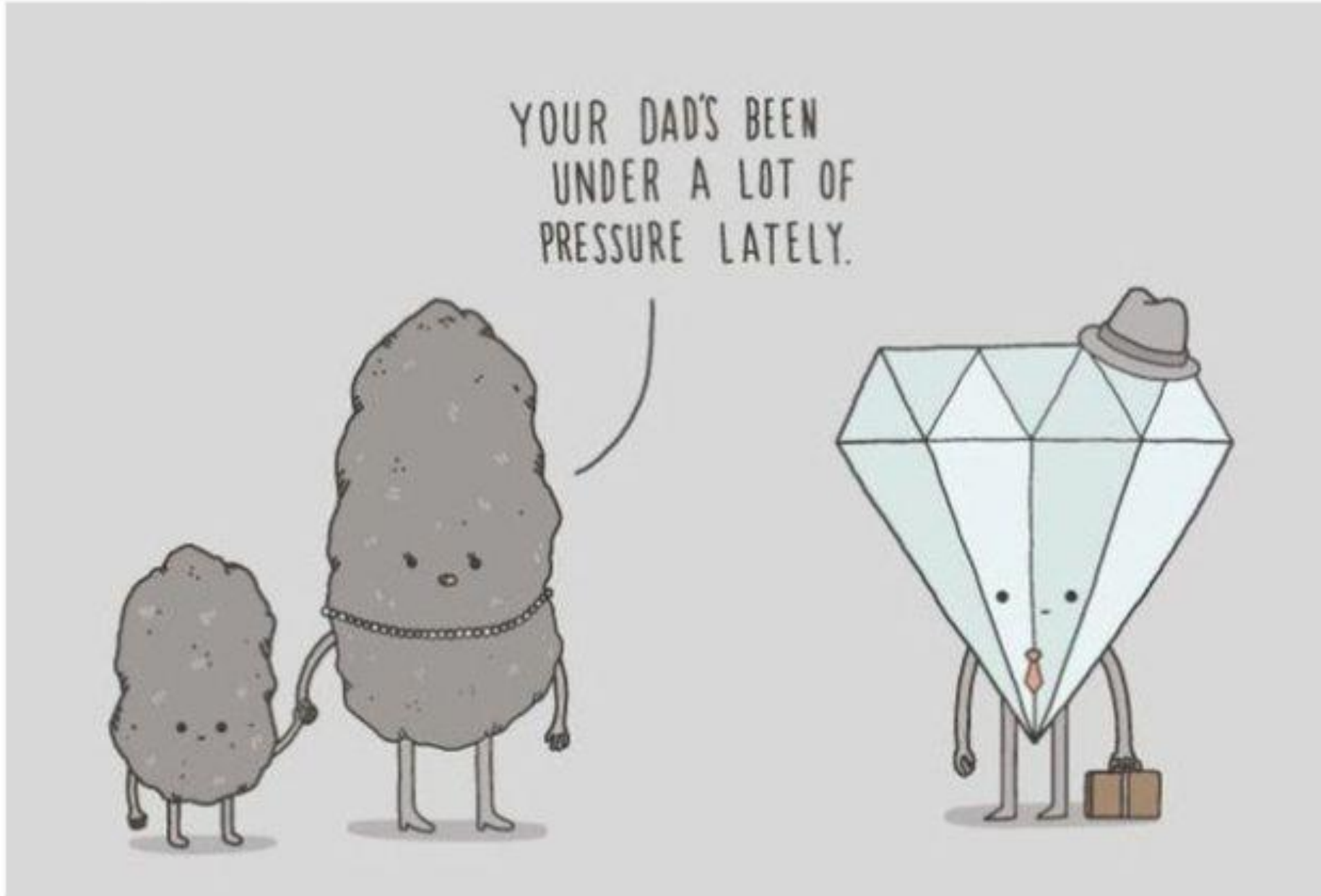
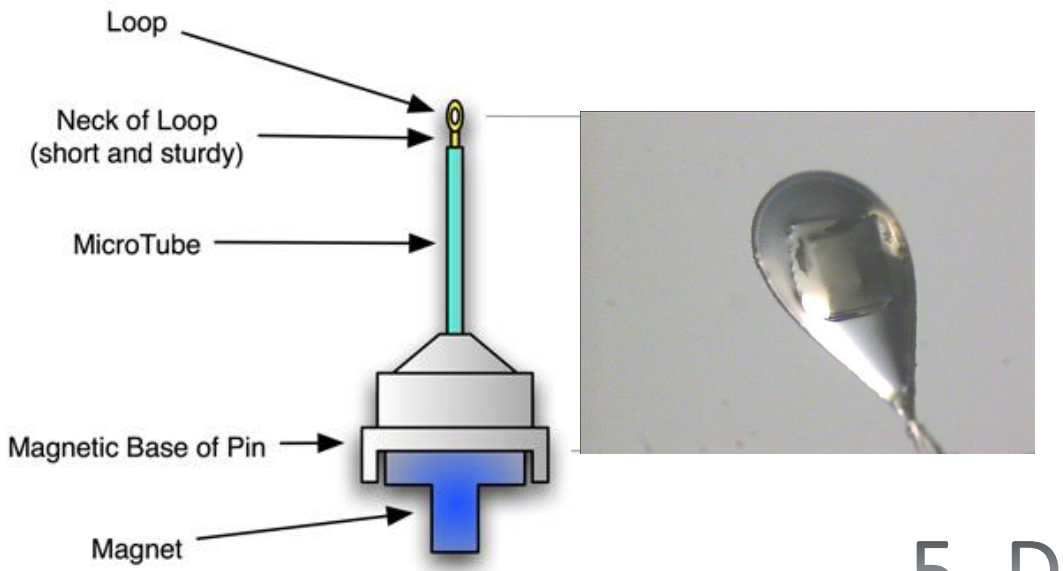
I can tell.

