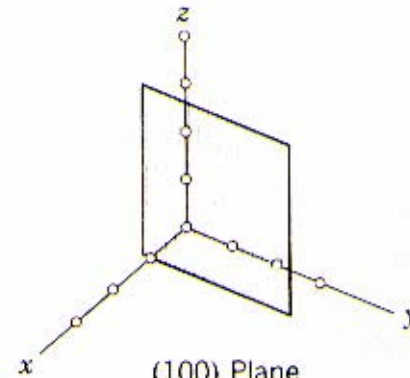
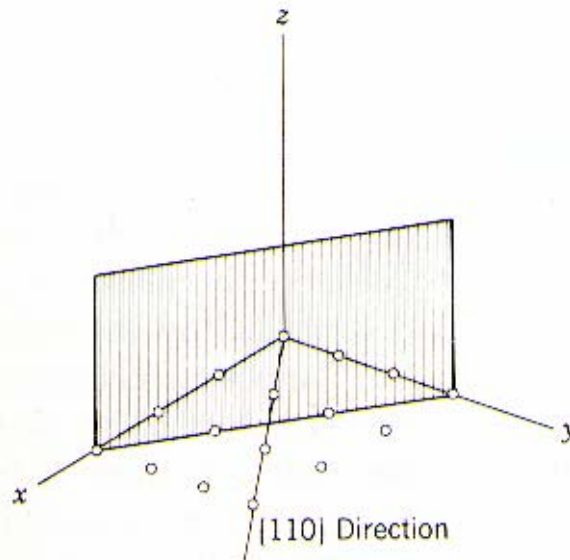


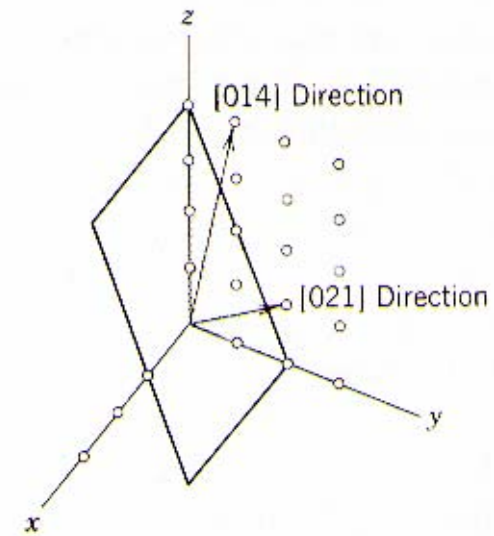
(111) Plane
(a)



(100) Plane
(b)



(110) Plane
(c)



(021) Plane
(d)

III. Microstructure

Length-scales

Angstrom = $1\text{\AA} = 1/10,000,000,000$ meter = 10^{-10} m

Nanometer = $1\text{ nm} = 1/1,000,000,000$ meter = 10^{-9} m

Micrometer = $1\mu\text{m} = 1/1,000,000$ meter = 10^{-6} m

Millimeter = $1\text{mm} = 1/1,000$ meter = 10^{-3} m

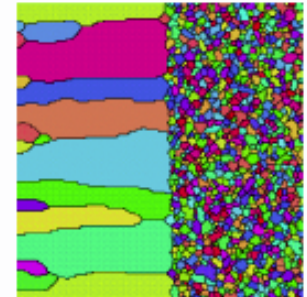
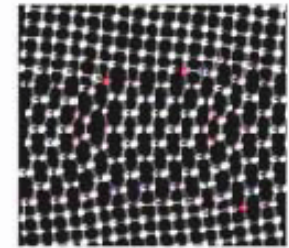
Interatomic distance \sim a few \AA

