THE FUTURE OF ASTEROID CHARACTERIZATION C. A. Thomas[1] and L. A. McFadden[2], [1]Planetary Science Institute (1700 East Fort Lowell, Suite 106, Tucson, AZ, 85719, USA, cthomas@psi.edu), [2]NASA Goddard Space Flight Center.

Introduction: The characterization of asteroids is an important methodology for understanding the past and current evolution of our Solar System. As we look to the future, we will discover a large number of objects and our ability to study these objects in detail will be greatly improved. We will have to determine a balance between the in depth analyses (e.g., mineralogy, rotation rate, spin pole) and the broad survey work (e.g., taxonomic type). Both of these types of studies are extremely useful, but as the field grows we will be limited by the assets available to us (including telescope time and researchers).

Main Belt and Trojan Asteroids: The Main Belt and Trojan asteroid populations are large reservoirs of material from the early Solar System. The diversity of composition in the Main Belt can tell us a lot about the starting conditions and early evolution of the primordial disk. Determining the composition of the Trojan asteroids of Jupiter can enable scientists to distinguish between dynamical models of Solar System evolution.

Near-Earth Asteroids: The majority of near-Earth objects originated in collisions between bodies in the Main Belt and subsequently found their way into near-Earth space through a series of dynamical interactions. Large scale spectral analyses of the near-Earth asteroid population can shed light on a variety of topics including source regions for the various populations and the distribution of taxonomic types and mineralogies. Additionally, near-Earth asteroid physical studies are important for understanding the hazard level associated with any potential impactors.

Future work:

Near-Earth Asteroids. For years the community has been working to characterize ~10% of the NEA population. Through various efforts such as MANOS [1], the MIT-UH-IRTF Joint Campaign for Spectral Reconaissance [2], and other published surveys [3,4] we have been able to keep that pace. However, the planned addition of the Large Synoptic Survey Telescope to discovery efforts will add at least 40,000 known objects (H<22.4) [6] to the population. The community and the various organizations that support near-Earth object studies (such as the NASA Planetary Defense Coordination Office) should assess the future needs and goals. If we want to continue characterization at a pace in line with the future discovery pace, then we need to support survey programs and the necessary telescopic assets. To execute a characterization program of such a large scale, the community needs programmatic organization in excess of what is currently available today. There will be a much larger number of observations to coordinate and we would need to work to prevent excessive duplication of efforts. Additionally, we should have a series of priorities to guide the overall effort. Such a large program would also require a significant outlay of telescopic resources. We need to invest in instrumentation suited to the specific studies (e.g., wide field cameras, low resolution spectrometers) and obtain significant amounts of time on various telescopes with a wide variety of apertures.

Main Belt and Trojan Asteroids. The Main Belt and Trojan asteroid populations have the potential to teach us about the past and present of our Solar System. We understand the structure of the Main Belt, so we should turn our focus towards in depth characterization. As we learn more about the current dynamical evolution of the Main Belt, we can start to understand the structure and compositions of the past. By examining the range of compositions of the old families and the meteorites with the oldest cosmic ray exposure ages, we can start to understand how dynamic the compositions of the Main Belt have been. Understanding the compositions of the Trojan asteroids can be potentially change our understanding of early Solar System evolution so further studies of these objects are imperative. Any extensive mineralogical studies will need to leverage the full wavelength range of spectroscopic studies. These studies will require a comprehensive set of complementary laboratory studies. Otherwise, we will not be able to fully leverage the new observations.

Conclusion. We will explore the necessary coordination and analytical tools to optimize our scientific investigations. As a community, asteroid researchers should work together to define our future priorities.

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