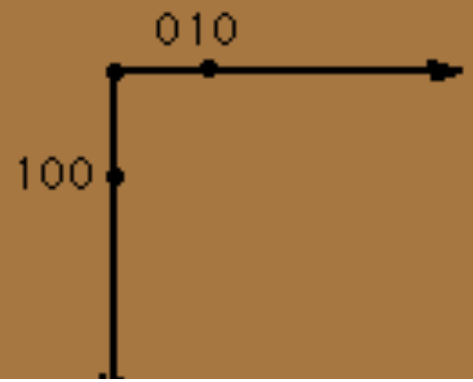

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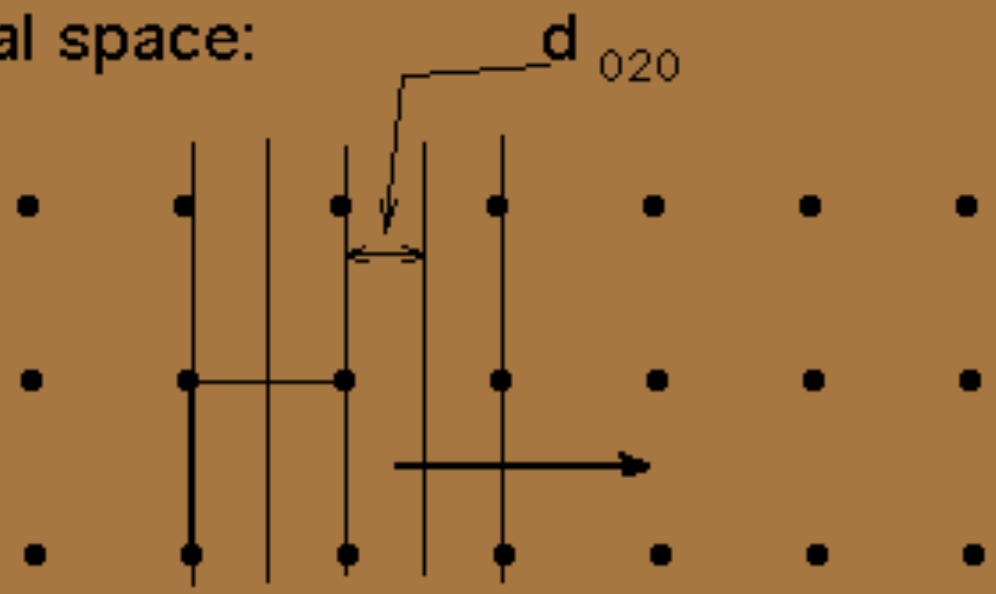

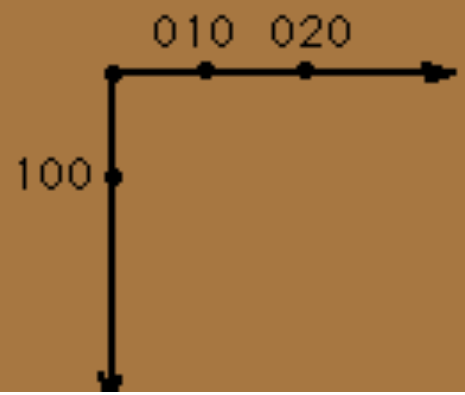

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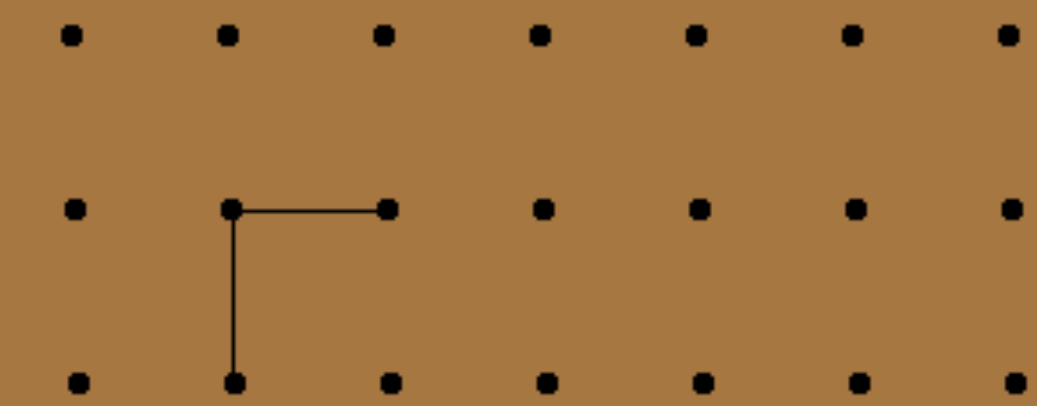

