Nuclear reactions with heavy ions

PART 1 (Andrea Vitturi) :   Interplay of nuclear structure and reaction mechanism in the description of heavy-ion collisions

1.   Basics in direct heavy-ion reactions. Semiclassical approximation, reaction formalism and coupled-channels
2.   Elastic scattering. Optical model. The case of weakly bound nuclei
3.   Coulomb excitation. One-step and multistep reactions.
4.   Nuclear inelastic excitations. Single-particle and collective excitations. Excitation of giant resonances
5.   Dipole excitations with isoscalar and isovector probes. GDR and PDR
6.   Breakup reactions and continuum discretization
7.   Interplay of different channels: reactions in one dimension as toy model
8.   Algebraic approaches (IBM, IBMF, ...). Discrete symmetries and alpha clustering. Phase transitions and critical point symmetries in even and odd nuclei
9.   Two-particle transfer
10.   Two-particle transfer (cont). Giant pairing vibration. Competition of T=0 and T=1 pairs.

PART 2 (Fernando Scarlassara) : Sub-barrier fusion reactions induced by heavy ions. The role of the intrinsic degrees of freedom