The Trojan Color Conundrum

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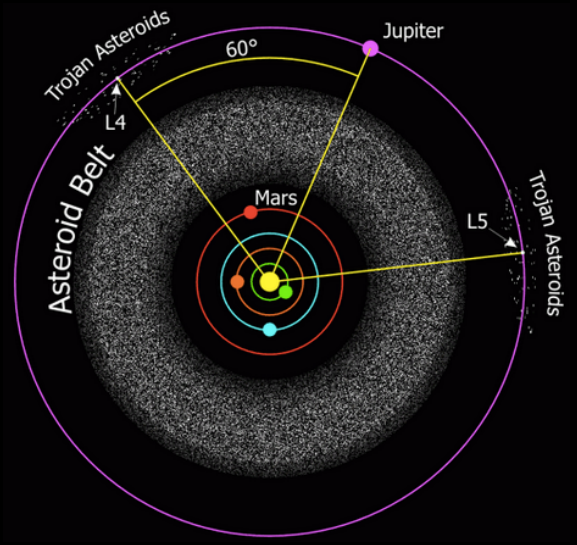
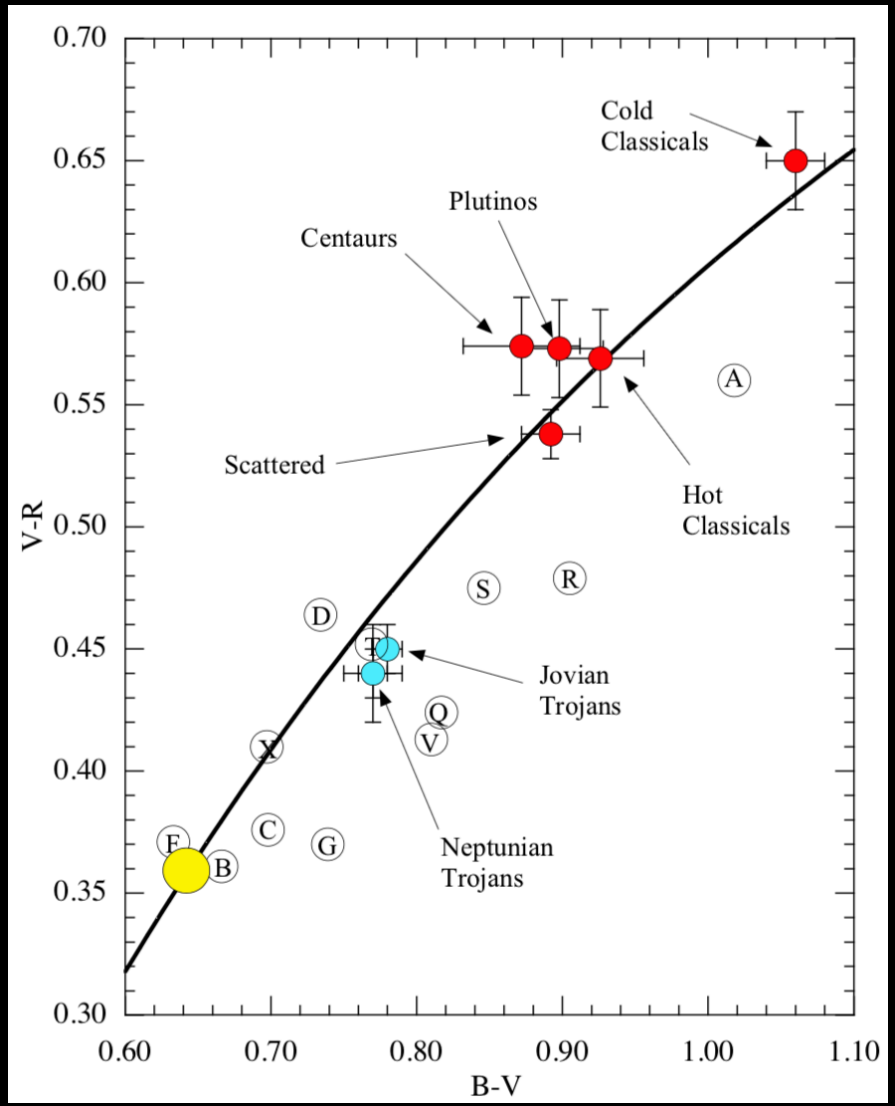