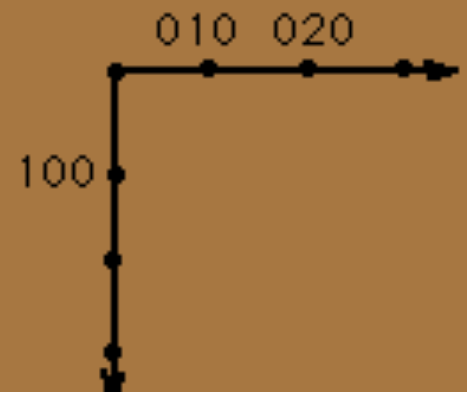

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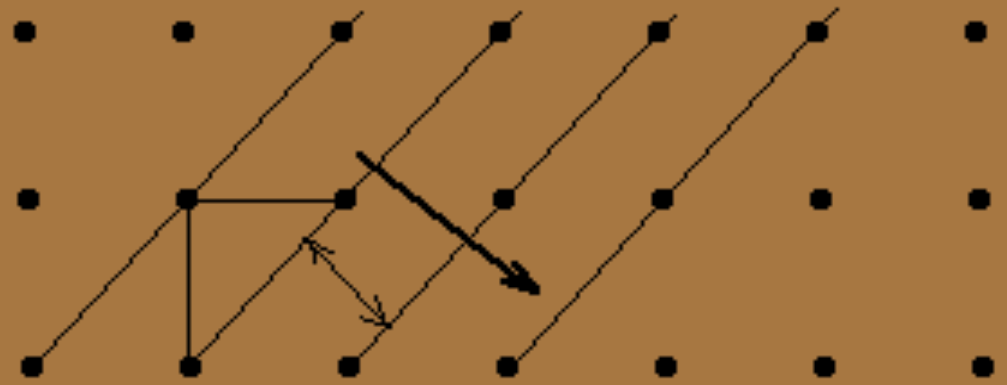

