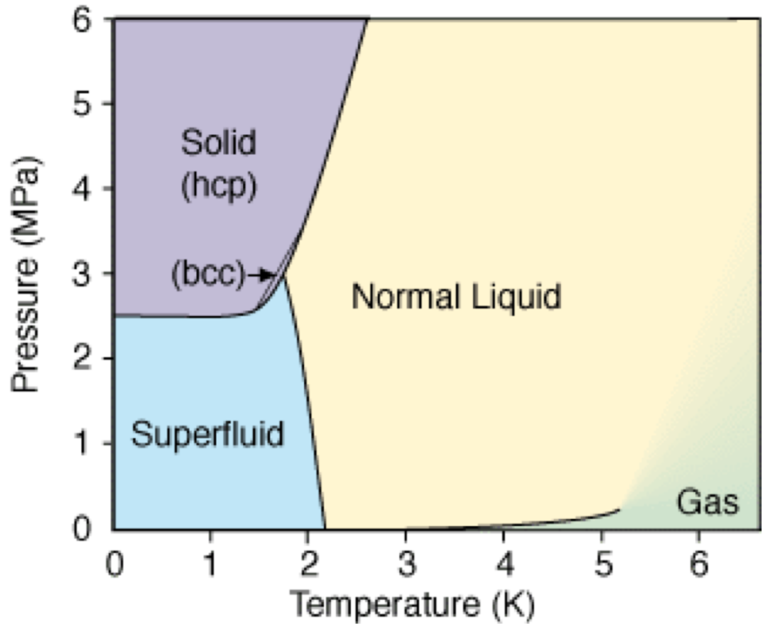
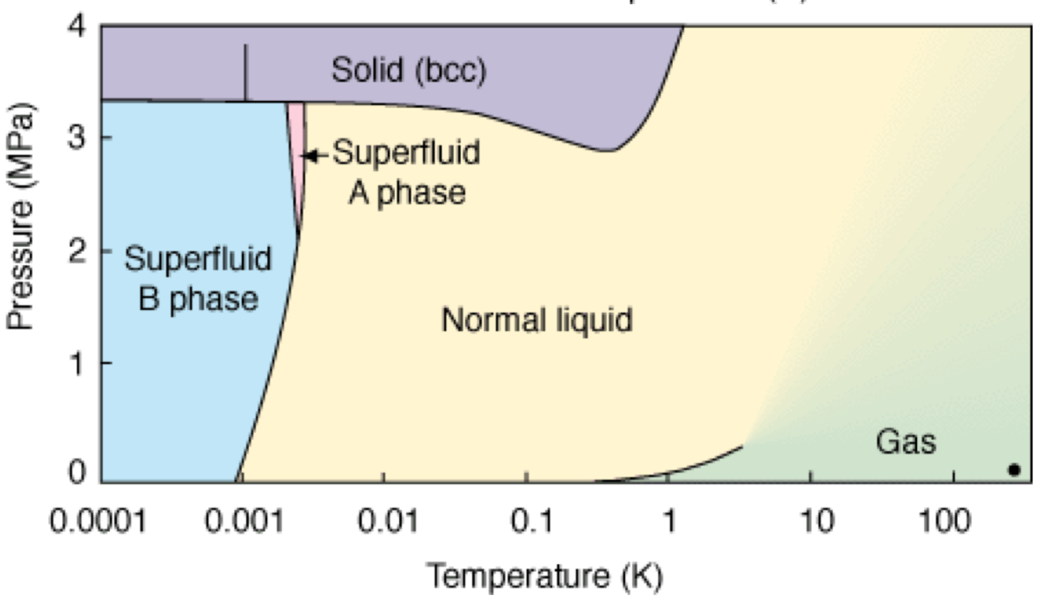
Superfluidità nell'Elio



^{4}He
si comporta da Bosone e a basse T ha la BEC (Bose-Einstein Condensation)



^{3}He
Sarebbe un Fermione ma a basse T forma Coppie di Cooper che si comportano da Bosoni)

