Synchrotron Radiation: Science & Applications

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This general talk is devoted to briefly introduce the main uses and applications of synchrotron radiation. An initial introduction will be dedicated to describe a synchrotron as a Large Facility devoted to produce photons that will be used to carry out excellent science.

The five outstanding main characteristics of synchrotron radiation are:

i) High brilliance and collimation
ii) Wavelength tunability
iii) Beamsize tunability
iv) Defined polarization
v) Time structure
vi) (Partial) coherence

These properties will be illustrated through selected examples ranging

from *biomedicine* (f.i. determination of the crystal structure of macromolecules from tiny crystals or cryo- nano tomography of individual cells by soft X-ray transmission microscopy) *to materials science* (f.i. experiments of powder diffraction of materials under high pressure in diamond-anvil-cells),

from cultural heritage (f.i. the study of degradation of pigments in paints by X-ray absorption spectroscopy)
to cements (f.i. the hydration chemistry of eco-cements followed by in-situ powder diffraction),

and from basic research on magnetic materials (f.i. ferromagnets where the magnetism of individual metal transition elements are selectively followed by X-ray Magnetic Circular Dicroism)

to industrial applications on chocolate (f.i. small X-ray scattering as function of temperature of the polymorphs of cacao).