• D. Jewitt (2018). The Astronomical Journal, 155:56

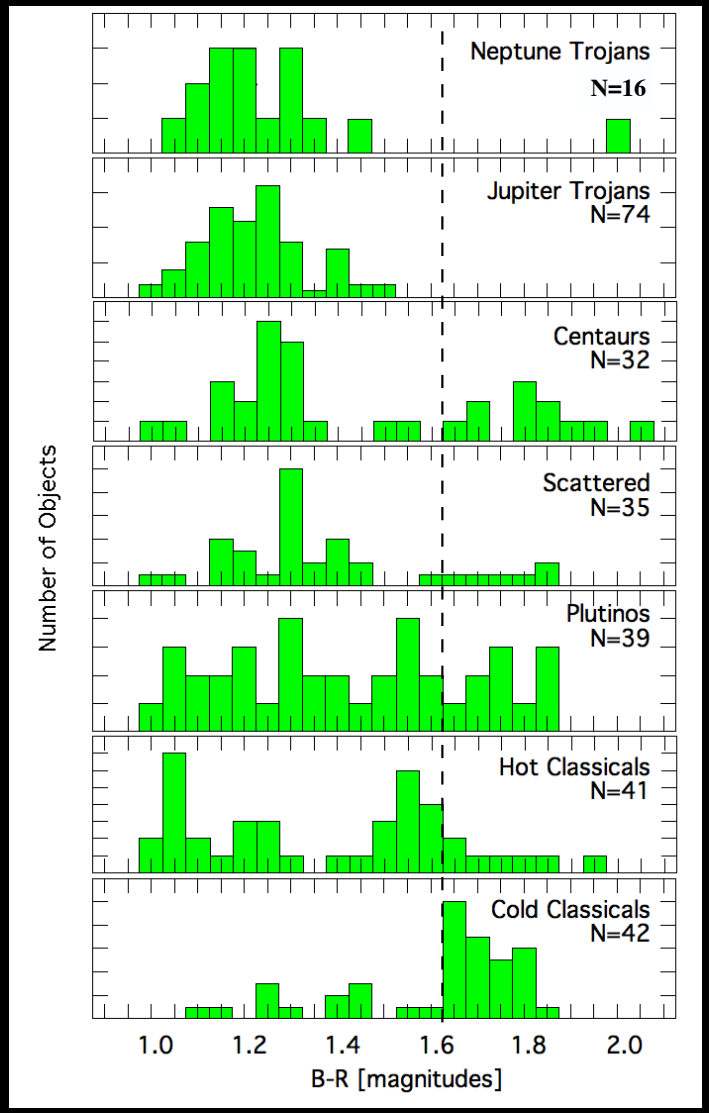
Average Colors by Group

Color is a proxy for composition

Jupiter & Neptune Trojans are redder than the Sun but much less red than any component of the Kuiper belt

