Lecture 1 : Basics concerning scattering and diffraction processes: an optical approach

I. Scattering mechanism (45 min)

1. Scattering cross sections
2. An optical formulation of scattering amplitude by a stationary target
3. Case of a dynamic target
4. Quantum formulation of scattering theory
5. Inclusion of anomalous, absorption, extinction effects….: from ideal to real situations

II. Physical information from scattering experiments (45 min)

1. X Ray and Gamma Ray scattering
2. Electron scattering
3. Neutrons
4. Most frequent experimental conditions
5. From ideal to
6. Time resolved scattering: a revolution

Tutorial : 50 years back. Imagination at work: the structure of DNA (30 min).

How the understanding of the famous diffraction picture implied a precursor intuition concerning modulated, commensurate and incommensurate features.

1. Diffraction photograph of DNA fibre.
2. From a single to a double helix model
3. Towards a discrete double helix
4. A realistic model for DNA

I could send before the summer school questions concerning this tutorial, to make it a real tutorial

Lecture 2 : Charge and Spin densities. A crucial help to master condensed matter behaviour

I. Basics concerning charge and spin density studies (20 mn)

1. Experimental considerations. Impact of new facilities
2. Realistic modelling
3. Some simple examples: a challenging interface with quantum modeliing
4. Complementarity between charge and spin density

II. Some challenging issues: looking at the future (40 mn)

1. Molecular systems, up to proteins
2. Pharmaceutical systems
3. Complex inorganic systems, porous materials
4. Molecular and nano-magnets
5. Systems under external forces
6. Systems out of equilibrium : photo-excited systems

III. Describing condensed systems as a superposition of fragments: transferability among similar chemical situations (30 mn)

1. Simultaneous modelling of charge and spin density: potential issues
2. Combining real and momentum space studies: from density functions to density matrix: potential impact of such an approach
3. A fragment partitioning model to describe electronic behaviour of condensed systems
4. From ideal to real solids