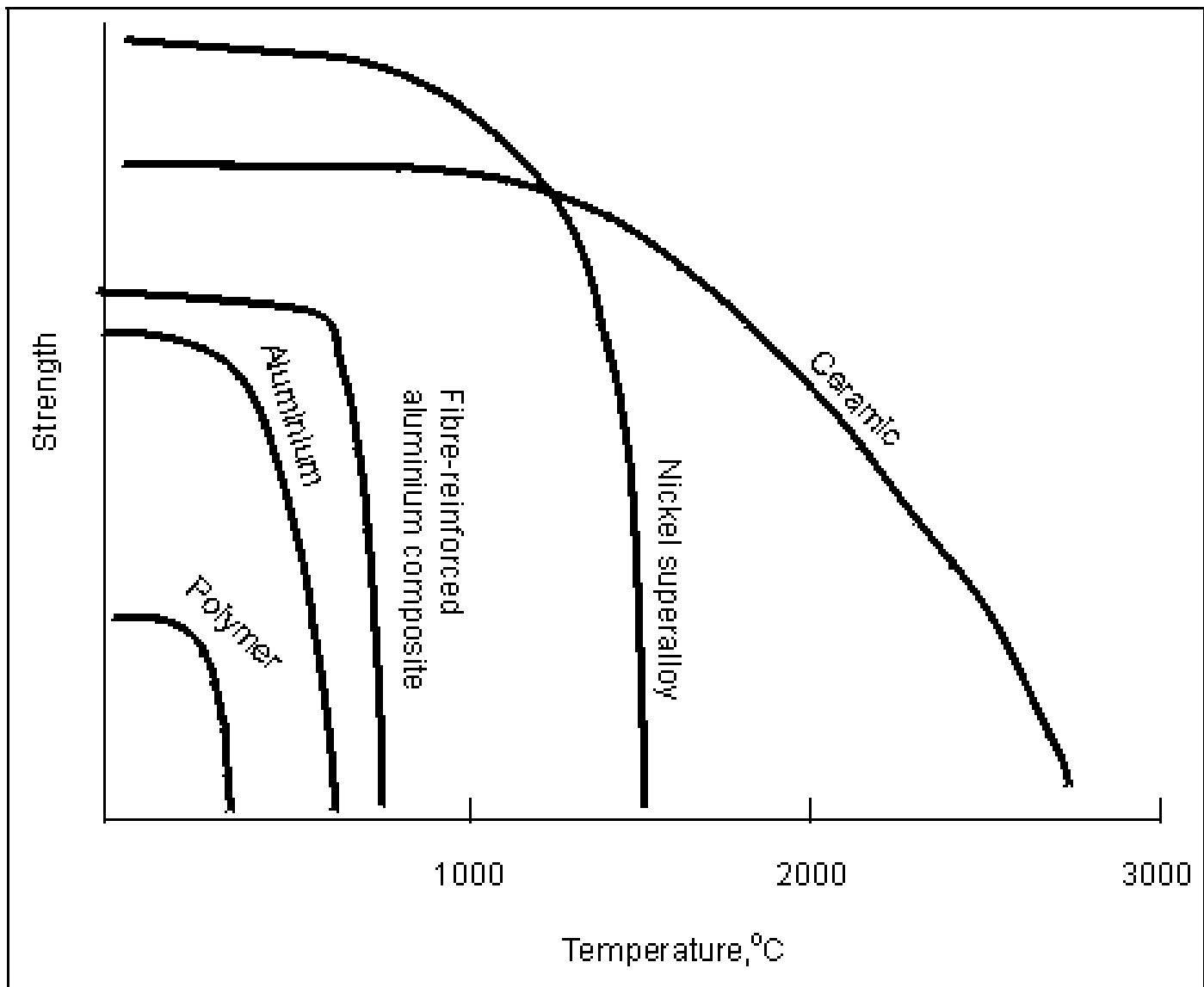
A human hair is $\sim 50\ \mu\text{m}$

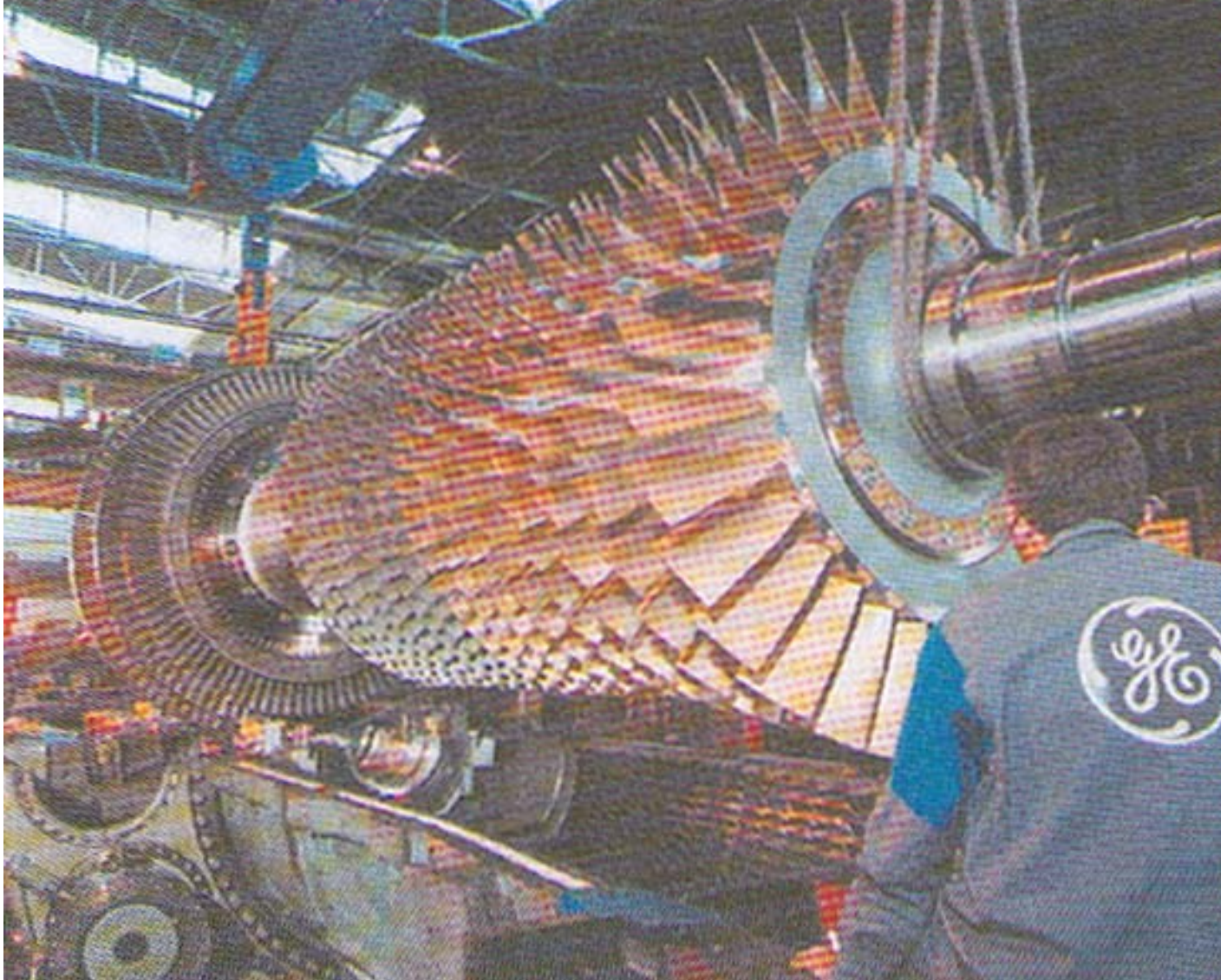
Elongated bumps that make up the data track on CD are
 $\sim 0.5\ \mu\text{m}$ wide, minimum $0.83\ \mu\text{m}$ long, and $125\ \text{nm}$ high