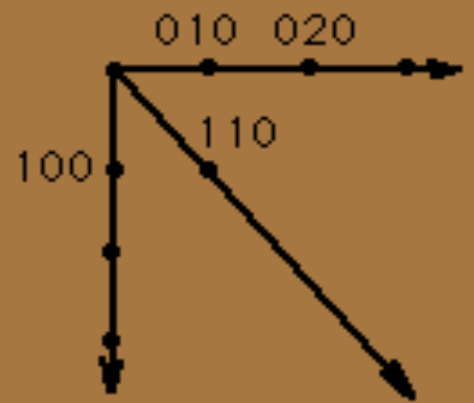

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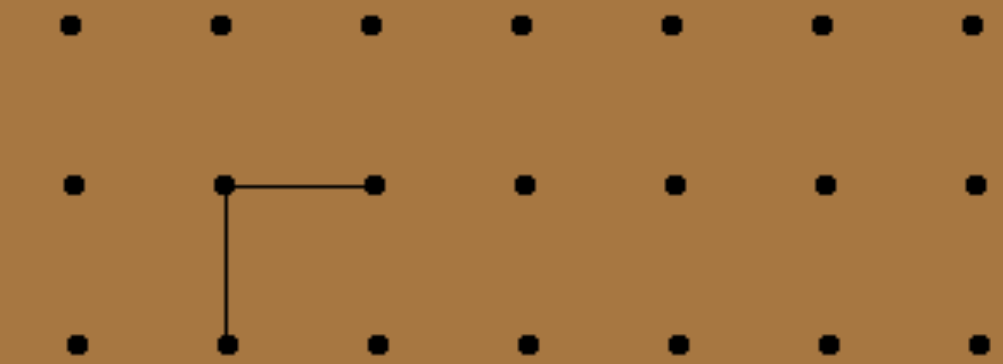
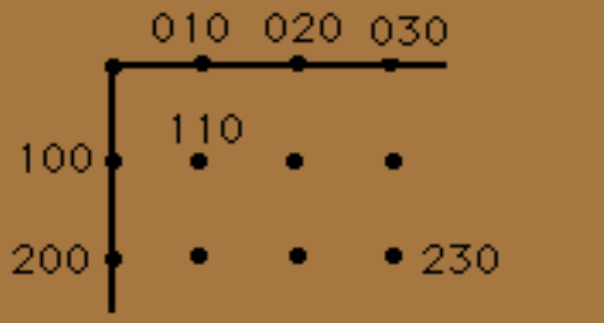
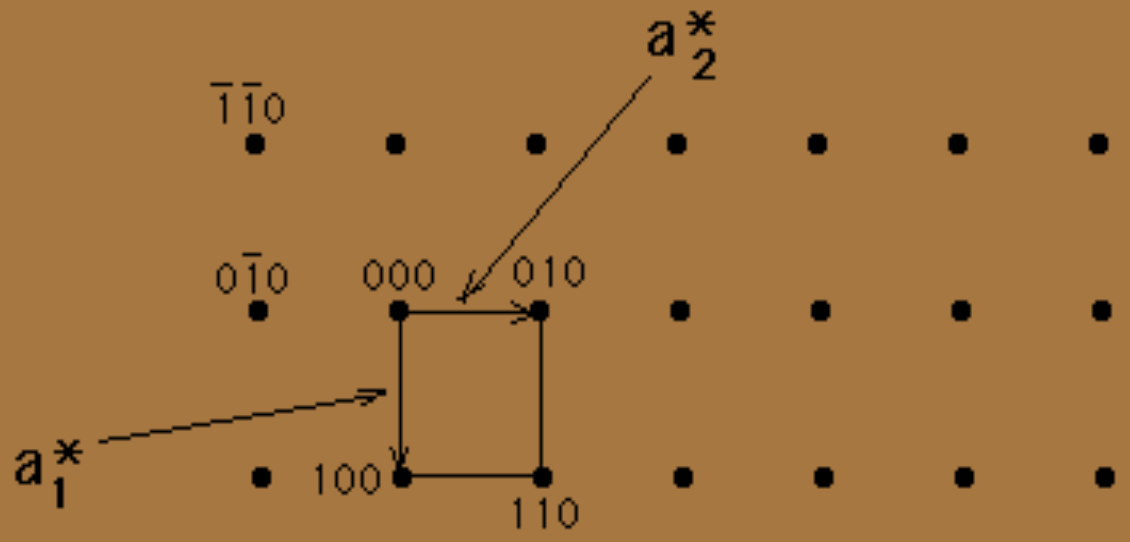




reciprocal lattice

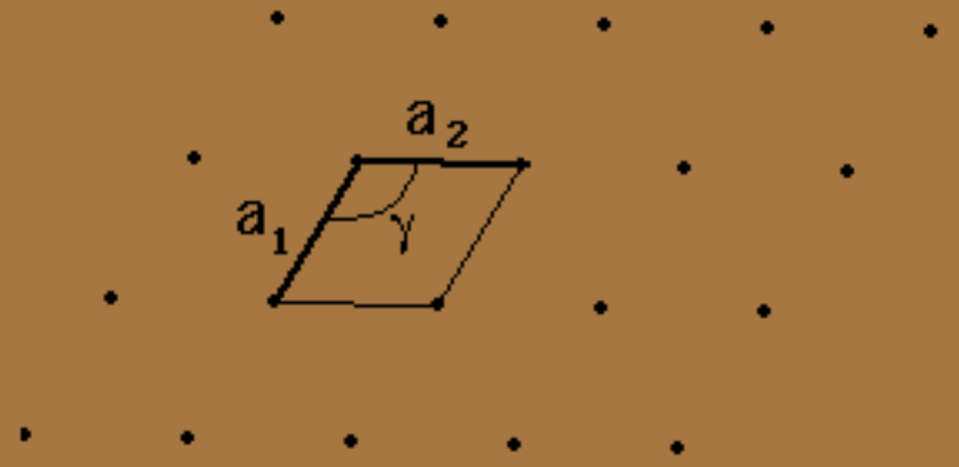
The reciprocal lattice:

