# Contact Binaries Among the Jupiter-Family Comet Population

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Observations by spacecraft and earth-based radar have shown the existence of asteroids that strongly indicate a contact-binary nature. Some of these objects have very distinctive shapes with a near-ellipsoidal large lobe with a near-spherical smaller lobe at one end (eg. 1996 HW1 [1] and now 1999 JV6 [2]). Recent results for the contact-binary asteroid Itokawa, that utilised the thermal response of its surface, imply significant density differences between its two components [3]. While not as common as their asteroid counterparts, some cometary nuclei also have pronounced bi-lobed appearances. Examples include comet 8P/Tuttle [4] 103P/Hartley 2 [5], 19P/Borrelly [6], and possibly comet 1P/Halley [7]. The strongest case for a contact-binary or merged system is based on imaging from the ESA Rosetta spacecraft, currently in the vicinity of the bi-lobed comet 67P/Churyumov-Gerasimenko. Layering is visible across its entire surface, which strongly implies that this comet formed from the merging of two independently-formed comets [8]. This in turn implies that low velocity collisions (cm-m's per second) were occurring presumably in the early stages of formation of these bodies, which is further supported by recent hydrocode simulations of such events [9]. Here I will review this topic in more detail and provide a discussion of the implications these observations have on the formation processes of cometary nuclei and the collisional environment that cometessimals were subjected to early in their formation histories. References: [1] Magri et al. 2011. Icar. 214, p210. [2] Rozek et al. 2016 (this meeting). [3] Lowry et al. 2014. AA 562, A48. [4] Harmon et al. 2010. Icar. 207, p499. [5] A'Hearn et al. 2011. Sci. 332, p1396. [6] Soderblom et al. 2002. Sci. 296, p1087. [7] Keller et al. 1986. Nat. 321, p320. [8] Massironi et al. 2015, Nat. 526, p402. [9] Jutzi and Asphaug. 2015. Sci. 348, p1355.