III. Microstructure

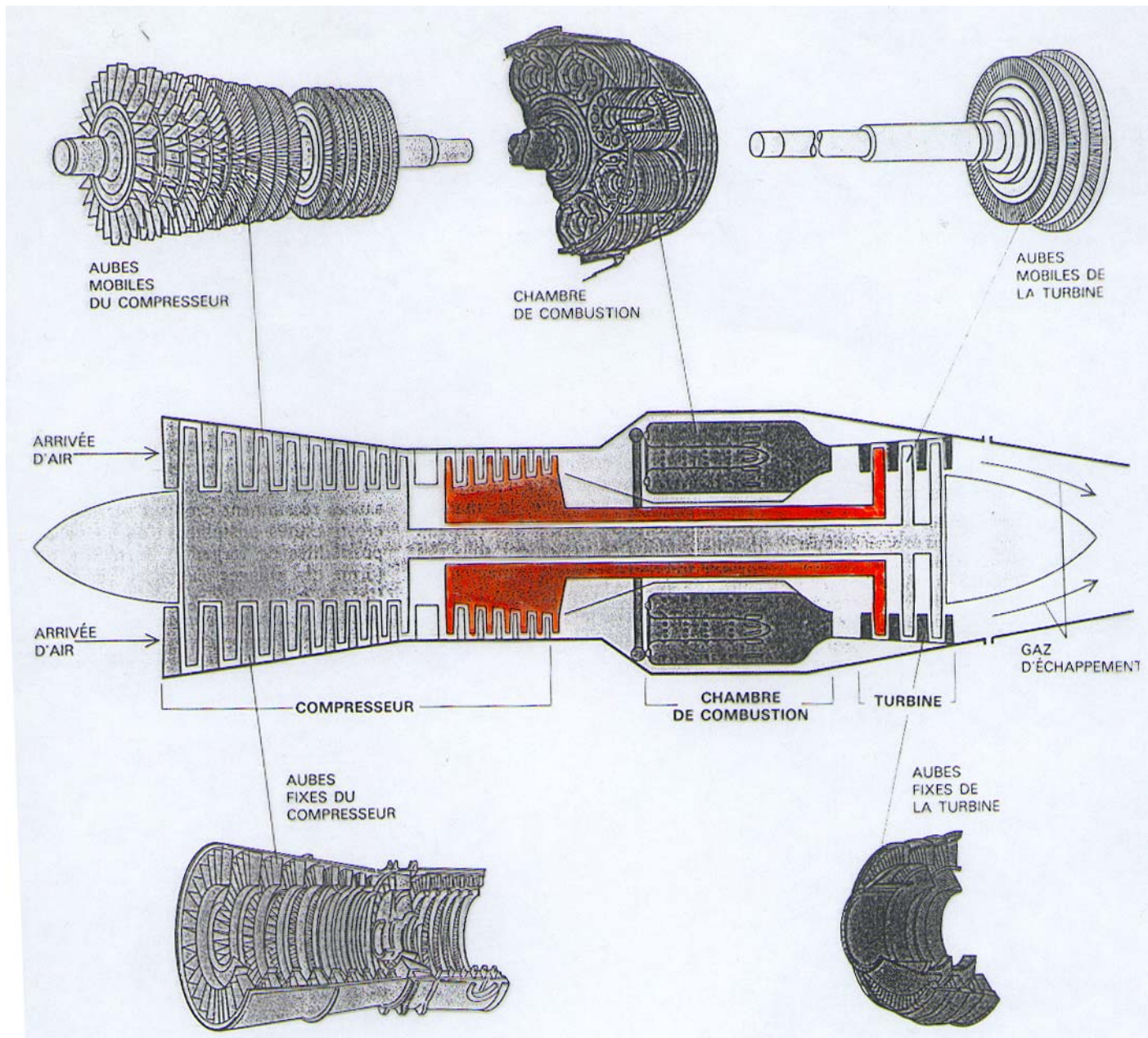
- **Structure**
(diffraction et microscope électronique en transmission (haute résolution) ou microscopie de surface)
- **Microstructure**
(microscope optique et électronique à balayage (réflexion))
- **Echelle macroscopique**
(Œil nu)







III. Microstructure

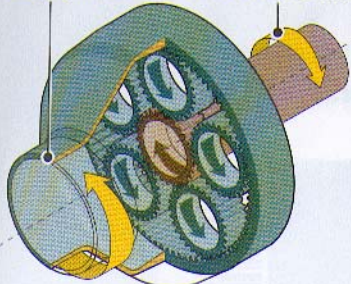


Bruit

> Réducteur de vitesse de rotation entre la soufflante et le corps basse pression