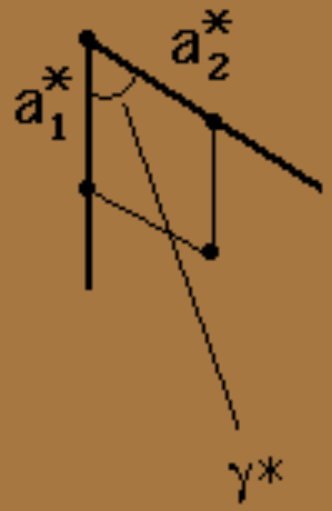


Here:

$$\left|a_1^*\right| = \frac{1}{a}$$

For hexagonal:



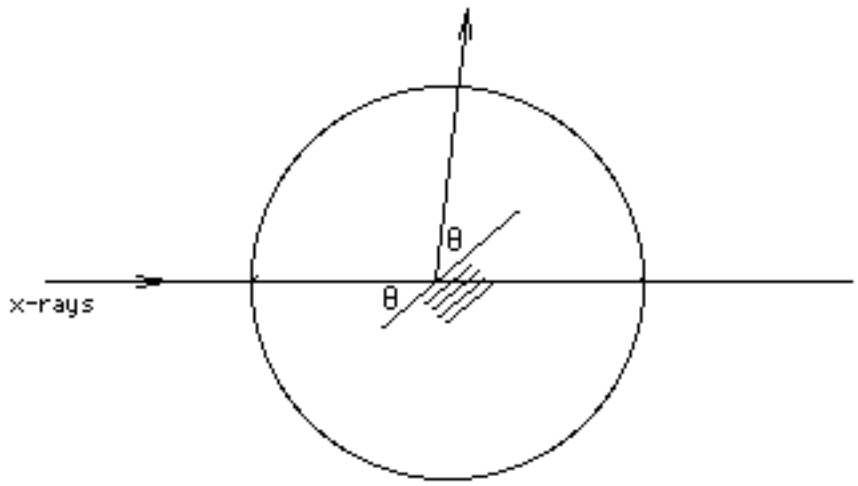


In general:

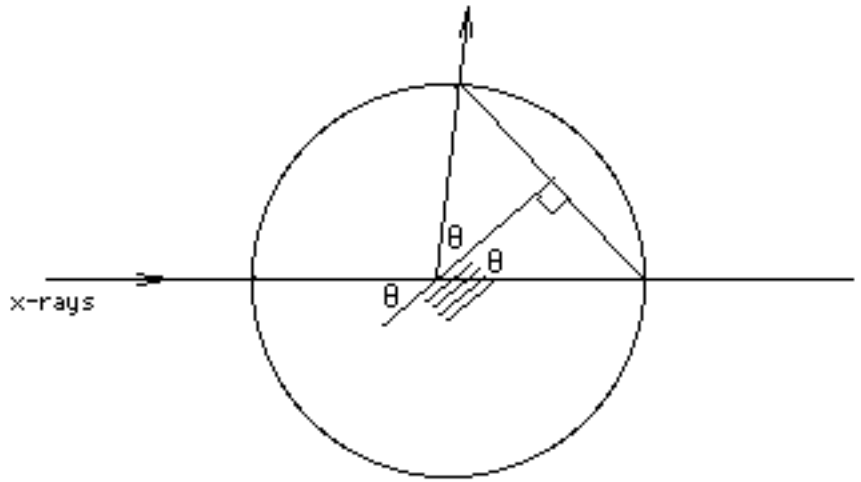
$$a^* = \frac{b \times c}{a \cdot b \times c}$$

