



Comets - Witnesses from the Beginning of the Solar System

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The circumstances of the formation of our solar system from an interstellar molecular cloud have been of high scientific interest. Once it was realized that comets contain large proportions of highly volatile compounds it became obvious that they must have formed very early in the outer fringes of the planetary nebula. Their key role for the understanding of the primordial material and physical processes in the early solar nebula was readily recognized and it was only consequential the ESA's first interplanetary mission was the flyby of comet Halley. Ever more sophisticated instrumentation of telescopes revealed a strong correlation of cometary compounds with interstellar material. Comet encounters during the last decade consolidated our perception of kilometre sized fragile nuclei with very low surface albedo and localized activity. The ESA cornerstone mission Rosetta was originally conceived as a comet nucleus sample return (CNSR) mission. The collaboration with the US, however, did not materialize. The Rosetta spacecraft is on its way to rendezvous a comet in 2014 and promises to provide outstanding insight in the physics and composition of comets. Our knowledge of the physical properties of cometary nuclei has been so strongly consolidated that a focussed relatively simple sample return mission can now be conceived. Applying the sophisticated modern analytical laboratory methods will allow for a detailed chronology of the solar system formation and its complex processes.

The present knowledge of comets will be discussed in the context of their origin and formation. An outlook of what we can expect from the Rosetta rendezvous and the merits of a comet nucleus sample return will be given. The feasibility of a CNSR mission based on our present knowledge of cometary nuclei and existing technology will be elaborated.