The Apollo Sample Suite: 50 Years of Solar System Insight

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The Apollo program was undoubtable a crowning achievement in human history. In addition to the obvious cultural significance, scientific results from the Apollo program had a lasting impression on a range of scientific fields, none more so that the effect the samples had on the fields of geology and cosmochemistry. The six Apollo missions collected 382 kg of rock, regolith, and core samples from geologically diverse locations on the Moon. In the nearly 50 years since the first samples were returned, there have been over 3000 different requests for samples, each yielding insights into fields as disparate as biology, medicine, astronomy, engineering, material science, and of course geology. Early studies of the Apollo samples revealed primary insights into the origin and evolution of the Moon, and of the Earth-Moon system, but the results also had implications for bodies throughout the solar system, e.g., defining crater counting rates. Over the decades, continued study of the Apollo samples by new generations of scientists using new instruments have continued to yield significant new discoveries, including the presence of endogenous water in the Moon and the possible presence of a lunar cataclysm, that in turn has contributed to new models of solar system formation and evolution. The Apollo samples have often been used as a proxy for studying other bodies like Mercury or asteroids. The Apollo samples have also directly contributed to the interpretation of remotely sensed data sets, including their use as ground truth for both Clementine and Lunar Prospector global geochemical maps. Despite the Apollo samples being a static collection, recent efforts will ensure that investigators continue to have access to new samples. For example, there was a recent solicitation for study of previously unopened Apollo samples in vacuum-sealed containers, as well as new access to samples stored frozen or in a He atmosphere. Similarly, the use of X-ray computed tomography as part of the curation process is identifying new clasts within polymict breccias that are available for study. Finally, the MoonDB project is putting all previously published lunar geochemical analyses into a searchable database, which should facilitate new investigations.