THE TROJANS IN THE SOLAR SYSTEM. E. Dotto (INAF-Osservatorio Astronomico di Roma, I dotto@mporzio.astro.it).

Introduction: The objects located in the L4 and L5 Lagrangian points of a planet's orbit are called Trojans. Mars, Jupiter and Neptune share their orbits with Trojan objects, but Saturn and Uranus are also believed to support similar populations of small bodies.

The identification of Mars Trojans is still a matter of debate: only four objects have been confirmed to be in the Mars Lagrangian points [1] and several other bodies have been identified as potential Mars Trojans.

Although the population of Neptune Trojans is expected to be 20 times larger than that of Jupiter Trojans [2], only six objects are so far known. At present, the most numerous group of known Trojans is in the orbit of Jupiter. It includes more than 2200 objects, more than 1200 in the L4 cloud and more than 1000 in the L5 cloud.

Physical properties: Rivkin et al [3] carried out visible and near infrared spectroscopy of three out of the four confirmed Mars Trojans, finding large spectral differences: 5261 Eureka and 1887 VF31 have been classified as Sr (or A) type, and Sr (or Sa) type, respectively, while 1999 UY7 belongs to the X (or T) class. These results seem to suggest that these objects did not all form in their current locations, or alternatively they suffered a strong variation in their sizes.

While the dynamical characteristics are quite well determined, the physical properties of the Jupiter and Neptune Trojan populations are not as well known. Color measurements of Neptune Trojans have shown that they are statistically indistinguishable from one another with slightly red colors, similar to the Jupiter Trojans and neutral/less red Centaurs. On the basis of this result, [4] argued that Neptune Trojans had a common origin with Jupiter Trojans, irregular satellites and the dynamically excited gray Kuiper belt population, and are distinct from the classical Kuiper belt objects.
For Jupiter Trojans, we have visible color indexes of about 300 objects [5], visible spectra of less than 150 bodies ([6], [7], [8], [9], [10], [11], [12], [13]), near-infrared spectra of a sample of about 50 objects ([14], [15], [16], [17], [18], [19], [20]), and thermal--IR spectra of only three bodies [21]. Albedo values are known for a few tens of objects, mainly published by [22], while only two measurements of the density is so far available in the literature ([23], [24], [25]).

Conclusions: On the basis of this still incomplete sample of information, the population of Jupiter Trojans shows some similarities with the other populations of minor bodies of the outer Solar System, but also some notable differences. Some analogies with neutral/less red Centaurs suggest that Jupiter Trojans are more similar to the active and "post-active" comets, than to the non-active icy bodies.
This may support a genetical link among these objects, as supposed by recent dynamical modeling which suggests a genetic relationship among Trans Neptunian Objects and Jupiter Trojans [26]. Nevetheless the complete puzzle is still far from being understood.

References:. [1] Scholl et al. (2005) Icarus 175, 397; [2] Sheppard and Trujillo (2006a) BAAS 38, 44.03; [3] Rivkin et al. (2003) Icarus 165, 349; [4] Sheppard and Trujillo (2006b) Science 313, 51 ; [5] Szabo et al. (2007) MNRAS 377, 1393; [6] Jewitt and Luu (1990) A.J. 100, 933; [7] Vilas et al. (1993) Icarus, 105, 67; [8] Fitzsimmons et al. (1994) A&A. 282, 634; [9] Lazzarin et al. (1995) A.J. 110, 3058; [10] Bendjoya et al. (2004) Icarus 168, 374; [11] Fornasier et al. (2004) Icarus 172, 221; [12] Lazzaro et al. (2004) Icarus 172, 179; [13] Fornasier et al. (2007) Icarus 190, 622; [14] Jones et al. (1990) Icarus 88, 172; [15] Luu et al. (1994) Icarus 109, 133; [16] Dumas et al. (1998) Icarus 133, 221; [17] Cruikshank et al. (2001) Icarus 153, 348; [18] Emery and Brown (2003) Icarus 164, 104; [19] Dotto et al. (2006) Icarus 183, 420; [20] Yang and Jewitt (2006) BAAS 38, 50.03; [21] Emery et al. (2006) Icarus 182, 496; [22] Fernandez et al. (2003) A.J. 126, 1563; [23] Lacerda and Jewitt (2006) BAAS 38, 34.02; [24] Marchis et al. (2006) Nature 439, 565; [25] Marchis et al. (2006) IAUC, 8732; [26] Morbidelli et al. (2005) Nature 435, 462