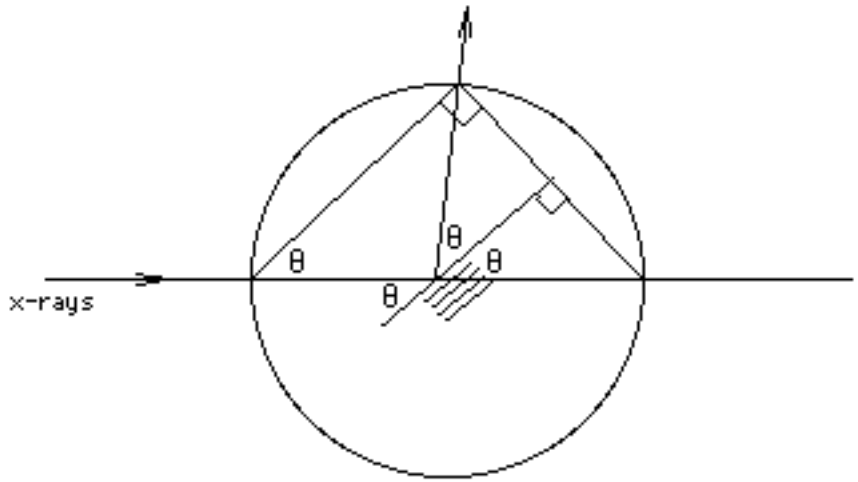
$$b^* = \frac{c \times a}{a \cdot b \times c}$$

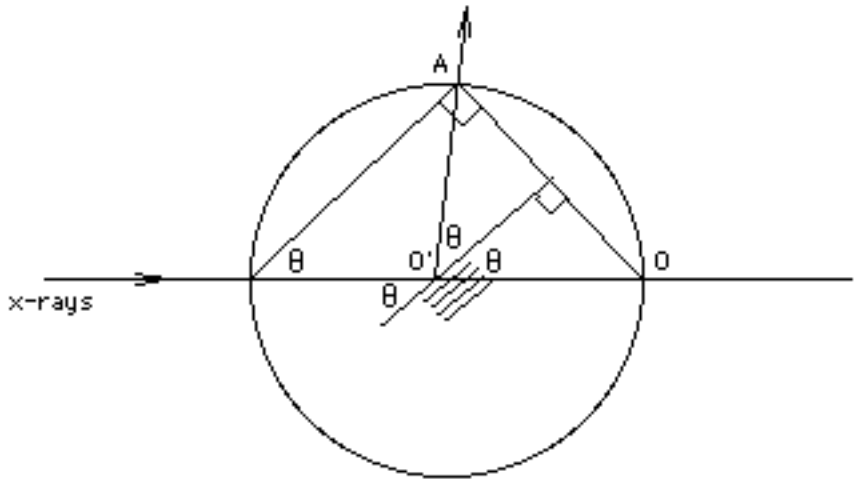
$$c^* = \frac{a \times b}{a \cdot b \times c}$$