Soufflante
3 000 tours/minute

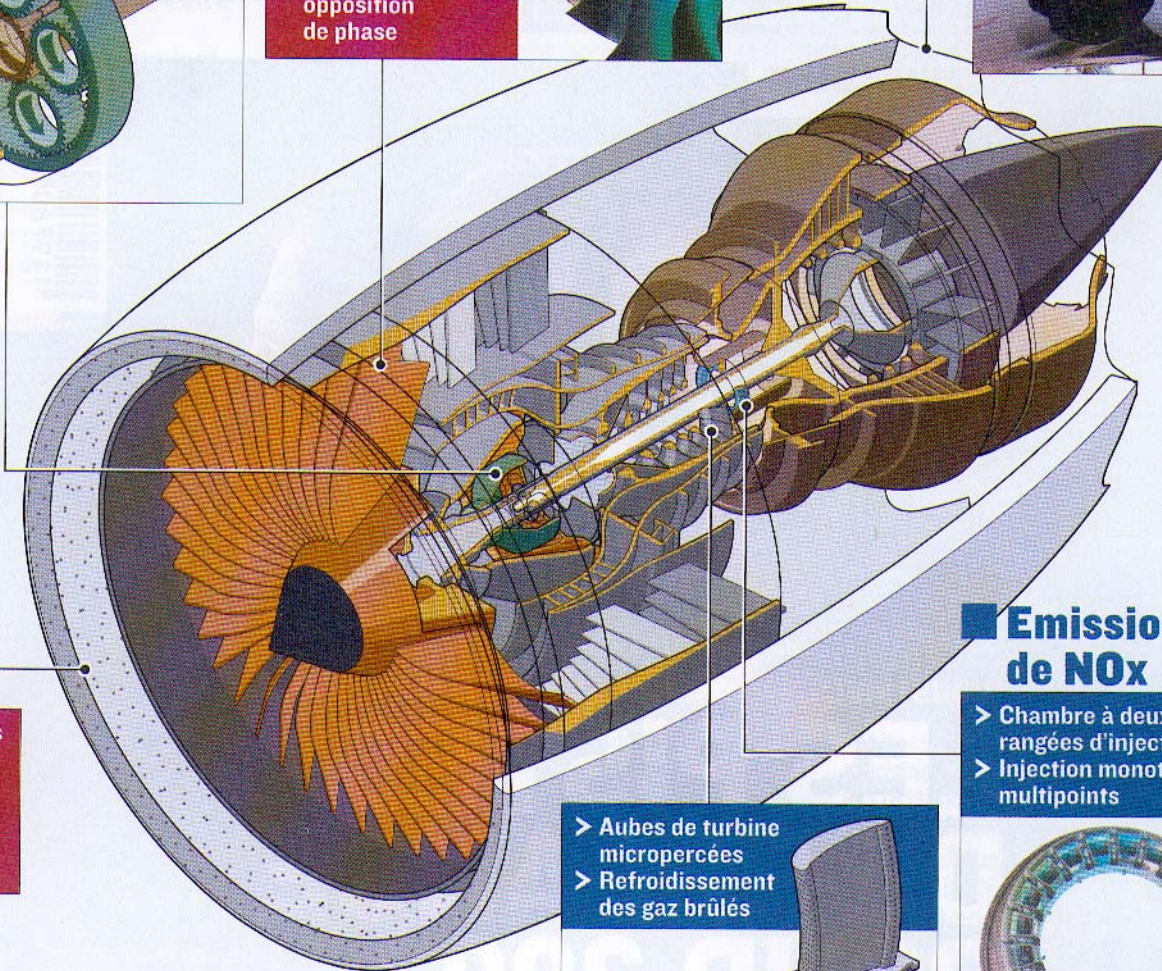
Arbre basse pression
9 000 tours/minute



> Nouvelles formes d'aubes
> Aubes creuses, en composites, en mousse d'alliage
> Générateur de bruit en opposition de phase



> Tuyère en chevrons
> Mélangeur de flux d'air

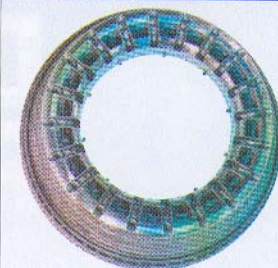
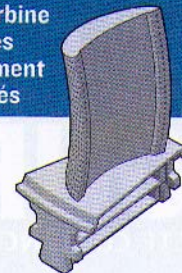