Periodic Table of the Elements

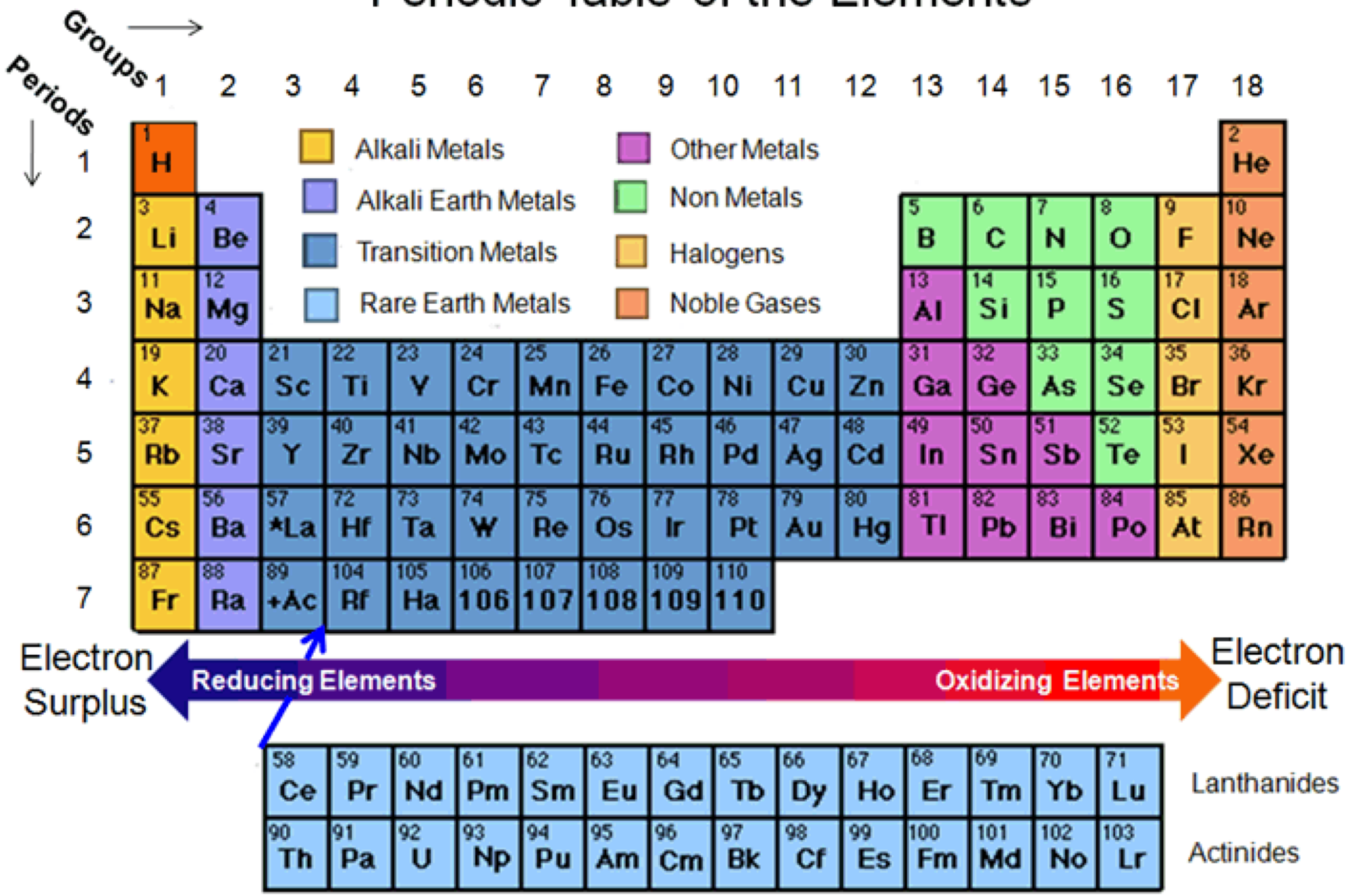
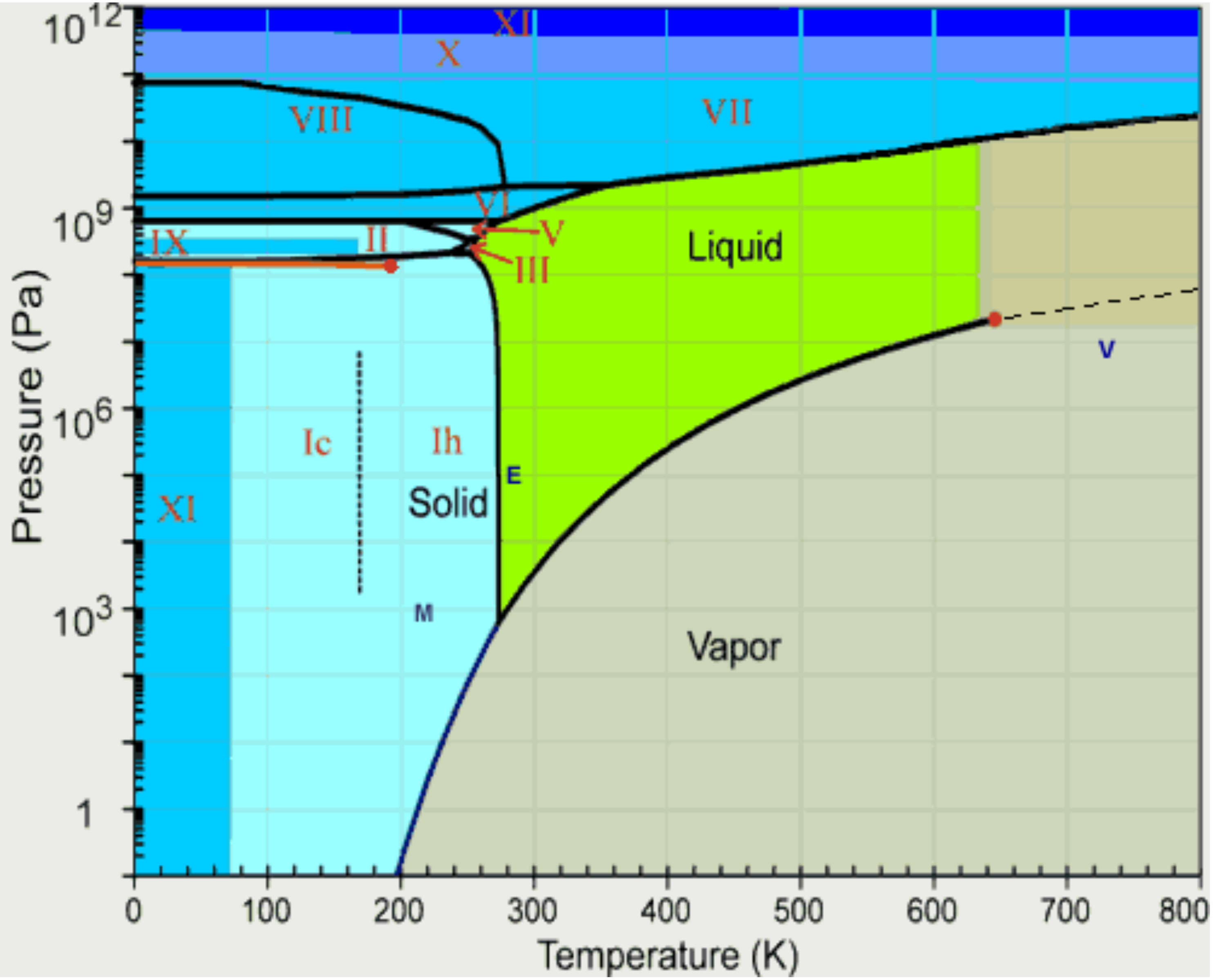
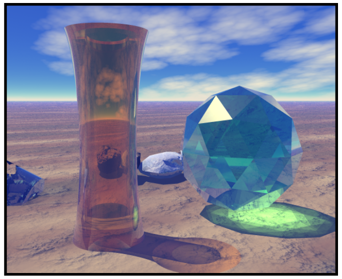
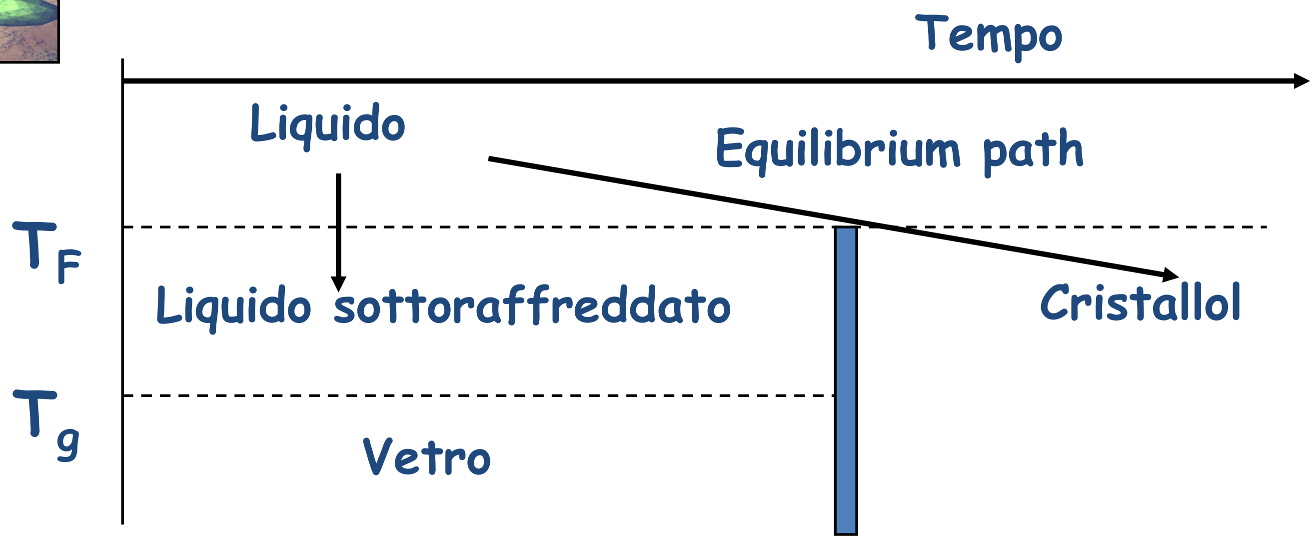


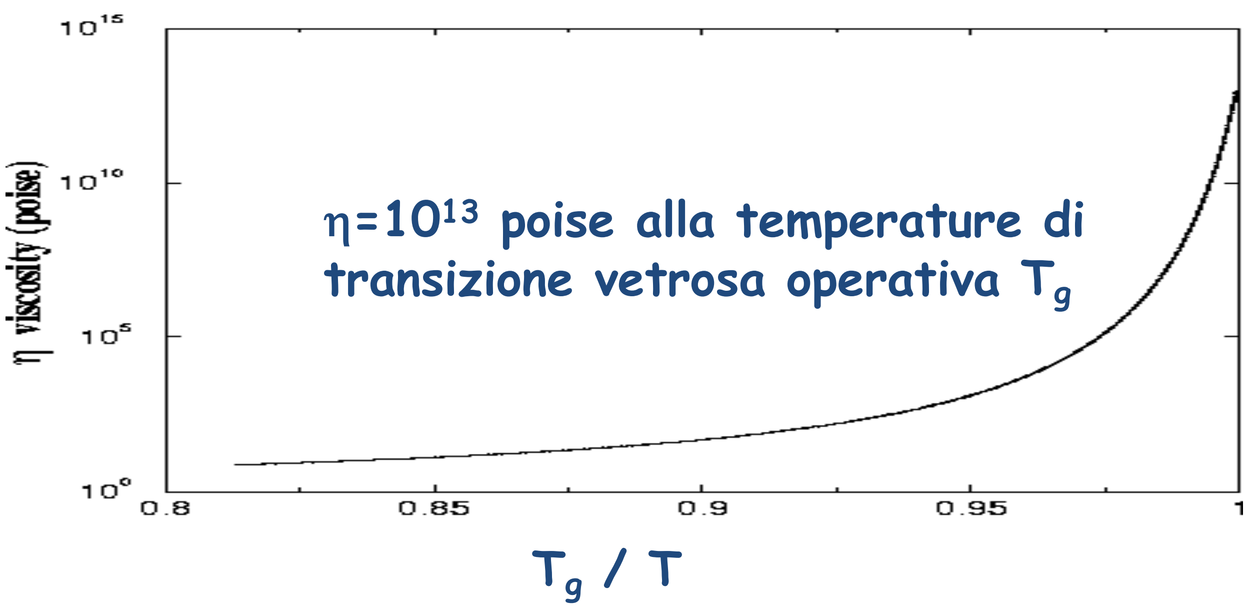
Diagramma di fase dell'acqua





Liquidi sottoraffreddati e transizione vetrosa





Transizione vetrosa

Liqudo normale (stabile)