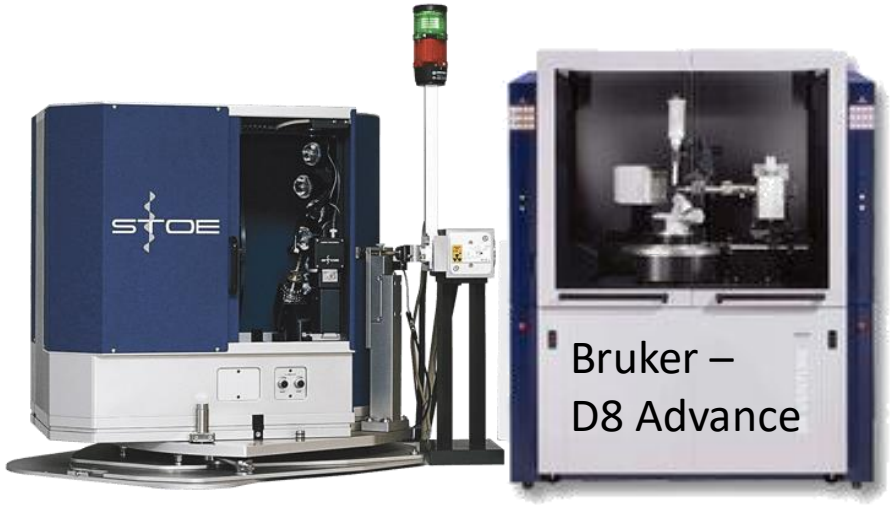


1. Make Crystal

2. Choose Crystal

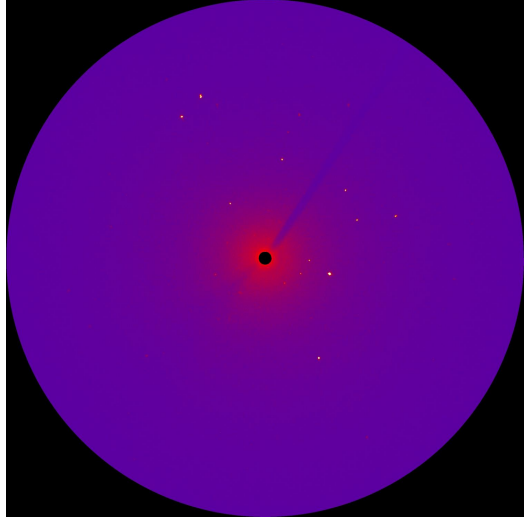


3. Mount Crystal

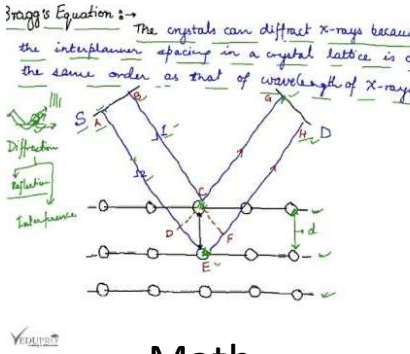


STOE – IPDS
(Image Plate Detector System)

