Cometary Origin and Evolution

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The earliest stages of collapse of our solar nebula are not subject to direct observational constraints. However, cometary nuclei can give us some information from this early era. Comet nucleus size distributions may preserve a record of the outer nebula mass distributions in the late stages of planetary formation, as well as a record of collisional evolution. The rate of proto-planetary growth and scattering as a function of heliocentric distance depended on the size and mass distribution of the km-size planetesimals that have survived as today's comets, their nebular surface density and their velocity distributions. Likewise, comparisons of the development and cessation of activity as a function of heliocentric distance for comets originating in different regions of the outer solar nebula can help us understand the volatile distribution and physical processes in the outer nebula and the planet formation environment. Observations of recent bright comets have shown that there is evidence of a preservation of an interstellar ice / dust component within nuclei, yet at the same time the cometary material has undergone processing during its formation. This review will discuss the possible formation scenarios for comets, and how observations are giving us information about the volatile distribution in the nebula, and the role that the comets have played in the formation of planets. Comparison will be drawn between the different dynamical classes of outer solar system bodies, *e.g.* the short-period comets, the long-period comets, the Centaurs, the dynamically new comets and the Edgeworth-Kuiper Belt objects.