sphere radius = $1/\lambda$

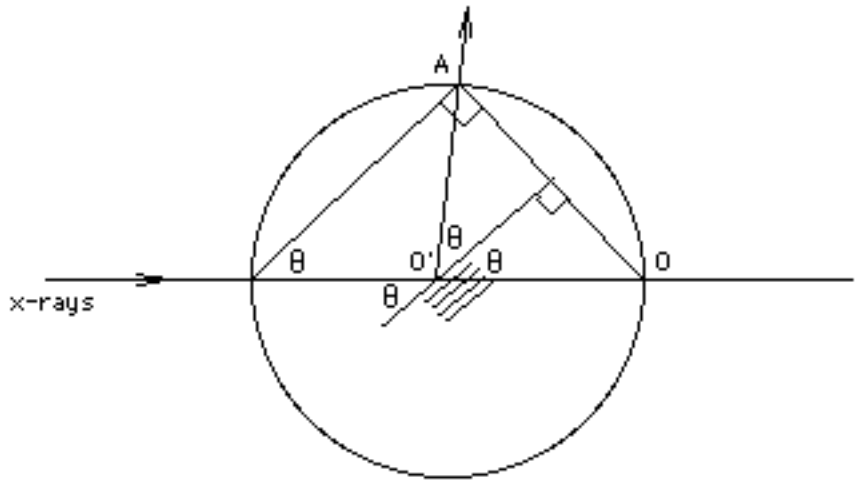

x-rays
θ
θ
θ


x-rays
θ
θ
θ
θ



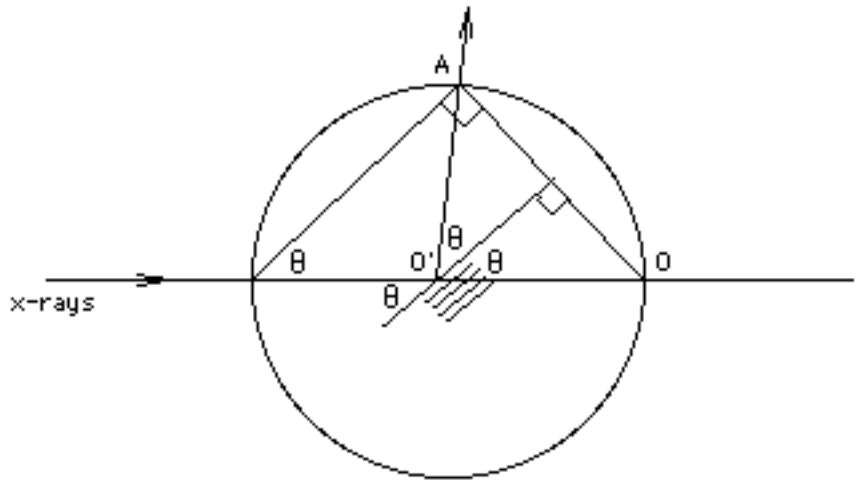
sphere radius = $1/\lambda$

$$\sin\theta = \frac{AO}{2/\lambda}$$



sphere radius = $1/\lambda$

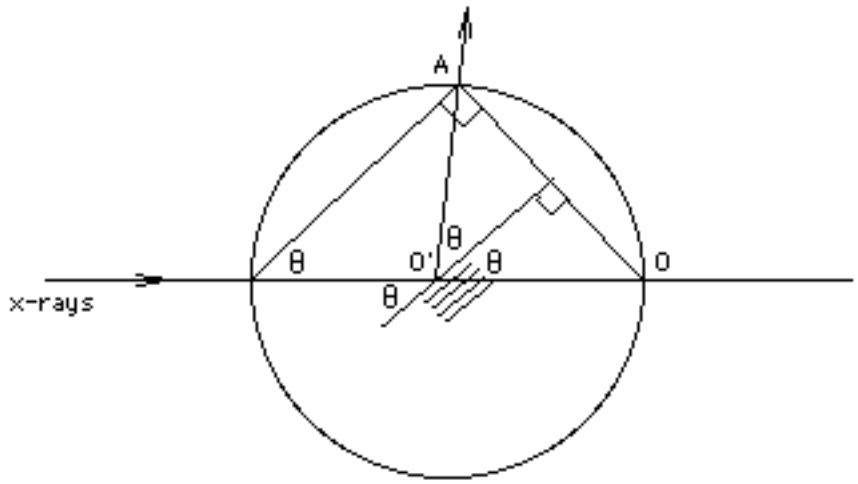
$$\sin\theta = \frac{AO}{2/\lambda} \qquad 2\sin\theta = AO \cdot \lambda$$



