NEO Sample Return mission

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The NEOs are representative of the population of asteroids and dead comets thought to be the remnants of the ancient planetesimals that accreted to form the planets. The chemical investigation of NEOs having primitive characteristics is thus essential in the understanding the planet formation and evolution. They carry records of the solar system's birth/early phases and the geological evolution of small bodies in the interplanetary regions. Moreover, collisions of NEOs with Earth represent a serious hazard to life. For all these reasons the exploration and characterization of these objects are particularly interesting and urgent.

NEOs are interesting and highly accessible targets for scientific research and robotic exploration. Within this framework, the mission LEONARD including an orbiter and a lander to the primitive double object (1996 FG3) has been studied by CNES, in collaboration with a number of European planetologists (France, Italy, Germany and United Kingdom) and related Space Agencies.

A new Sample Return mission is under study within a large European community and possible collaboration with the Japanese Space Agency JAXA to reply to the ESA Cosmic Vision AO.

The principal objectives are to investigate on 1) the properties of the building blocks of the terrestrial planets; 2) the major events (e.g. agglomeration, heating, ...) which ruled the history of planetesimals; 3) the primitive asteroids which could contain presolar material unknown in meteoritic samples; 4) the organics in primitive materials; 5) the initial conditions and evolution history of the solar nebula; and 6) how they can shed light on the origin of molecules necessary for life.

This type of mission appears clearly to have the potential to revolutionize our understanding of primitive materials.