> Microperforations de la lèvre de la nacelle
> Revêtement intérieur isolant (nida)

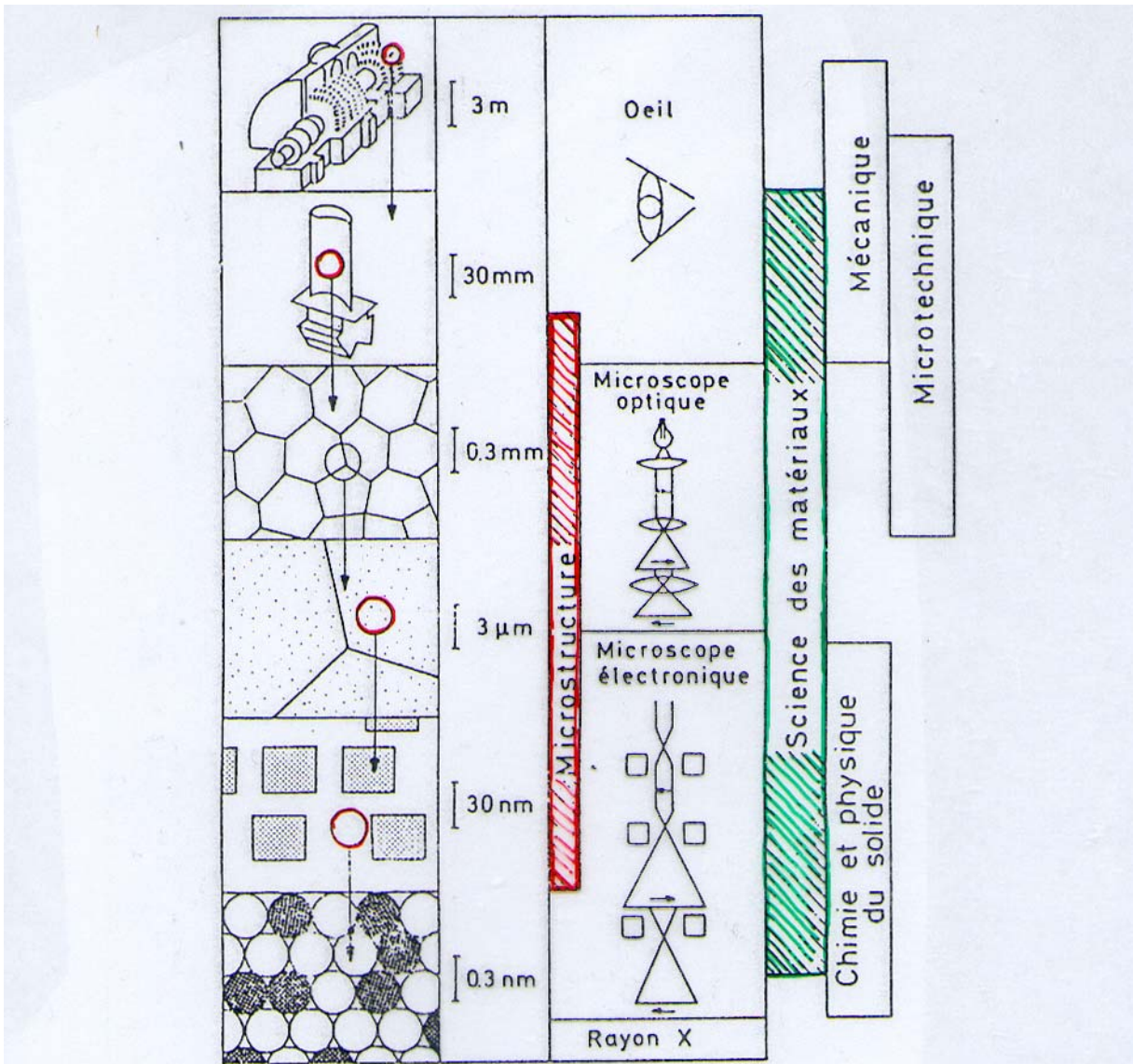
Emission de NOx

> Chambre à deux rangées d'injecteurs
> Injection monotête multipoints

> Aubes de turbine micropercées
> Refroidissement des gaz brûlés



III. Microstructure



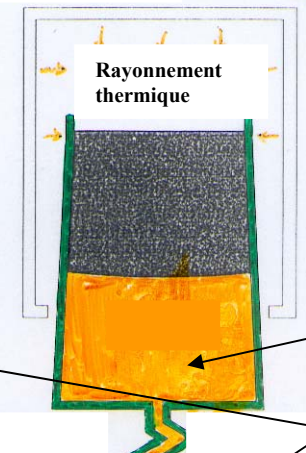
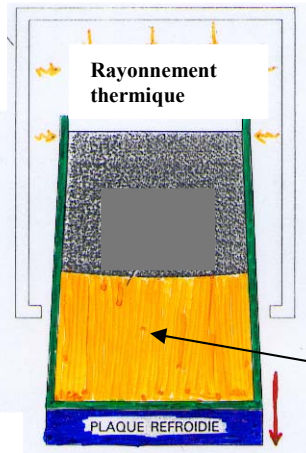