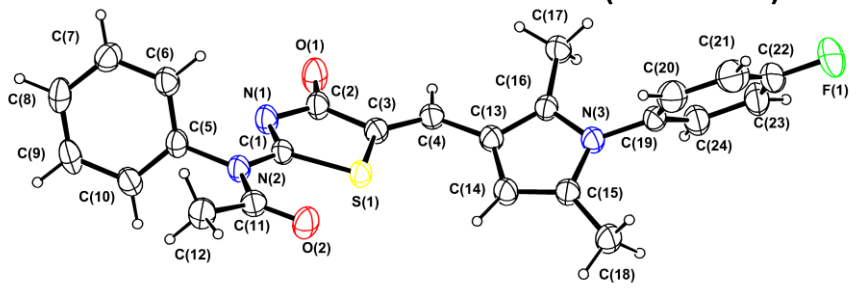
4. Measure crystal

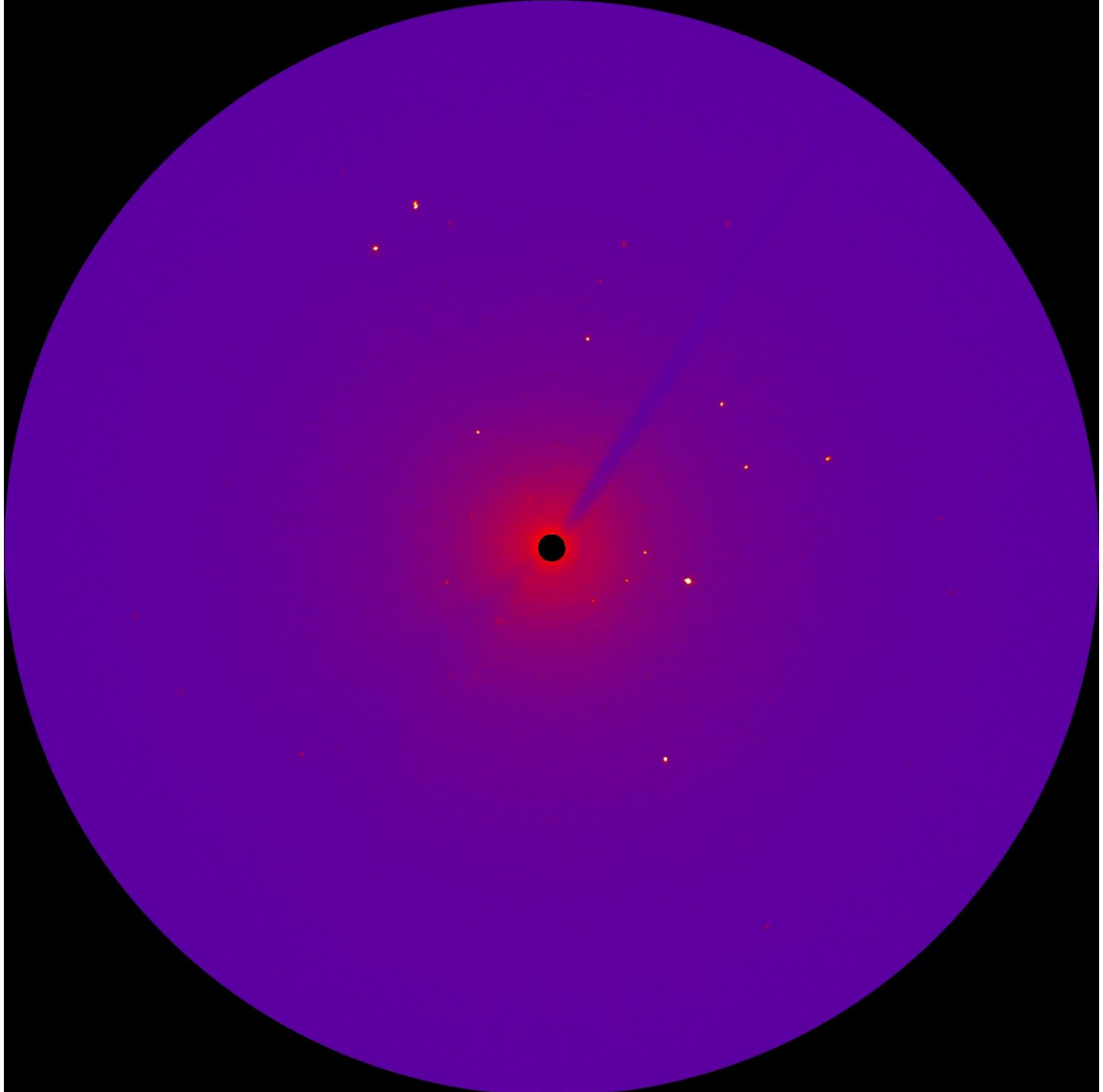


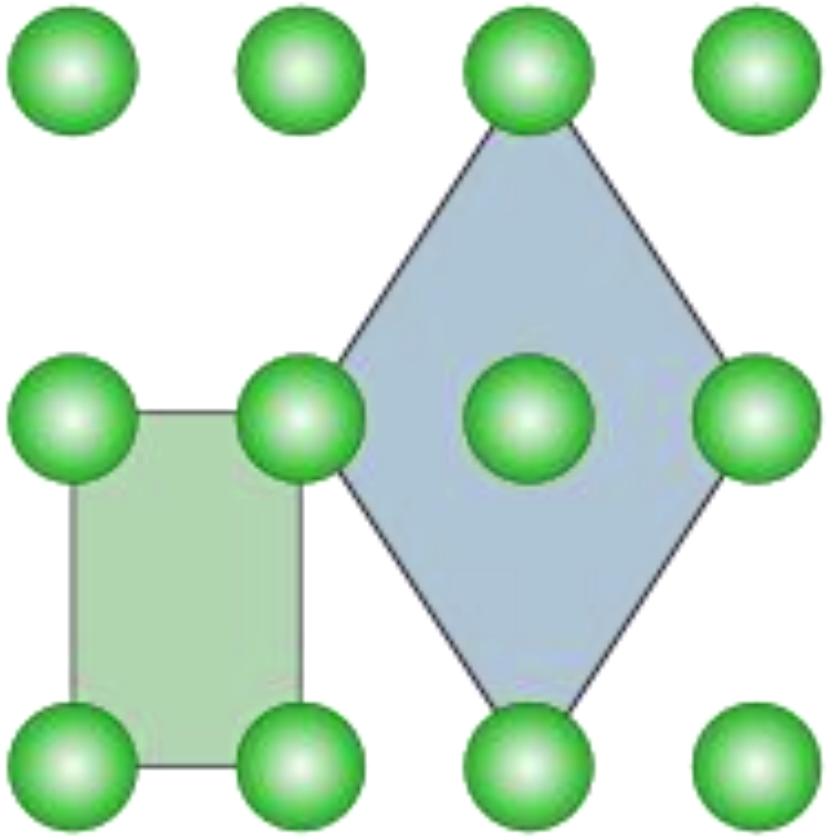
5. Data Reduction And Refinement

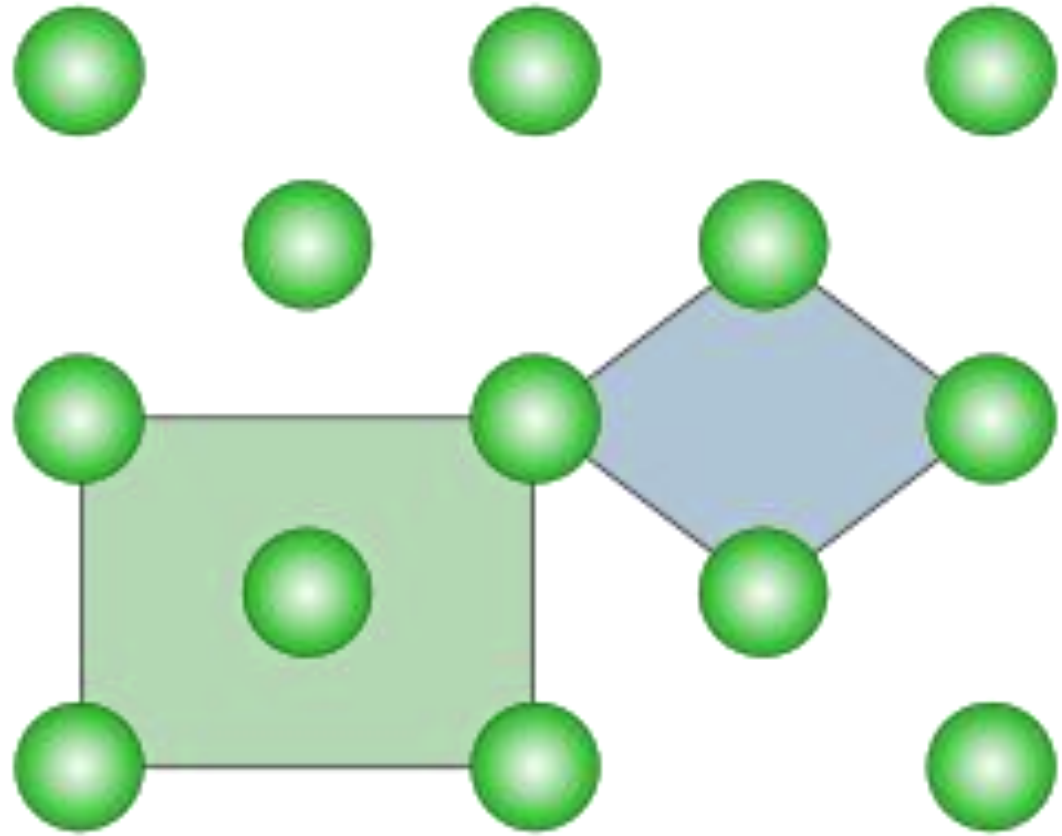


Math
Intuition
Experience
(Voodoo)