sphere radius = $1/\lambda$

$2 \sin \theta = AO \cdot \lambda$

Braggs' law if AO = 1/d
AO is normal to planes

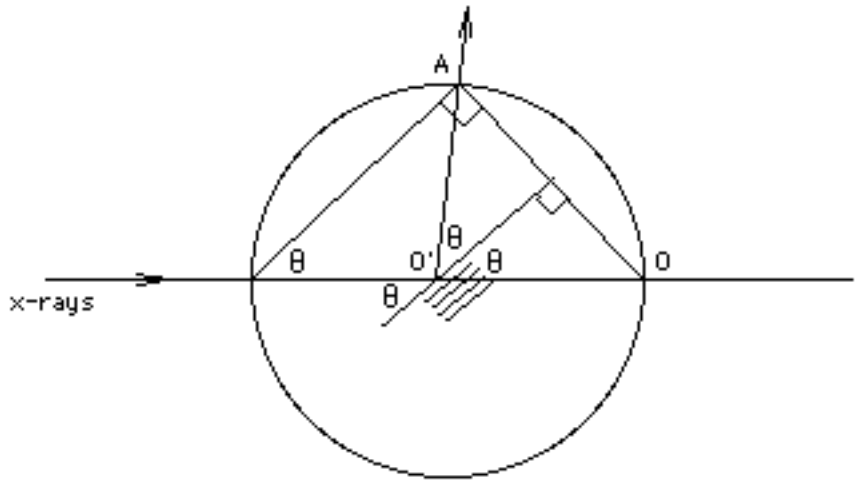


sphere radius = $1/\lambda$

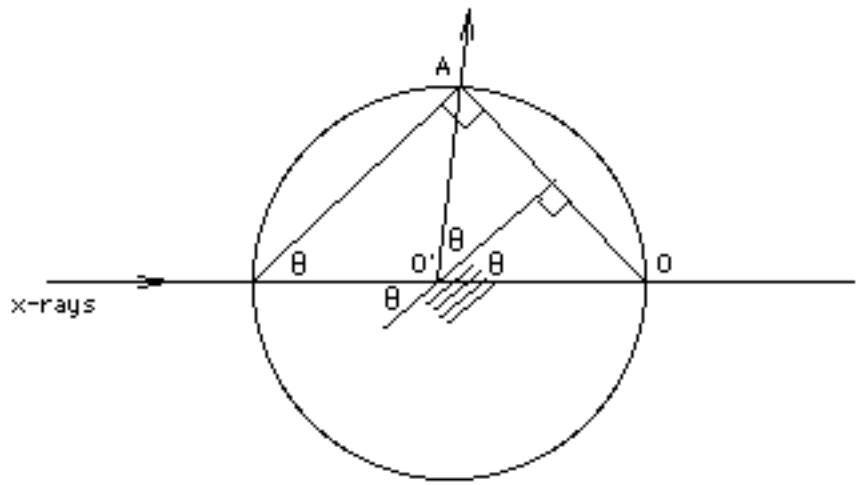
$2 \sin \theta = AO \cdot \lambda$

Braggs' law if AO = 1/d
AO is normal to planes

If O is origin then A is a reciprocal lattice point

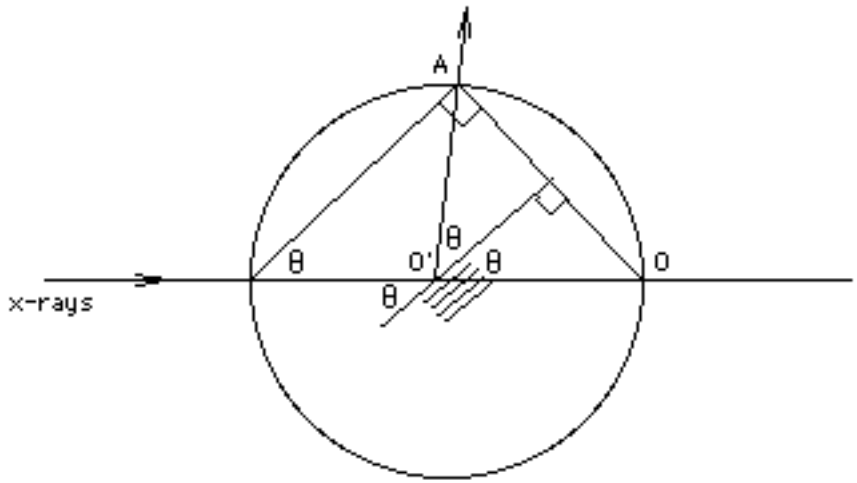


Criterion: if the origin of the reciprocal lattice is placed at O, then, for any reciprocal lattice point on the Ewald sphere, there be reflection along the direction from the center of the sphere to the point on the sphere.



Criterion: if the origin of the reciprocal lattice is placed at O, then, for any reciprocal lattice point on the Ewald sphere, there be reflection along the direction from the center of the sphere to the point on the sphere.

Any point in the reciprocal lattice which does not lie on the sphere corresponds to sets of planes which are not in a position to reflect.



In general, reciprocal lattice points do not lie on the sphere.

To observe the reflections, then, we must:

1. **move the sphere**
2. **move the crystal (rotate)**
3. **change the size of the sphere**