T_m (Temperatura di fusione, sperimentale)

MCT

Liquido sottoraffreddato con dinamica dominata da rilassamenti strutturali (metastabile)

T_C (Temperatura di crossover fra due regimi)

E/MCT

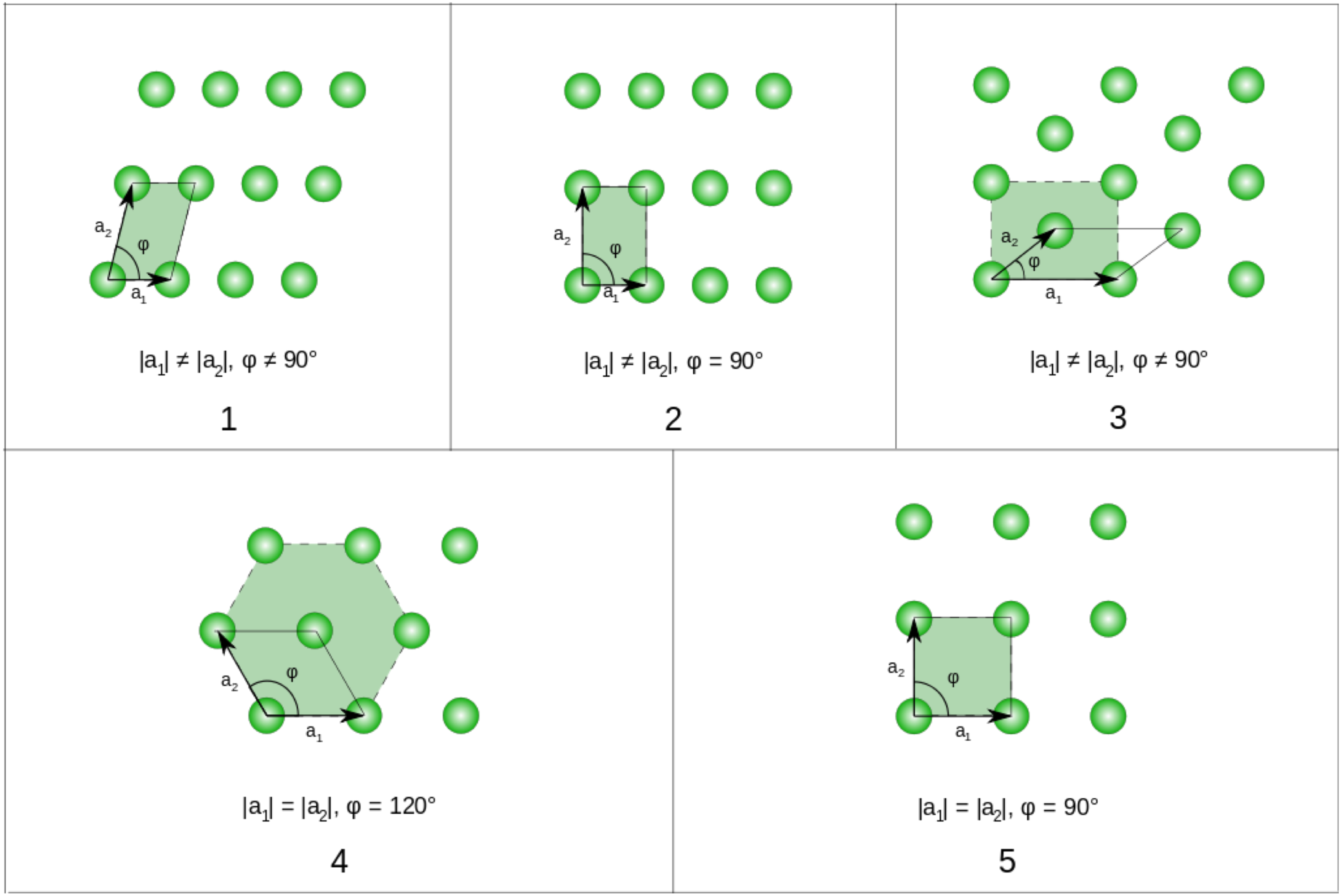
Liquido sottoraffreddato con dinamica dominata da salti (mertastabile)

T_g (Temperatura di transizione vetrosa, sperimentale)

Vetro (metastabile)

[Complex dynamics of glass forming liquids: a mode coupling theory, W. Götze, Oxford (2009)]

I cinque diversi reticoli di Bravais in due dimensioni: obliquo, rettangolare, rettangolare centrato, esagonale e quadrato