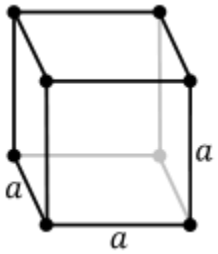




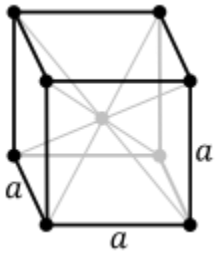




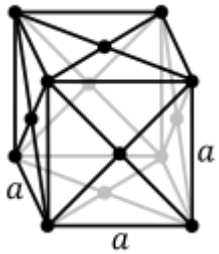
14 Bravais Lattices



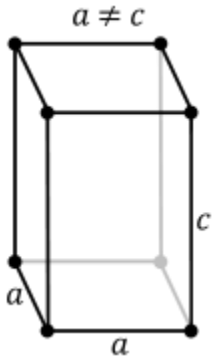
cP



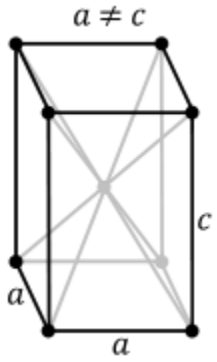
cI



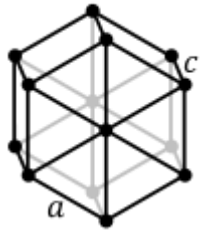
cF



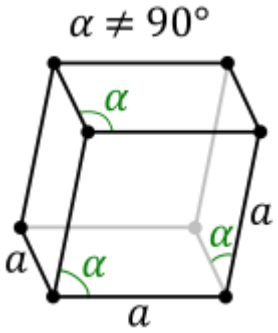
tP



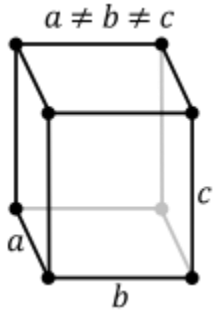
tI



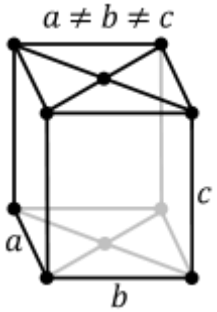
hP



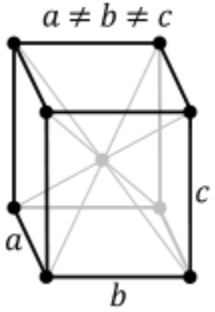
hR



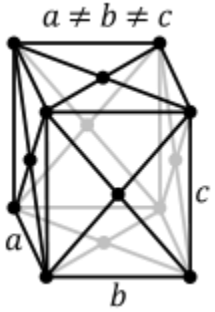
oP



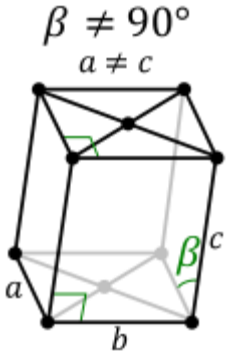
oC



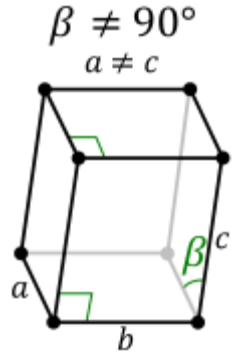
oI



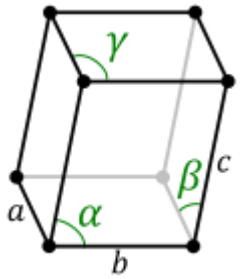
oF



mC

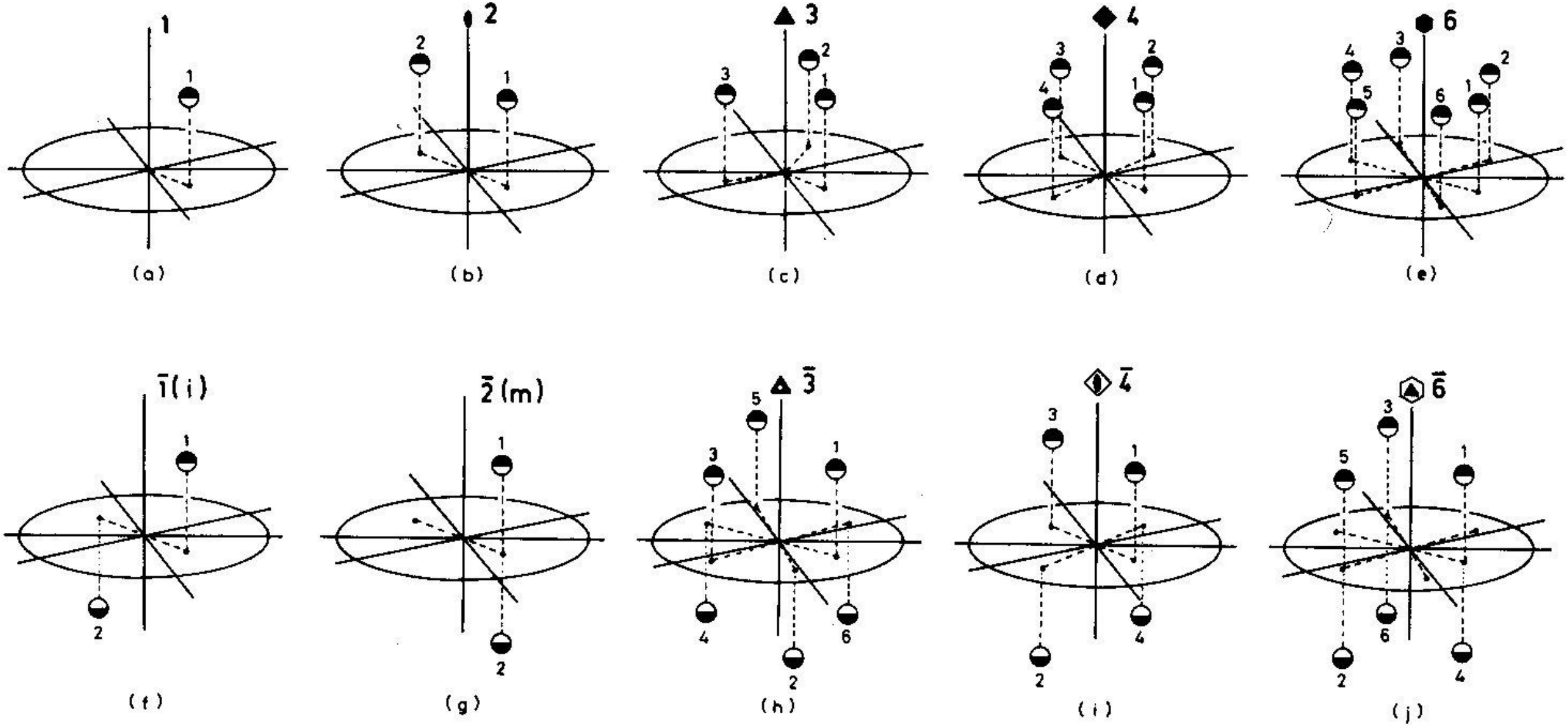


mP

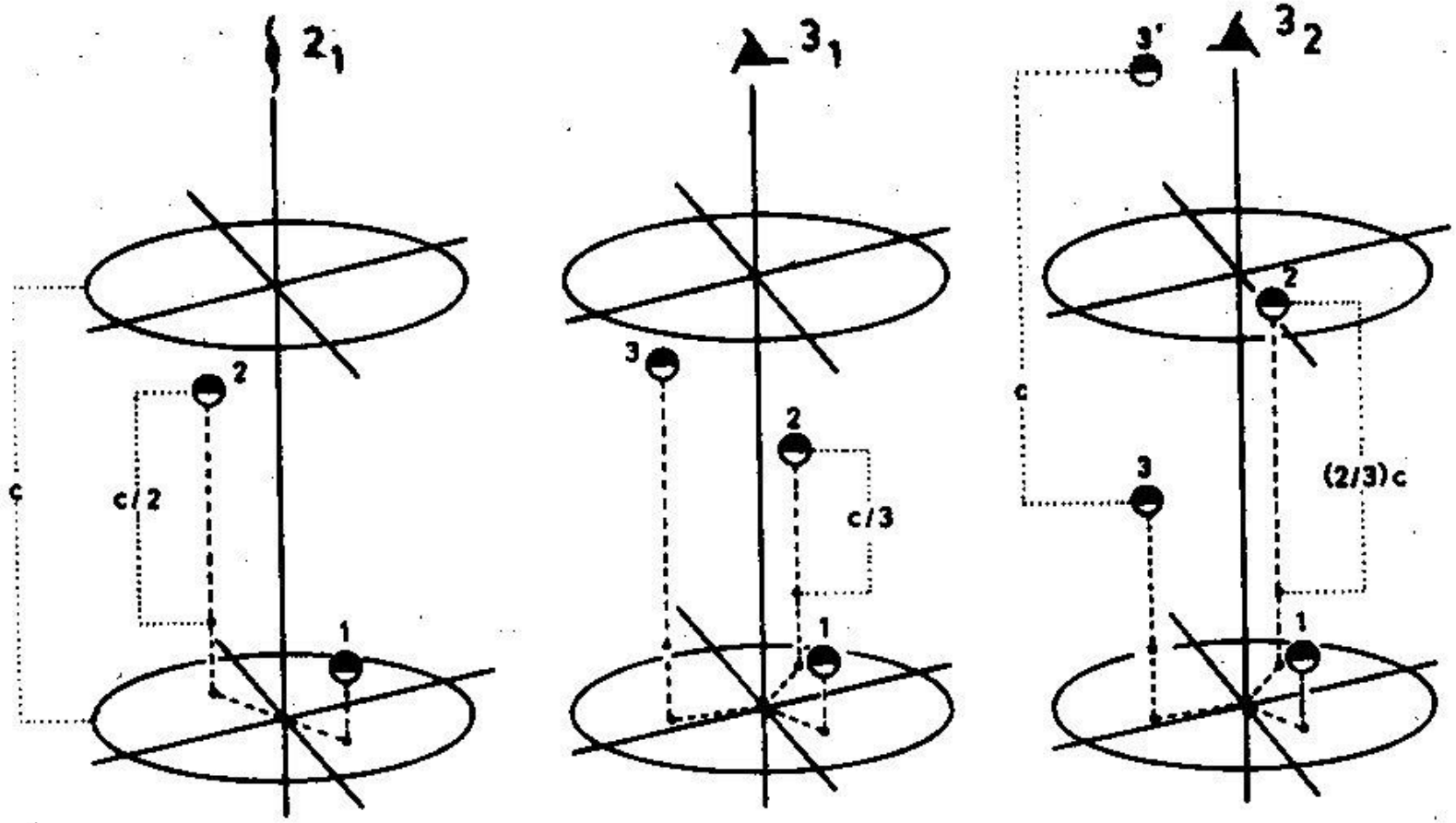


aP

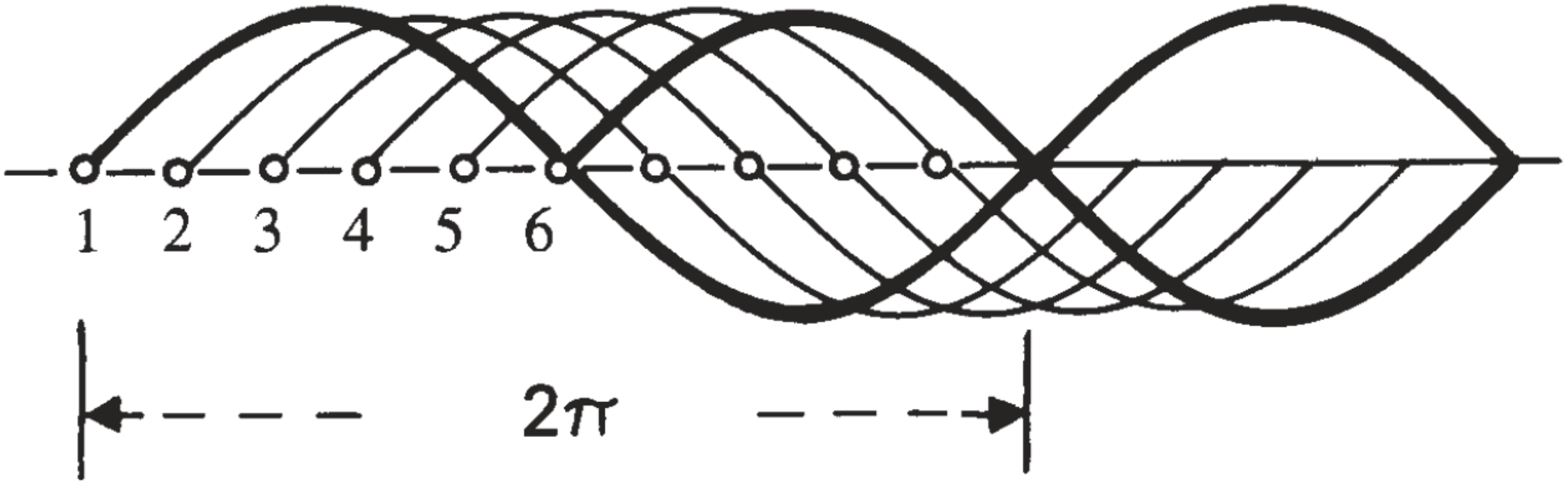
Hermann-Mauguin



Screw axis

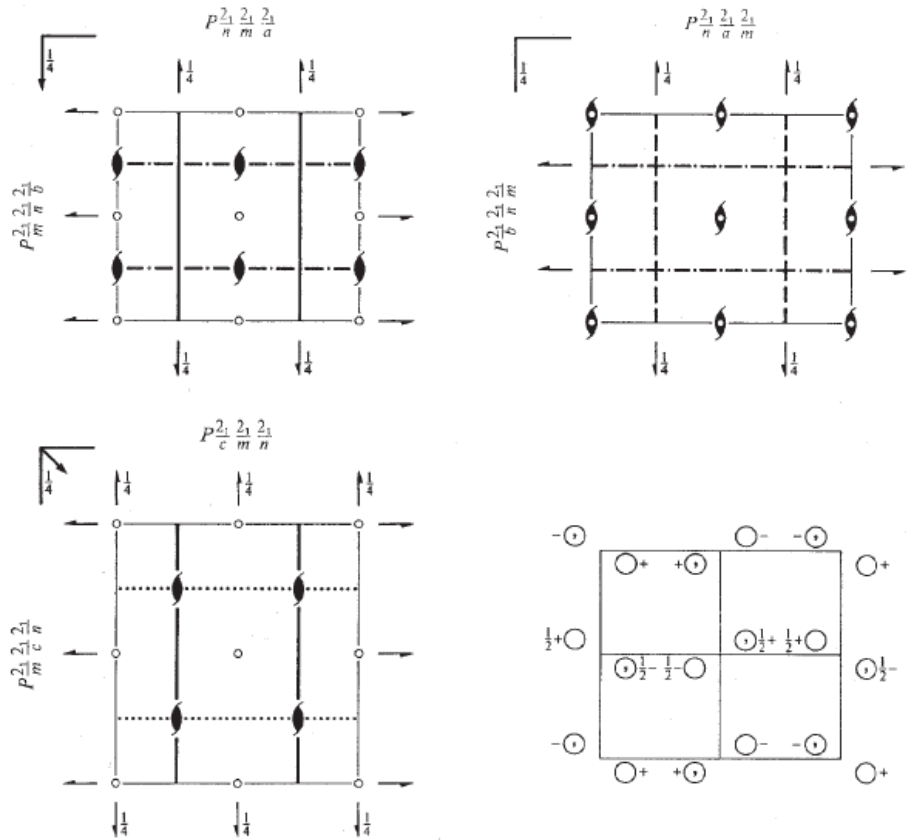