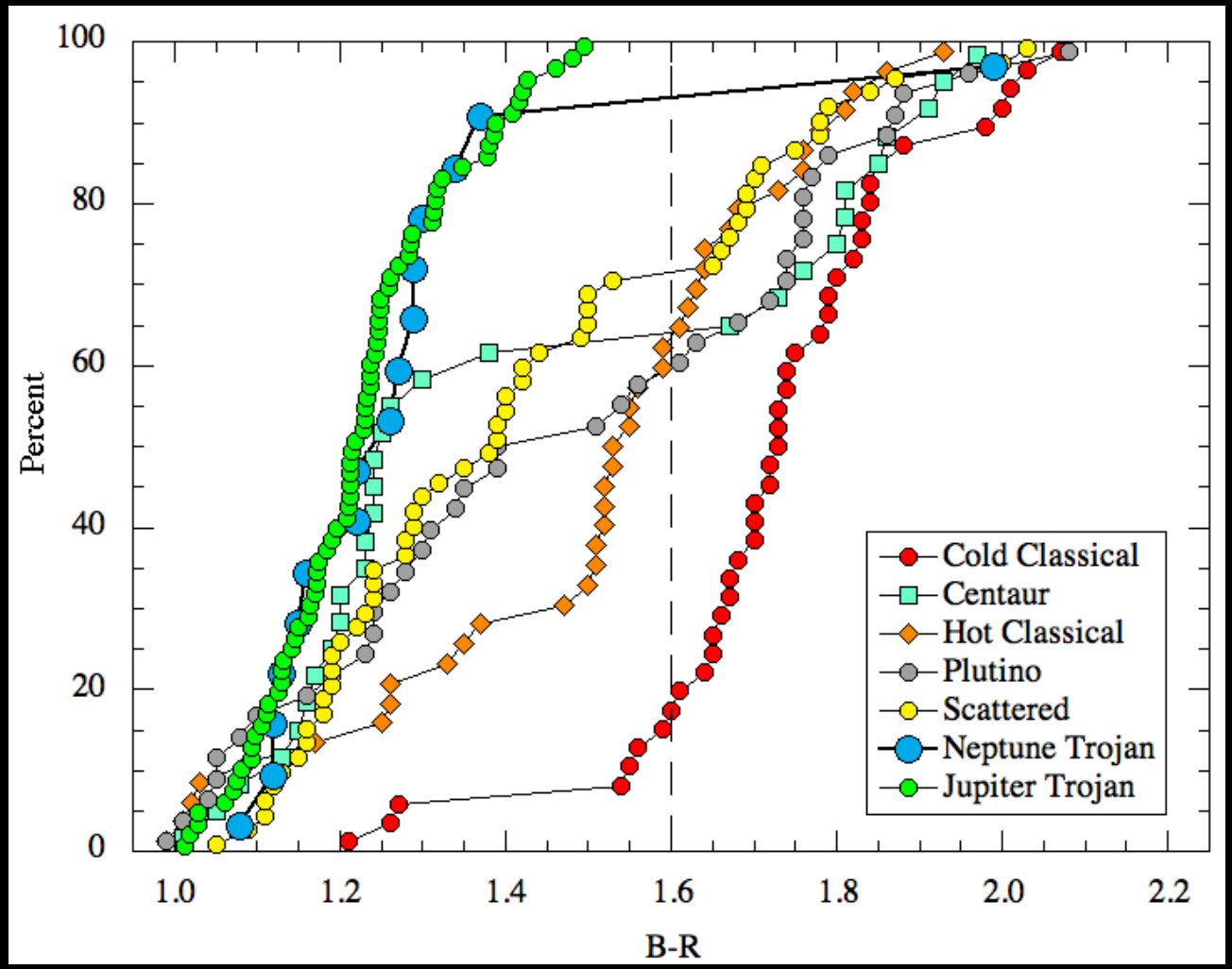


Hot Populations



Statistical tests confirm what the eye shows: it is unlikely that either Trojan distribution could be drawn by chance from a "hot population" distribution, with probability $P \sim 0.004$

Cumulative Distributions



The conundrum is that the Trojan colors are different from those of their supposed source objects, but that there is no established process capable of modifying the surface colors at both Jupiter and Neptune.

Possible Solutions

Either

1) More data will remove the difference between the color distributions
(but statistics suggest that this is unlikely)

Or

2) A non-thermal process might be identified at Neptune
(e.g. collisions, but collision rates too small - Almeida et al. (2009). A&A 508:1021 - Dong & Zhou (2018), arXiv:1806.10651v1: "only one collision will happen given 5×10^5 Trojans during 1Gyr. " and mechanism is purely conjectural.)

Or

3) The Trojans are not captured KBOs
(e.g. paper by Pirani et al. 2018)

Questions?