

New Opportunities for Studying Planetary Returned Samples at Brookhaven National Laboratory

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A wide variety of synchrotron studies have proven invaluable in the study of extraterrestrial planetary materials, including meteorites, lunar samples, comets, asteroids, solar wind and interplanetary dust. Over the next two decades, new opportunities and new challenges are expected including plans to have samples returned from two asteroids (Hyabusa-2, OSIRIS-REx) and from both the surface (NASA's MSR campaign) and upper atmosphere (SCIM) of Mars. Samples returned from the surface of Mars, holding the potential for containing extant and/or extinct life, present great analytical challenges but also unique opportunities for the analytical capabilities of BNL. Such samples will be returned in sealed metal sleeves and sample interrogation while still inside the sleeves will be a crucial requirement of preliminary examination. As a Category V (Restricted Earth Return) mission, planetary protection requirements further demand that such samples be contained within combined Biosafety Level (BSL) 4 and Class 100 laboratory conditions and non-destructive analytical methods that can be applied remotely, such as with an extended NSLS-II beam line, will be of considerable advantage.