$\Delta = \lambda/10$



$P\,n\,m\,a$ D_{2h}^{16} $m\,m\,m$ Orthorhombic

No. 62 $P\,2_1/n\,2_1/m\,2_1/a$ Patterson symmetry $P\,m\,m\,m$



Origin at $\bar{1}$ on $1\,2_1\,1$

Asymmetric unit $0\le x\le\frac{1}{4}$; $0\le y\le\frac{1}{4}$; $0\le z\le 1$

Symmetry operations

(1) 1	(2) $2(0,0,\frac{1}{2})$ $\frac{1}{4},0,z$	(3) $2(0,\frac{1}{4},0)$ $0,y,0$	(4) $2(\frac{1}{4},0,0)$ $x,\frac{1}{4},\frac{1}{4}$
(5) $\bar{1}$ 0,0,0	(6) a $x,y,\frac{1}{4}$	(7) m $x,\frac{1}{4},z$	(8) $n(0,\frac{1}{2},\frac{1}{2})$ $\frac{1}{4},y,z$

Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; (2); (3); (5)

Positions

Multiplicity, Wyckoff letter, Site symmetry		Coordinates				Reflection conditions
						General:
8 d 1	(1) x,y,z	(2) $\bar{x}+\frac{1}{2},\bar{y},z+\frac{1}{2}$	(3) $\bar{x},y+\frac{1}{2},\bar{z}$	(4) $x+\frac{1}{2},\bar{y}+\frac{1}{2},\bar{z}+\frac{1}{2}$		$0kl$: $k+l=2n$ $hk0$: $h=2n$ $h00$: $h=2n$ $0k0$: $k=2n$ $00l$: $l=2n$