Reticoli di Bravais 3DIM

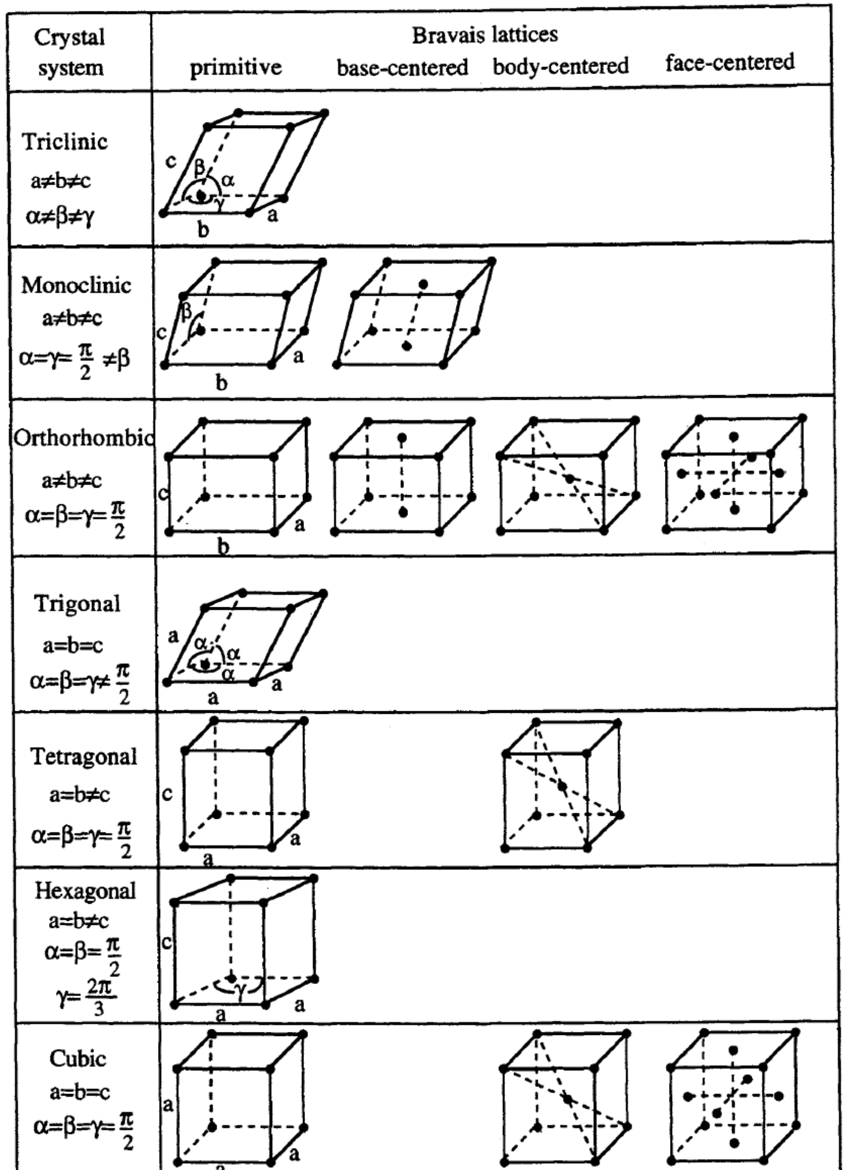
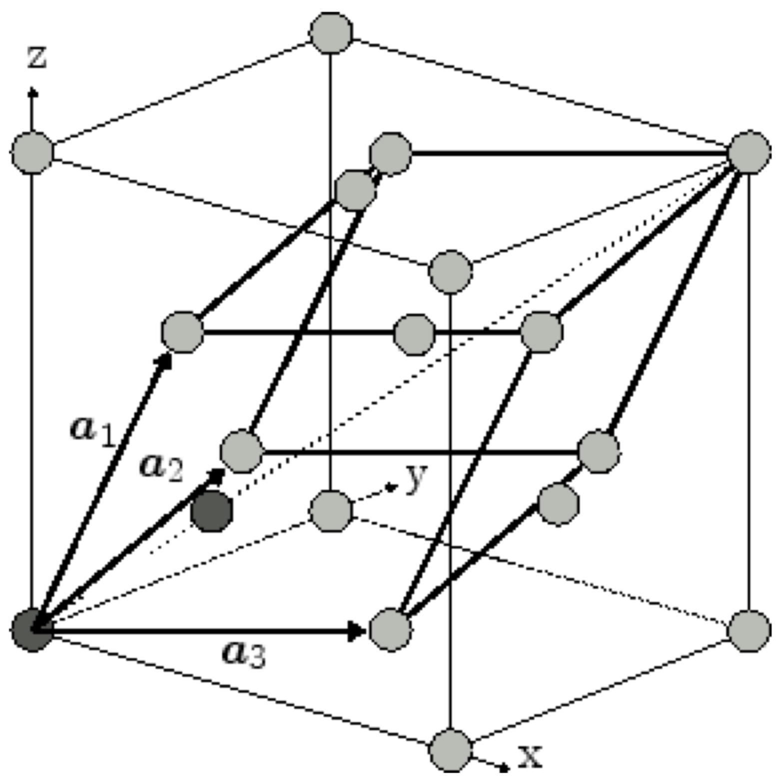
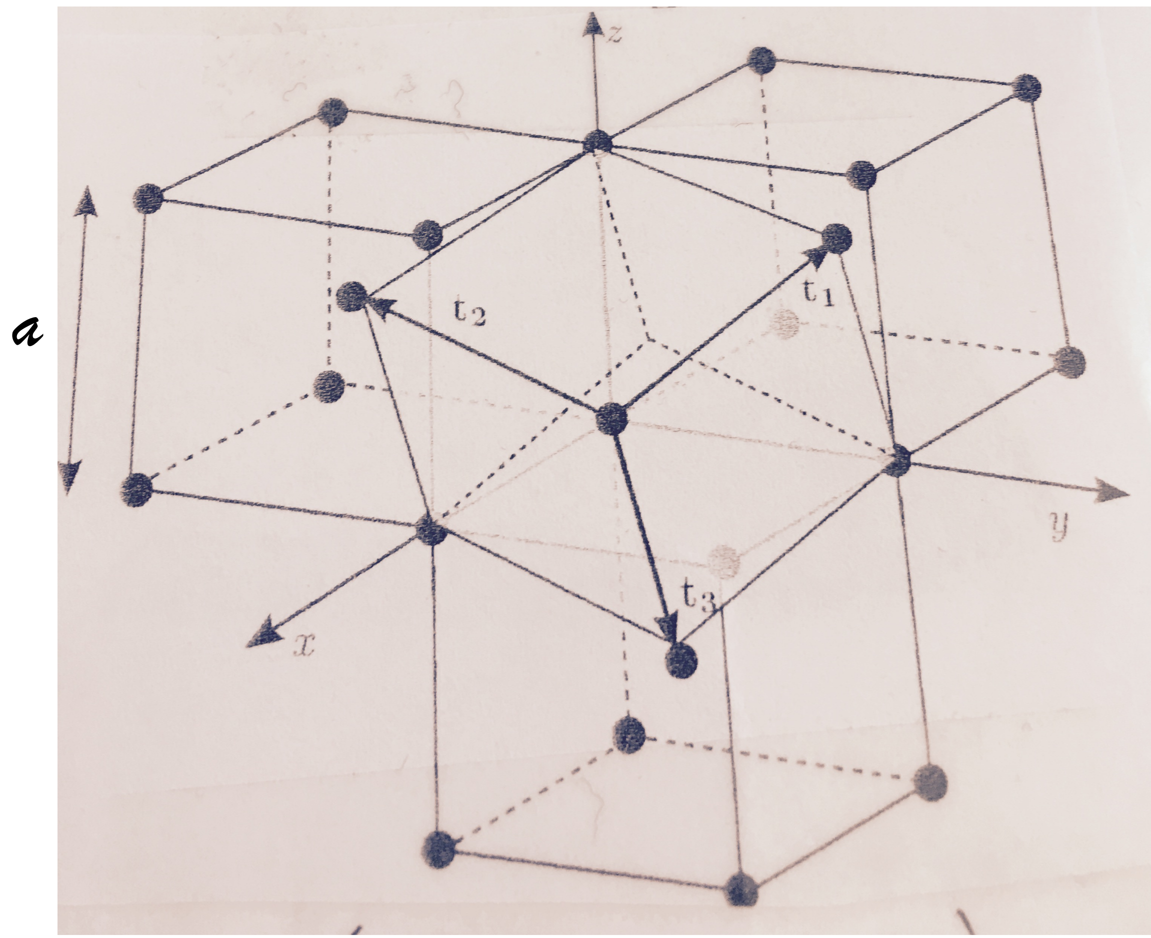


Fig. 3 Classification of the fourteen Bravais lattices into the seven crystal systems. The conventional parallelepiped cells are shown.

Vettori di base primitivi del reticolo cubico a face centrate (face centered cubic, fcc) che formano la cella primitiva. La cella primitiva in figura ha anche una base di due atomi che sono segnati in colore più scuro.



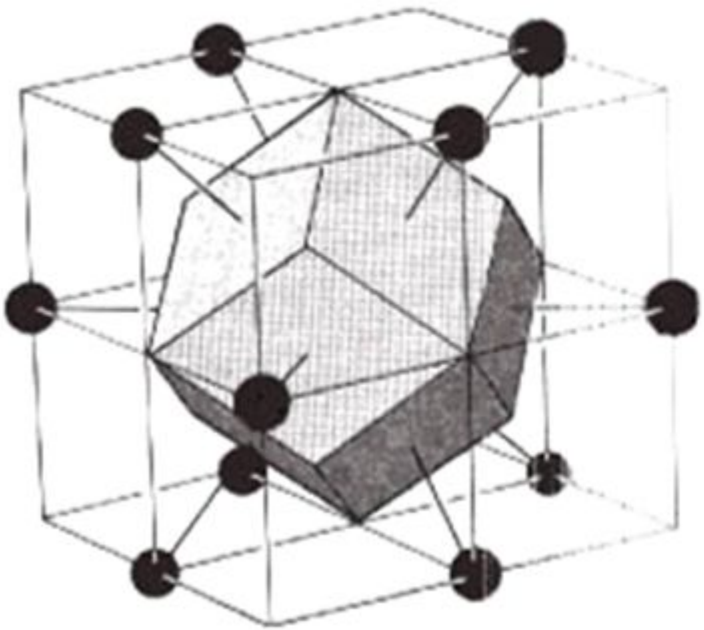
Cella primitive del cristallo cubico a face cetrate (Body Centered Cubic) BCC