Rapport de grandeur entre les structures et les microstructures en relation avec les principaux domaines de la science et de la technologie.

Moule
céramique

Enceintes chauffantes

Métal
fondu
cristaux

polycristallin



monocrystalin

Cristaux en
forme de
filaments

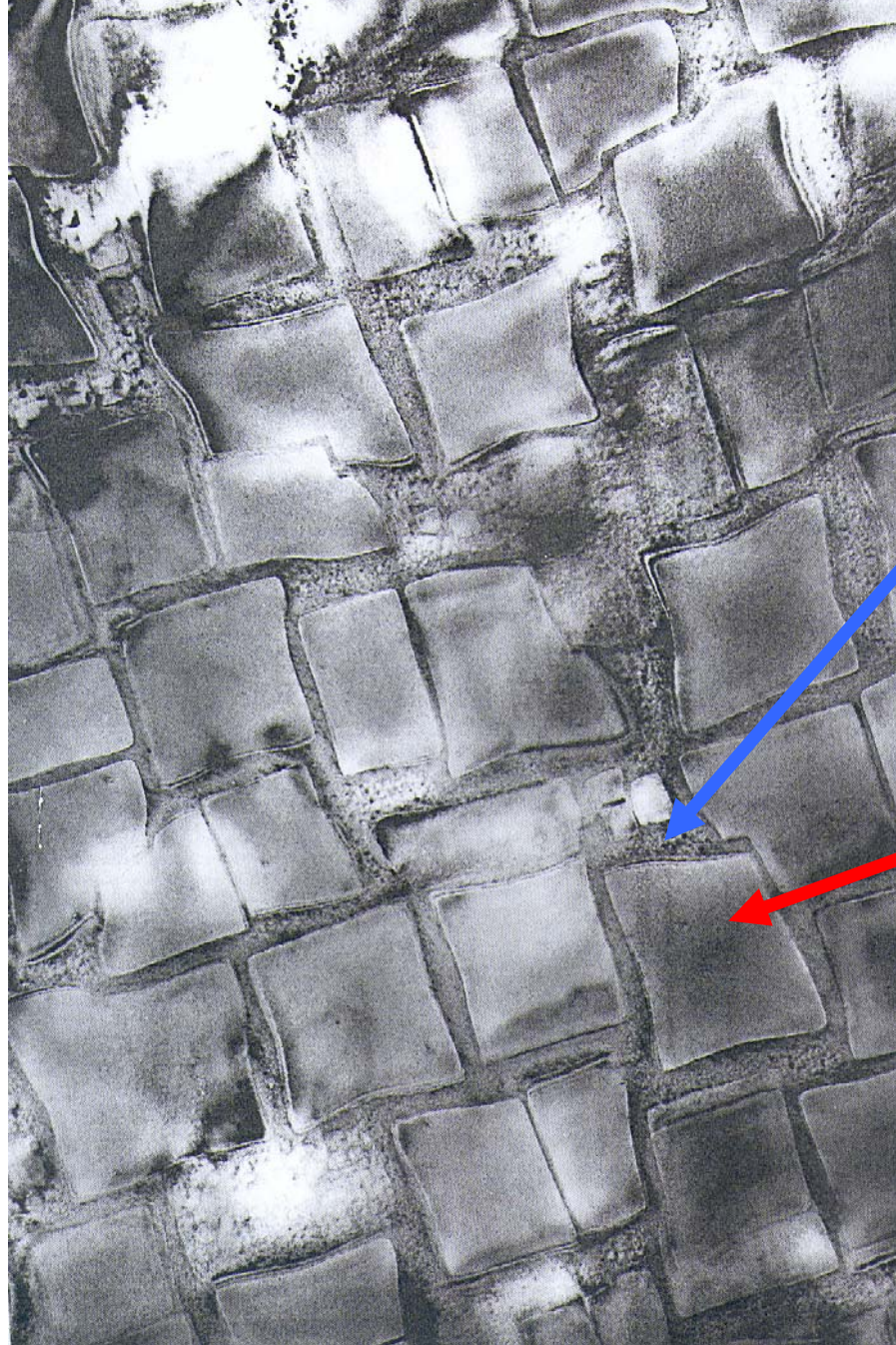
Polycristallin
à texture orientée
(grains en forme de
filaments)