	(5) $\bar{x},\bar{y},\bar{z}$	(6) $x+\frac{1}{2},y,z+\frac{1}{2}$	(7) $x,\bar{y}+\frac{1}{2},z$	(8) $\bar{x}+\frac{1}{2},y+\frac{1}{2},z+\frac{1}{2}$		
						Special: as above, plus
4 c $.m.$	$x,\frac{1}{4},z$	$\bar{x}+\frac{1}{2},\frac{3}{4},z+\frac{1}{2}$	$\bar{x},\frac{3}{4},\bar{z}$	$x+\frac{1}{2},\frac{1}{4},\bar{z}+\frac{1}{2}$		no extra conditions
4 b $\bar{1}$	0,0,$\frac{1}{2}$	$\frac{1}{2}$,0,0	0,$\frac{1}{2}$,$\frac{1}{2}$	$\frac{1}{2}$,$\frac{1}{2}$,0		hkl : $h+l,k=2n$
4 a $\bar{1}$	0,0,0	$\frac{1}{2}$,0,$\frac{1}{2}$	0,$\frac{1}{2}$,0	$\frac{1}{2}$,$\frac{1}{2}$,$\frac{1}{2}$		hkl : $h+l,k=2n$

Symmetry of special projections

Along [001] $p\,2g\,m$
$\boldsymbol{a'}=\frac{1}{2}\boldsymbol{a}$ $\boldsymbol{b'}=\boldsymbol{b}$
Origin at 0,0,z