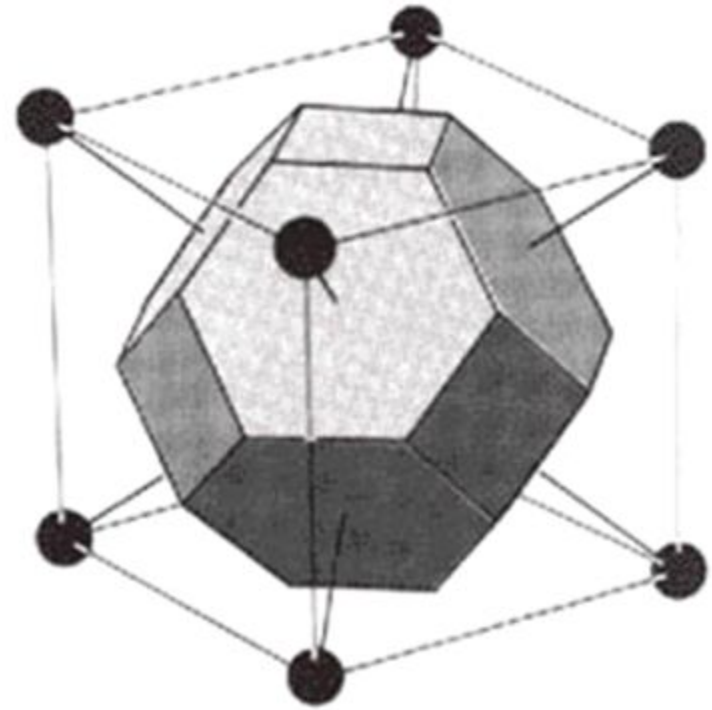
Wigner-Seitz Cell - 3D

Dodecaedro rombico: ha 12 facce a forma di rombo

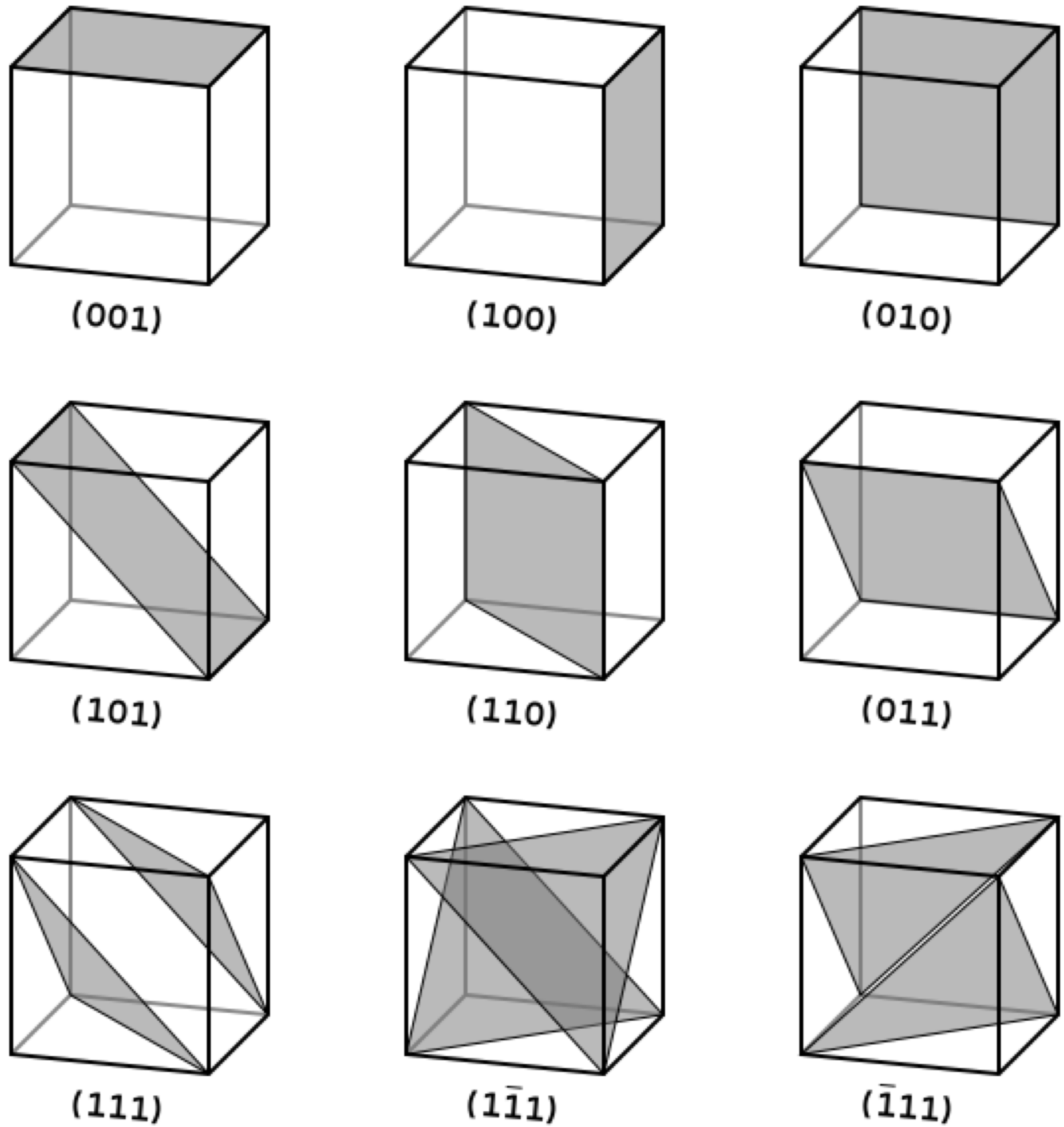
Ottaedro troncato (uno dei tredici poliedri archimedei ottenuto tagliando le cuspidi all’ottaedro regolare che e’ un solido platonico)

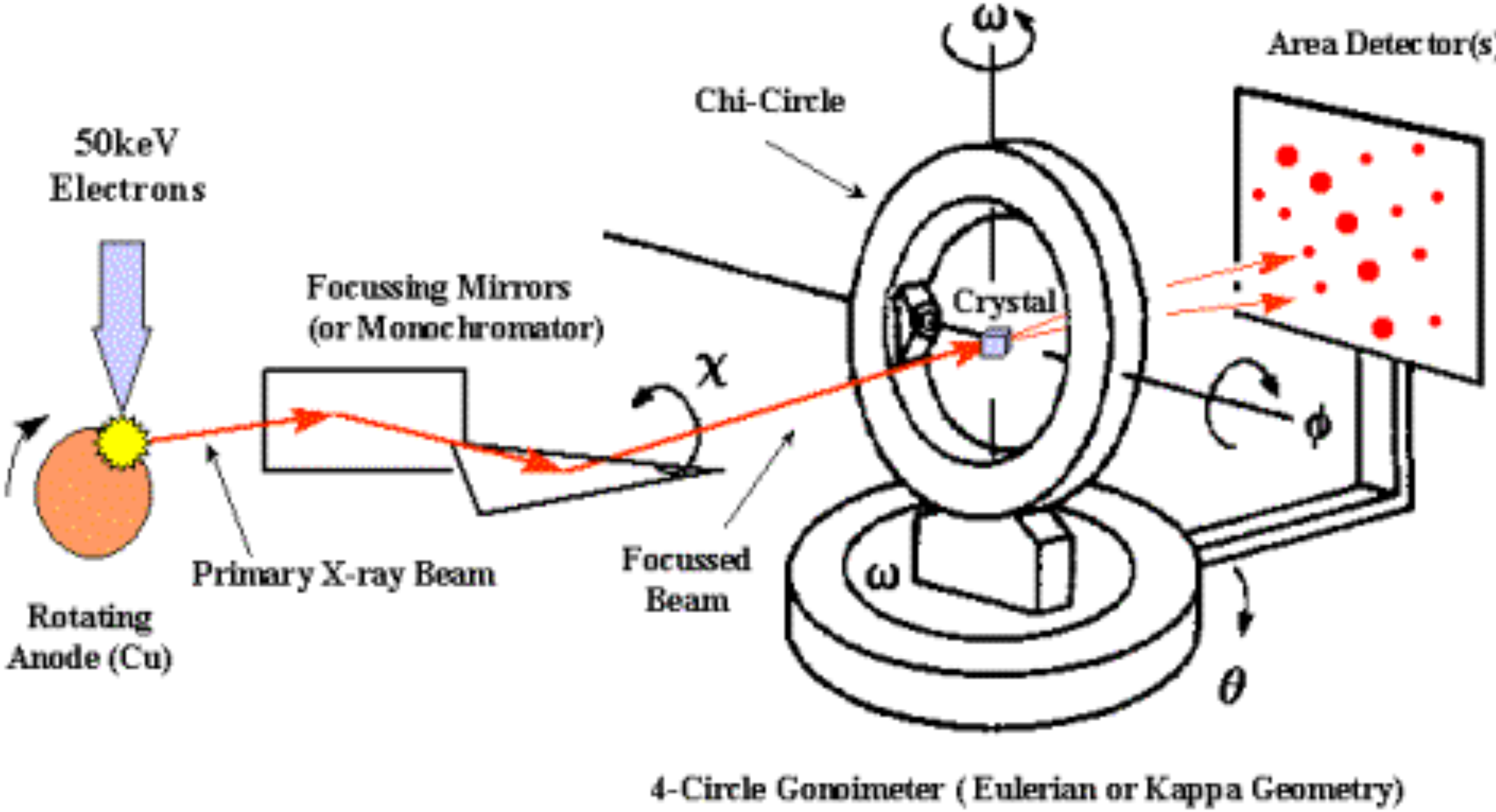


f.c.c Wigner-Seitz cell



b.c.c Wigner-Seitz cell


(001)
(100)
(010)
(101)
(110)
(011)
(111)
$(1\bar{1}1)$
$(\bar{1}11)$


50keV
Electrons
Rotating
Anode (Cu)
Primary X-ray Beam
Focussing Mirrors
(or Monochromator)
Focussed
Beam
χ
Chi-Circle
ω
Crystal
ω
φ
θ
Area Detector(s)
4-Circle Gonoimeter (Eulerian or Kappa Geometry)