monocrystalin



Microstructure à priori anisotrope, structure est anisotrope

*** 140 000**



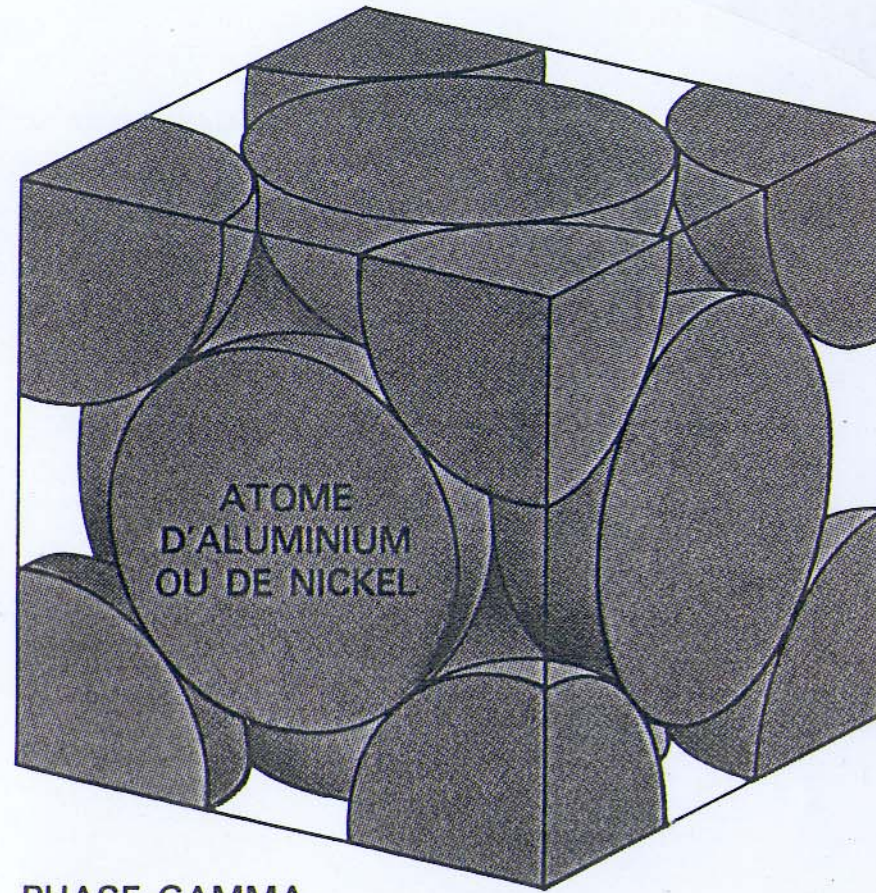
**cfc
désordre**

cfc ordre

ATOME
D'ALUMINIUM

ATOME
DE NICKEL

PHASE GAMMA-PRIME



PHASE GAMMA