Along [100] $c\,2m\,m$
$\boldsymbol{a'}=\boldsymbol{b}$ $\boldsymbol{b'}=\boldsymbol{c}$
Origin at $x,\frac{1}{4},\frac{1}{4}$

Along [010] $p\,2g\,g$
$\boldsymbol{a'}=\boldsymbol{c}$ $\boldsymbol{b'}=\boldsymbol{a}$
Origin at 0,y,0

Maximal non-isomorphic subgroups

I	[2]$P\,2_1\,2_1\,2_1$	1; 2; 3; 4
	[2]$P\,1\,1\,2_1/a$ ($P\,2_1/c$)	1; 2; 5; 6
	[2]$P\,1\,2_1/m\,1$ ($P\,2_1/m$)	1; 3; 5; 7
	[2]$P\,2_1/n\,1\,1$ ($P\,2_1/c$)	1; 4; 5; 8
	[2]$P\,n\,m\,2_1$ ($P\,m\,n\,2_1$)	1; 2; 7; 8
	[2]$P\,n\,2_1\,a$ ($P\,n\,a\,2_1$)	1; 3; 6; 8
	[2]$P\,2_1\,m\,a$ ($P\,m\,c\,2_1$)	1; 4; 6; 7
IIa	none	
IIb	none	

Maximal isomorphic subgroups of lowest index

IIc [3]$P\,n\,m\,a$ ($\boldsymbol{a'}=3\boldsymbol{a}$); [3]$P\,n\,m\,a$ ($\boldsymbol{b'}=3\boldsymbol{b}$); [3]$P\,n\,m\,a$ ($\boldsymbol{c'}=3\boldsymbol{c}$)