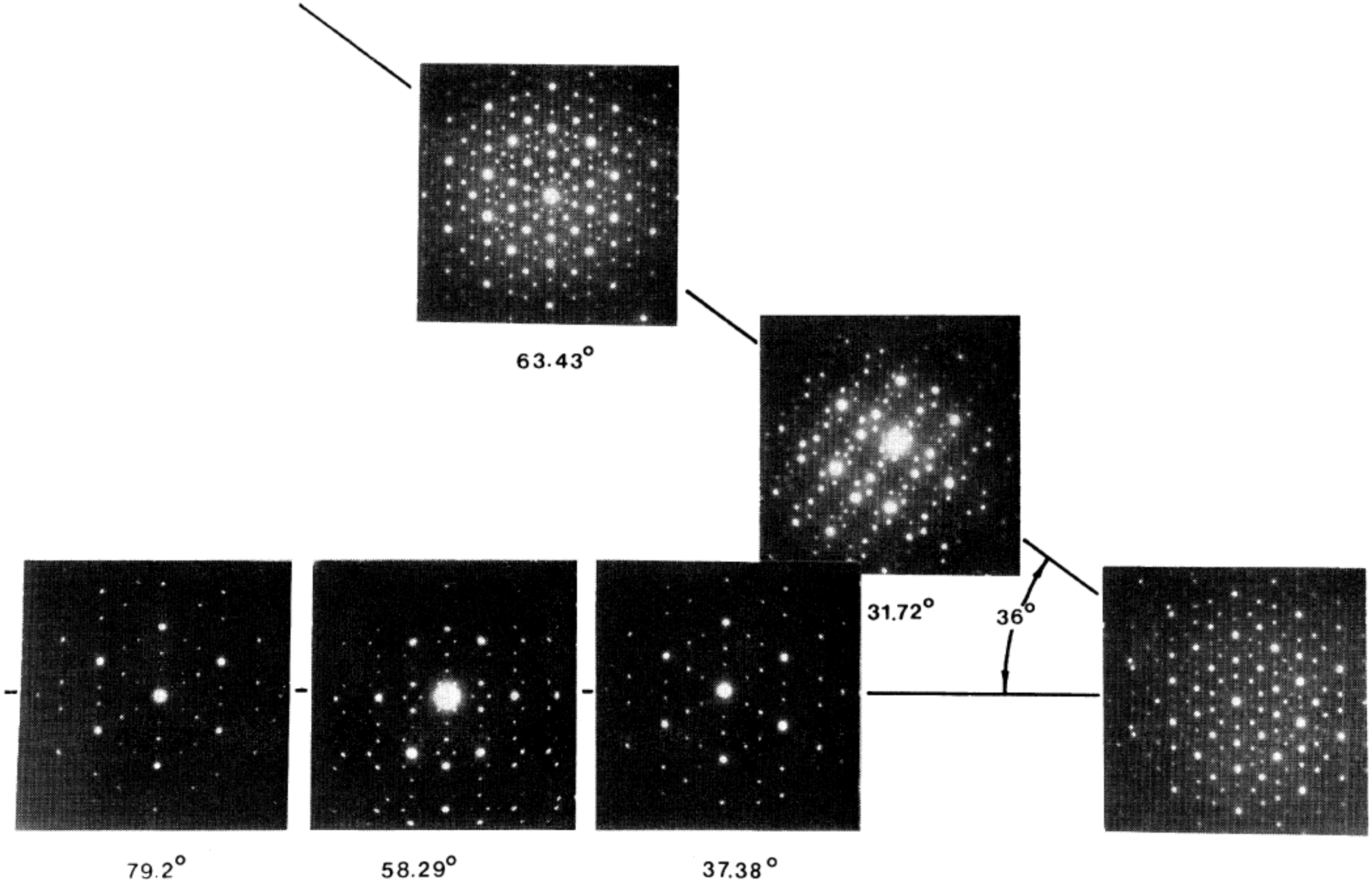


FIG. 2. Selected-area electron diffraction patterns taken from a single grain of the icosahedral phase. Rotations match those in Fig. 1.

