Lucy: Surveying the Diversity of the Trojan Asteroids: The Fossils of Planet Formation

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The Lucy mission is the first reconnaissance of the Jupiter Trojan asteroids - objects that hold vital clues to deciphering the history of the Solar System. Due to an unusual and fortuitous orbital configuration, Lucy, which has been selected as part of NASA's Discovery Program, will perform an exhaustive landmark investigation that visits six of these primitive asteroids, covering both the L4 and L5 swarms, all the known taxonomic types, the largest remnant of a catastrophic collision, and a nearly equal mass binary. More specifically, Lucy will visit: Eurybates (L4, C-type), Polymele (L4, P-type), Leucus (L4, D-type), Orus (L4, D-type) and the Patroclus-Menoetius binary (L5, P-types). It will launch in 2021 and will have encounters from 2025-2033.
Lucy will use a suite of high-heritage remote sensing instruments to map the geology, surface color and composition, thermal and other physical properties of its targets at close range. More specifically, Lucy's primary science objectives are: i) Surface composition: Lucy will map the color, composition and regolith properties of the surface and determine the distribution of minerals, ices and organics species; ii) Surface geology: Lucy will map albedo, shape, crater spatial and size distributions, determine the nature of crustal structure and layering, and determine the relative ages of surface units; iii) Interior and bulk properties: Lucy will determine the masses and densities, and study subsurface composition via crater windows, fractures, ejecta blankets, and exposed bedding; iv) Satellite and ring search: Lucy will determine the number, size-frequency distribution and location of km-scale satellites and dense rings.
Owing to their unique location near Jupiter and the critical role they play in revealing and constraining models of the formation and evolution of the Solar System, Trojans have been a high priority for space missions for over a decade. By studying these important bodies, Lucy, like the human fossil for which it is named, will revolutionize the understanding of our origins.

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