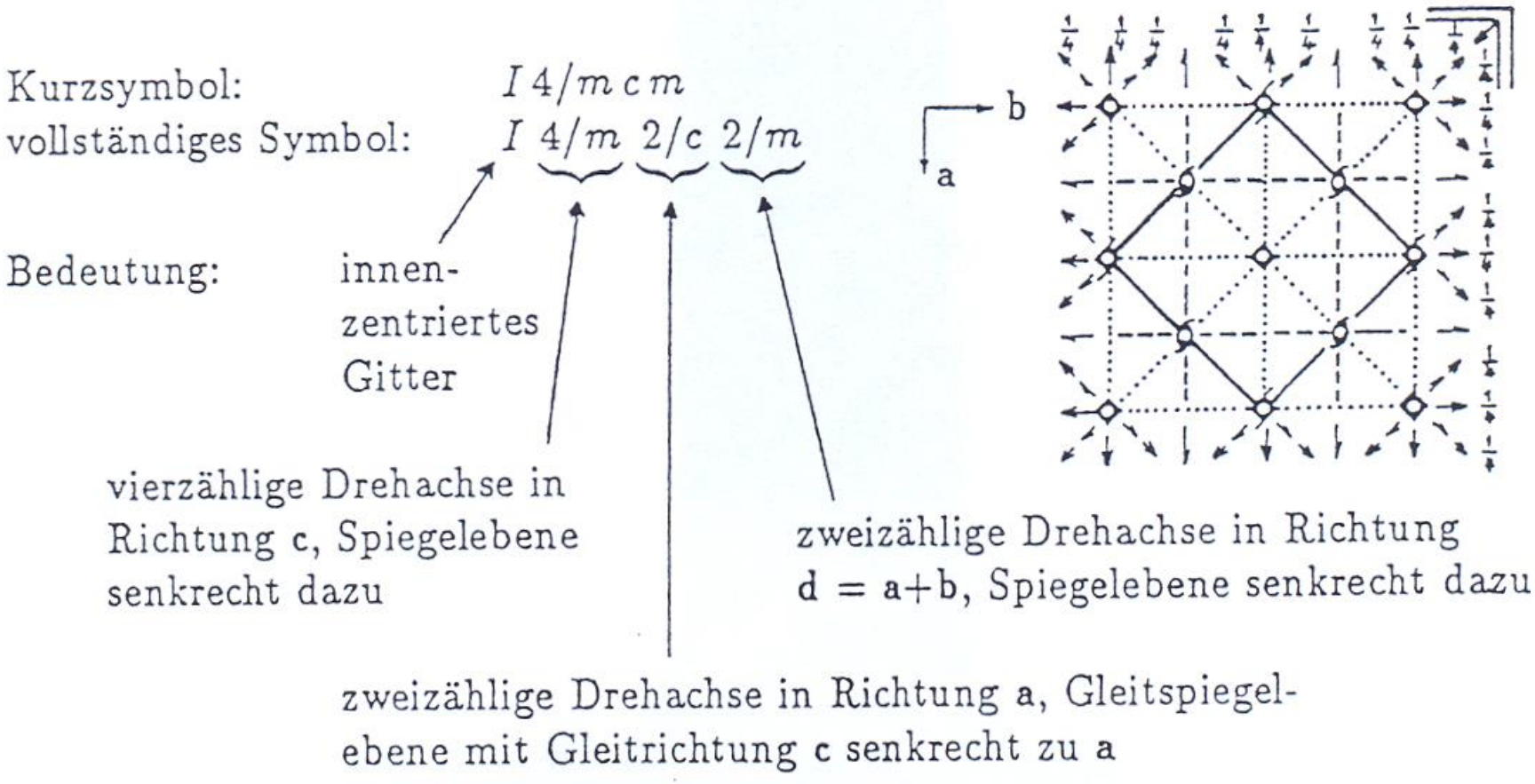
Minimal non-isomorphic supergroups

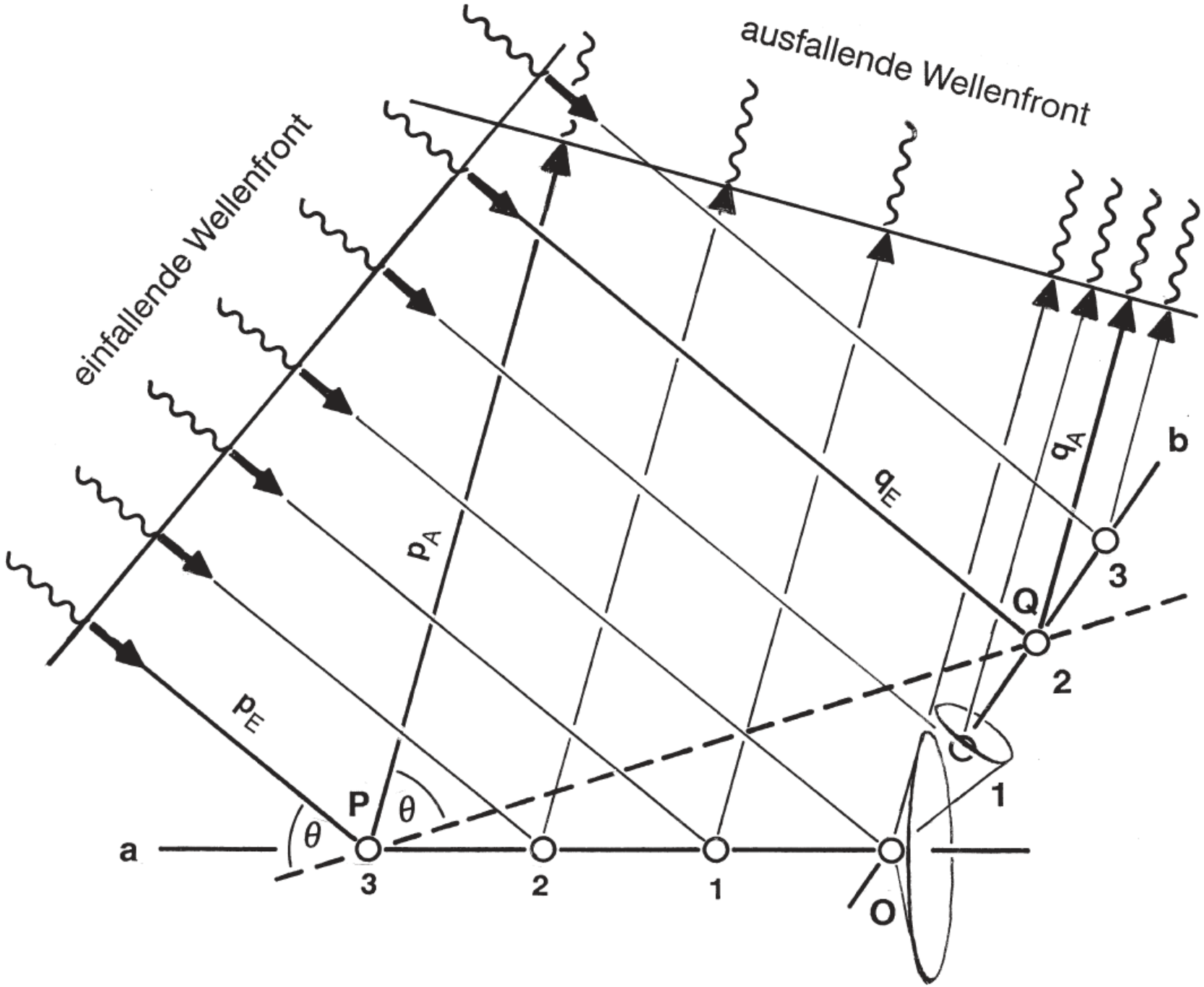
I none

II [2]$A\,m\,m\,a$($C\,m\,c\,m$); [2]$B\,b\,m\,m$($C\,m\,c\,m$); [2]$C\,c\,m\,b$($C\,m\,c\,a$); [2]$I\,m\,m\,a$; [2]$P\,n\,m\,m$($2\boldsymbol{a'}=\boldsymbol{a}$)($P\,m\,m\,n$); [2]$P\,c\,m\,a$($2\boldsymbol{b'}=\boldsymbol{b}$)($P\,b\,a\,m$); [2]$P\,b\,m\,a$($2\boldsymbol{c'}=\boldsymbol{c}$)($P\,b\,c\,m$)

Space group Symbolism according to Herrmann-Mauguin

(Int.Tables for X-Ray Crystallography)




einfallende Wellenfront
ausfallende Wellenfront
p_E
p_A
q_E
q_A
P
Q
O
a
b
θ
θ
3
2
1
3
2
1

Monoklin

$$\sin^2\theta = \frac{\lambda^2}{4}\left[\frac{h^2}{a^2\sin^2\beta} + \frac{k^2}{b^2} + \frac{l^2}{c^2\sin^2\beta} - \frac{2hl\cos\beta}{ac\sin^2\beta}\right]$$

Orthorhombisch

$$\sin^2\theta = \frac{\lambda^2}{4}\left[\frac{h^2}{a^2} + \frac{k^2}{b^2} + \frac{l^2}{c^2}\right]$$

Tetragonal

$$\sin^2\theta = \frac{\lambda^2}{4a^2}\left[h^2 + k^2 + \left(\frac{a}{c}\right)^2 l^2\right]$$

Hexagonal und trigonal

$$\sin^2\theta = \frac{\lambda^2}{4a^2}\left[\frac{4}{3}(h^2 + k^2 + hk) + \left(\frac{a}{c}\right)^2 l^2\right]$$

Kubisch

$$\sin^2\theta = \frac{\lambda^2}{4a^2}\left[h^2 + k^2 + l^2\right]$$

Triklin

$$\sin^2\theta = \frac{\lambda^2}{4}\left[h^2a^{*2} + k^2b^{*2} + l^2c^{*2} + 2klb^*c^*\cos\alpha^* + 2lhc^*a^*\cos\beta^* + 2hka^*b^*\cos\gamma^*\right]$$

$$a^* = \frac{1}{V}bc\sin\alpha, \qquad \cos\alpha^* = \frac{\cos\beta\cos\gamma - \cos\alpha}{\sin\beta\sin\gamma}$$

$$b^* = \frac{1}{V}ca\sin\beta, \qquad \cos\beta^* = \frac{\cos\gamma\cos\alpha - \cos\beta}{\sin\gamma\sin\alpha}$$

$$c^* = \frac{1}{V}ab\sin\gamma, \qquad \cos\gamma^* = \frac{\cos\alpha\cos\beta - \cos\gamma}{\sin\alpha\sin\beta}$$

$$\mathrm{V} = abc\sqrt{1 + 2\cos\alpha\cos\beta\cos\gamma - \cos^2\alpha - \cos^2\beta - \cos^2\gamma}$$

Schrödinger's Lunchbox.