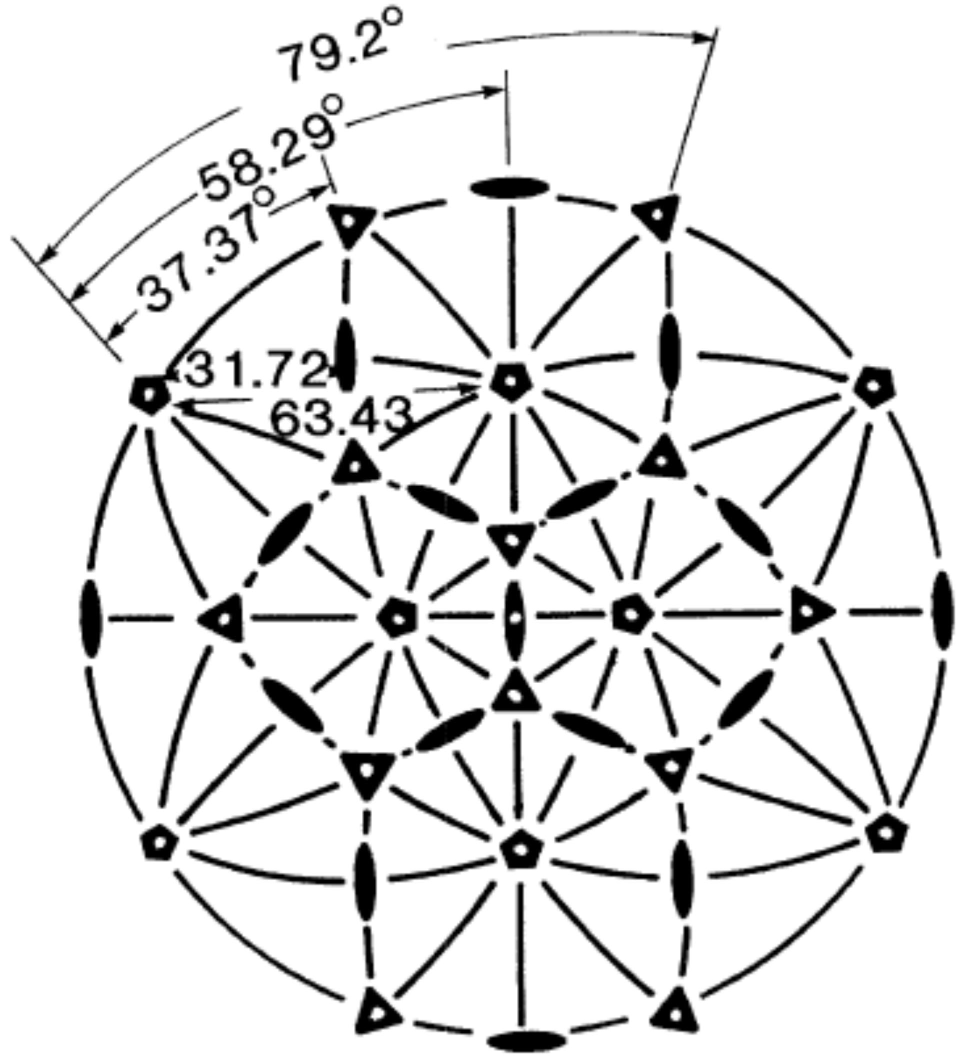
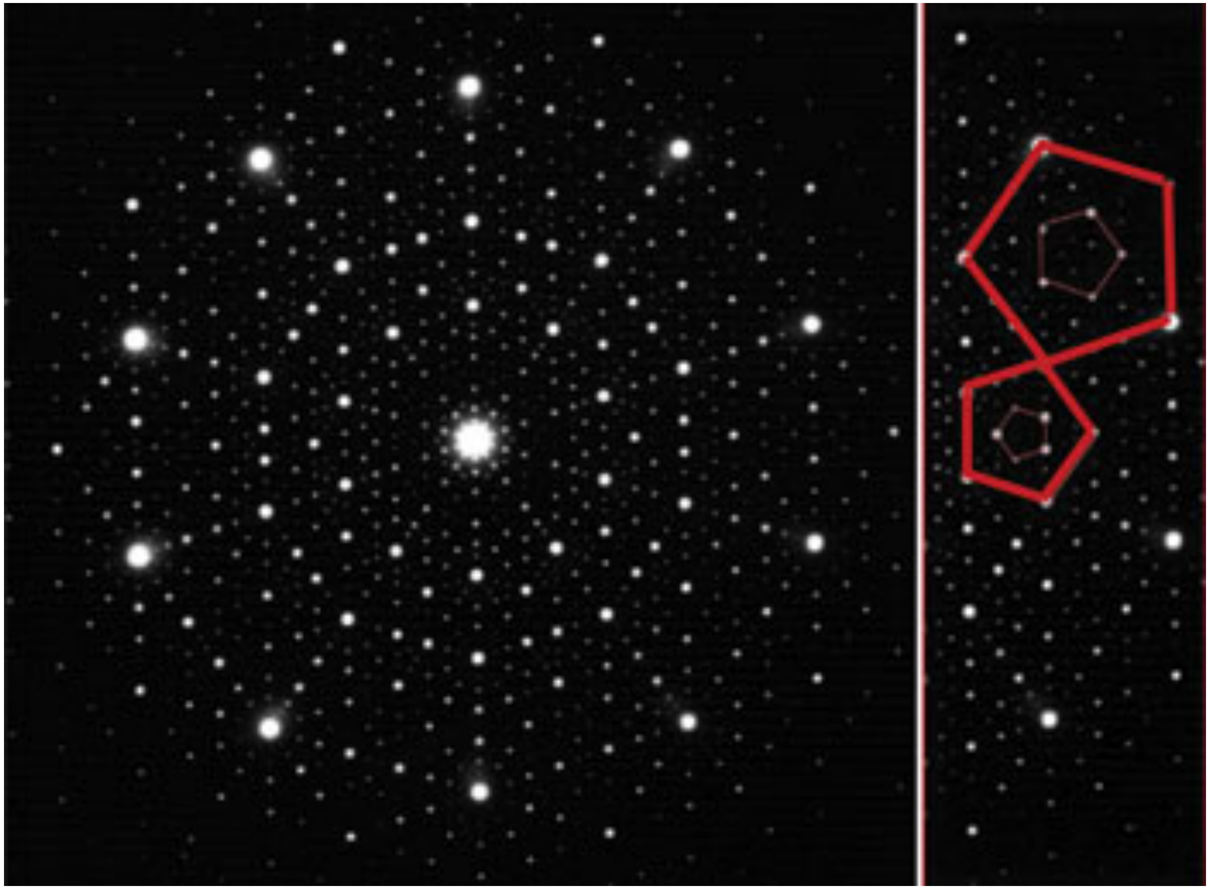
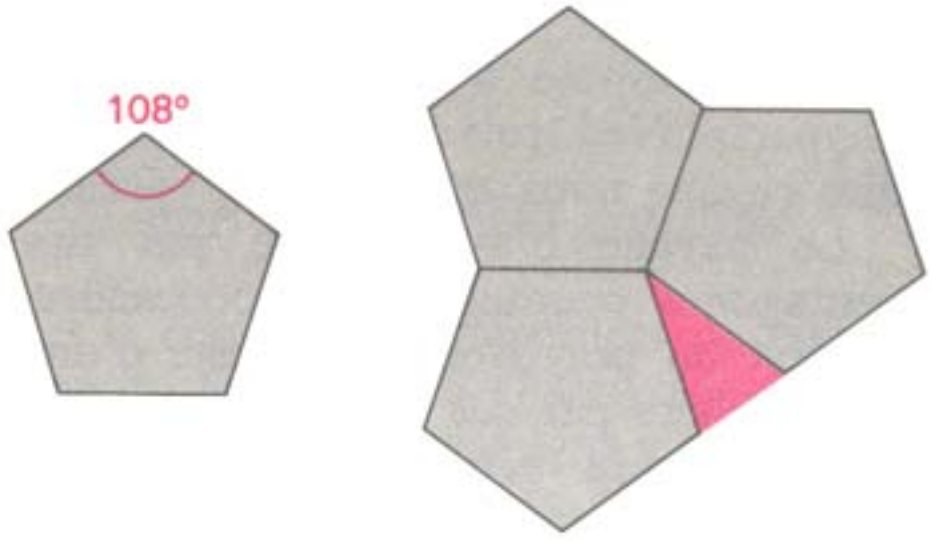


FIG. 1. Stereographic projection of the symmetry elements of the icosahedral group $m\overline{35}$.



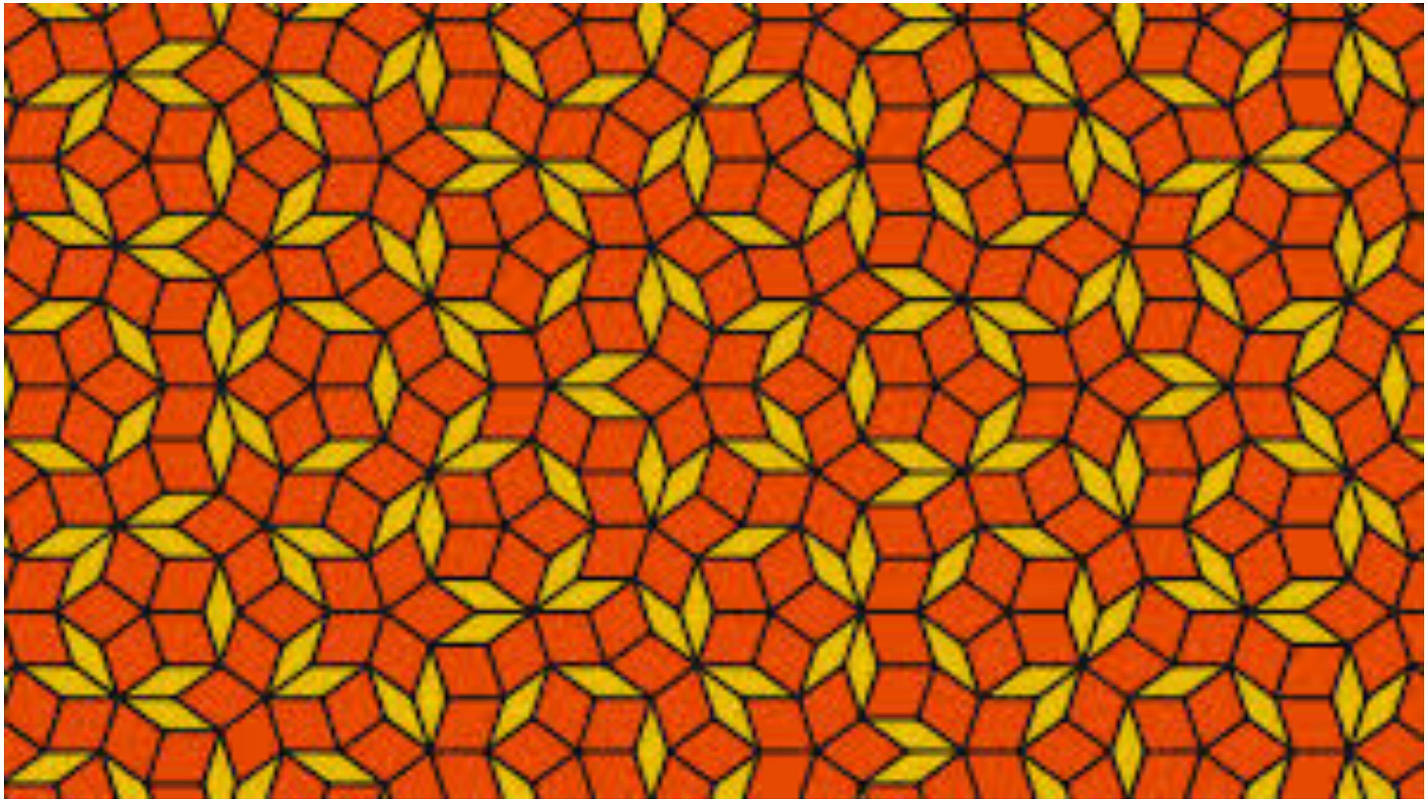
The electron diffraction pattern from an icosahedral quasicrystal contains perfect pentagons The 2011 Nobel prize in chemistry was awarded to Daniel Shechtman of the Technion - Israel Institute of Technology, Haifa, for the discovery of quasicrystals Quasicrystals exhibit long-range order but contain atoms packed in a pattern that cannot be repeated - a concept that broke the well established rules of crystalline behaviour at the time of their discovery in 1984

