



Update on Pluto's Tiniest Moons

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We report on the discovery and subsequent analysis of "P5", Pluto¹'s fifth known moon (officially designated S/2012 (134340) 1), and also provide an update on the latest results for "P4" (S/2012 (134340) 1). P5 was discovered in Hubble Space Telescope (HST) images from June and July 2012, and has since been recovered in HST images from 2011. P4, discovered in 2011, was imaged extensively by HST in 2012, and has also been recovered from archival images as far back as 2005. Preliminary orbital elements for P5 are: semimajor axis $a = 42579$ km; mean motion $n = 17.8560$ degrees/day; eccentricity $e = 0.0048$; inclination $i = 0.88$ degrees. For P4, these values are : $a = 57711$ km; $n = 11.1910$ degrees/day; $e = 0.0029$; $i = 0.34$ degrees. These values place the moons near, but not in, the 1:3 and 1:5 mean motion resonances with Charon, just as Nix and Hydra fall near the 1:4 and 1:6 resonances. While these associations are too close to have arisen by chance, the role of the near-resonances in the orbital history of the Pluto system is unknown. Photometry indicates that P5 is half as bright as P4 and $\sim 5\%$ is bright as Nix. This implies a diameter ~ 10 km if P5's albedo is 0.35, comparable to that of Charon. Searches for additional moons have been negative so far, suggesting that Pluto has no additional moons more than half as bright as P5 orbiting exterior to Charon. However, scattered light in the HST images prevents us from setting such a strict upper limit for any unseen moons interior to Charon's orbit.