

Asteroid (41) Daphne and its moon

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We provide a progress report on our analysis of past observations, and our plans for future observations, of asteroid (41) Daphne and its tiny moon, Leucippos (unofficial name). Leucippos was discovered on March 28, 2008 [Conrad, et al., IAUC 8930 (2008)] during an observation using the NIRC2 imager on Keck II. Both Daphne and Leucippos were then imaged in follow-up observations carried out with NIRC2 on April 23rd and with VLT/NACO on 5 different nights during May of that same year [Conrad et al., AAS/DPS, (2008); Merline et al., ACM/LPI (2008)]. Our analysis indicates a highly irregular shape for Daphne with an equivalent diameter of about 190 km, and an extreme mass ratio between Daphne and Leucippos of about one million. Density of an asteroid can be measured for systems like Daphne/Leucippos. Daphne is resolved, allowing a volume estimate; while the orbit of Leucippos around Daphne provides the mass estimate. Density leads to better knowledge of composition. Knowledge of asteroid composition has become increasingly important for understanding planet formation and for determining the potential use of asteroid resources. For the upcoming opposition during March 2017, we plan to better constrain the volume and mass, and hence density, of the Daphne system by conducting observations with new technology coming on line at the Large Binocular Telescope (LBT). We will use LBT in 8-meter mode with extreme AO and the recently commissioned LUCI-1 imager, in 12-meter mode (combined aperture, un-phased) using both LUCI-1 and LUCI-2 simultaneously, and in 23-meter mode using the soon to be commissioned imager LINC-NIRVANA (LN). LN will bring a new, experimental mode to LBT. This mode, a variant of Fizeau imaging that uses light from surrounding stars for fringe tracking, can be used with resolved sources like (41) Daphne. We will report the status of our planning, and the expected resolution and performance, for each of these 3 future modes coming on line at LBT.