Frustrazione Geometrica del poentagono



2DIM Penrose Tiling

L'ordine orientazionale si traduce nel fatto che i rombi non possono avere che 10 orientazioni possibili.
Si noti che la struttura quasicristallina 2Dim e' contruita con due tipi di rombi come celle elementari



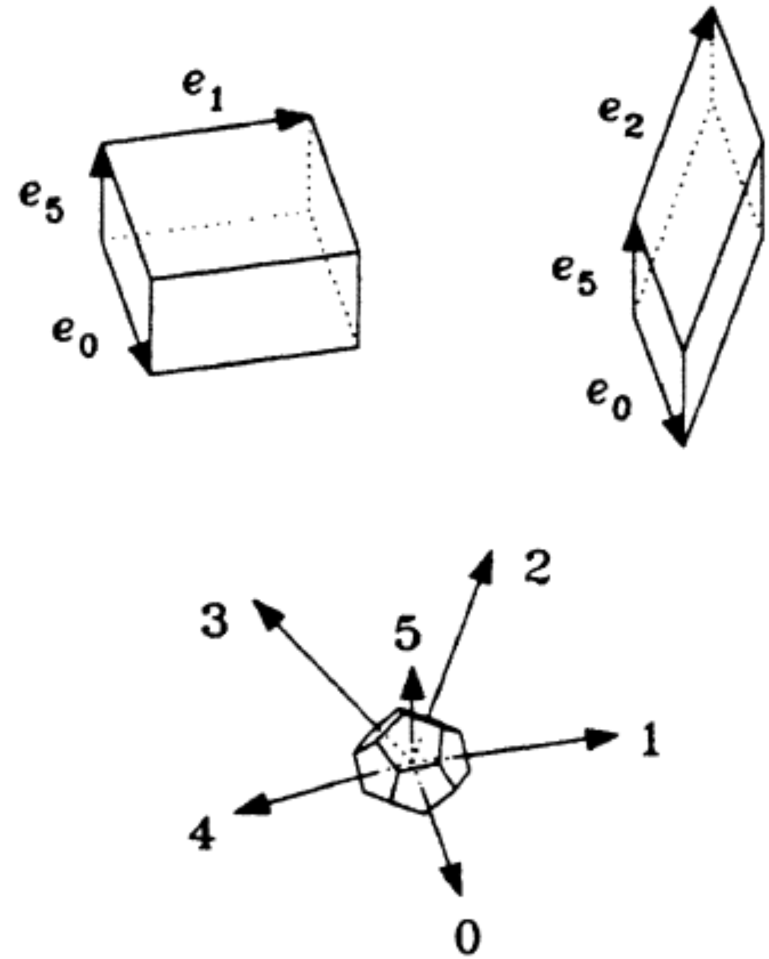
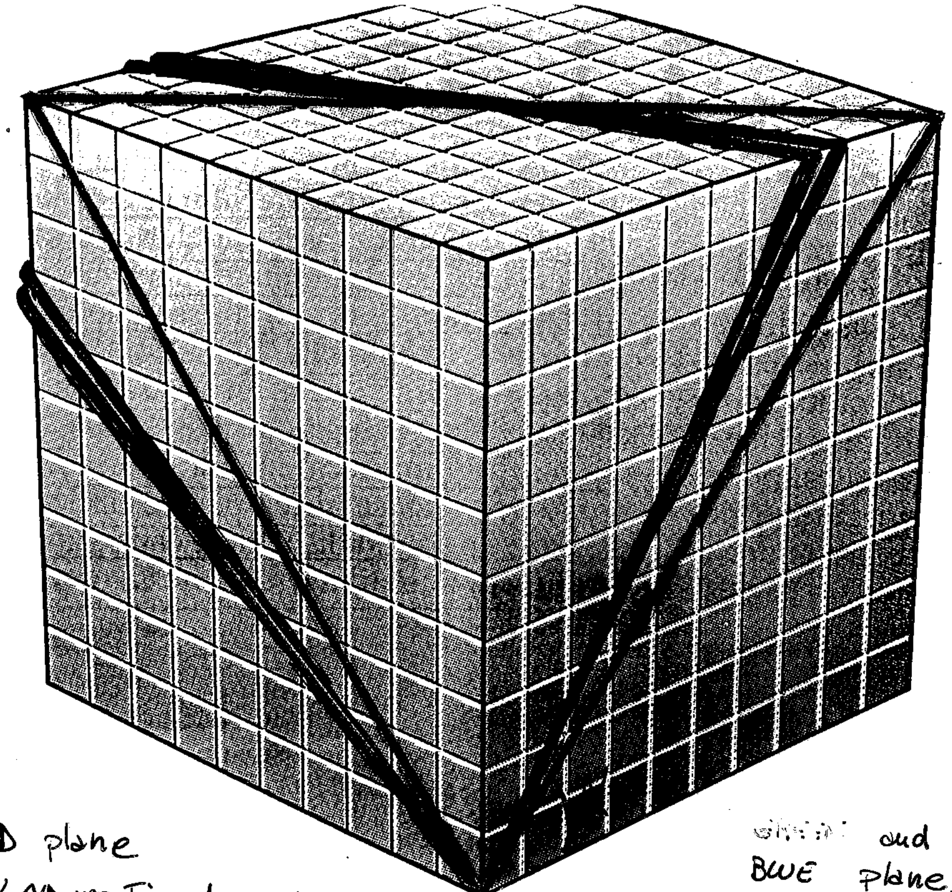


FIG. 8. Two types of rhombohedra that arise naturally in icosahedral quasicrystal packings and the star of vectors chosen for the analysis of the vertex model. The prolate rhombohedron (left) is based on a triplet of the form $(\mathbf{e}_5, \mathbf{e}_0, \mathbf{e}_1)$, the oblate on a triplet of the form $(\mathbf{e}_5, \mathbf{e}_0, \mathbf{e}_2)$.



RED plane
$tg\alpha \rightsquigarrow$ irrational number

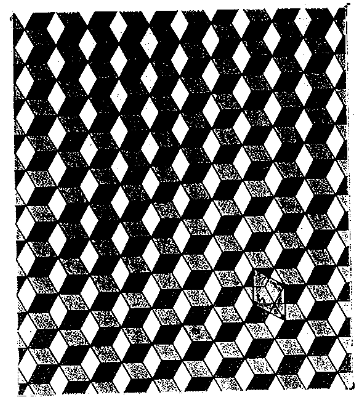
[illegible] and
BLUE planes
$tg\alpha \rightsquigarrow$ rational number

- WHEN A 3-DIM CUBIC LATTICE IS CUT BY A PLANE EITHER PERIODIC OR QUASIPERIODIC 2-DIM LATTICES CAN BE OBTAINED.

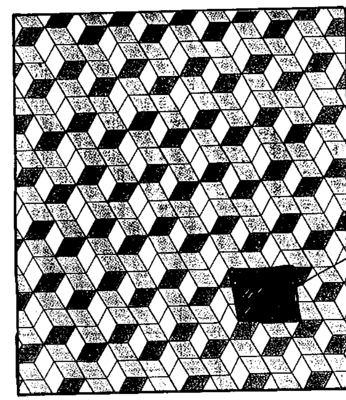
  THE INCLINATION OF THE PLANE WITH RESPECT TO THE CUBIC LATTICE DETERMINES THE CHARACTERISTICS OF THE RESULTING 2-DIM LATTICE.

THE PLANES OF THE PREVIOUS FIGURE INTERSECT THE 3-DIM LATTICE SO THAT THEY FORM:

- GREEN PLANE
  Periodic lattice



- BLUE PLANE
  Periodic lattice



- RED PLANE
  Quasiperiodic lattice
  NO SINGLE UNIT CELL CAN GENERATE THIS LATTICE