

International Workshop on the Leading-edge Research Base

“Frontiers in Life & Earth, Planetary Sciences”

“IDPs and Stardust”

S. Messenger, Robert M Walker Laboratory for Space Science, Astromaterials Research and Exploration Science Directorate, NASA Johnson Space Center, Houston TX, 77058

Interplanetary dust particles (IDPs) collected in the Earth’s stratosphere and NASA Stardust mission samples constitute direct samples of diverse cometary bodies. These materials are among the least altered remnants of the original building blocks of the Solar System. Both cometary materials and primitive meteorites contain a broad diversity of organic compounds that appear to have formed in a range of environments, including the presolar cold molecular cloud, the solar nebula, asteroids and comet nuclei. Isotopic anomalies in H, C, and N are commonly observed in meteoritic organic matter, reflecting chemical processes at extremely low temperatures. These isotopic anomalies are also very heterogeneous on micrometer and even smaller spatial scales, suggesting that some presolar organic grains have survived the formation of the Solar System. Most recently, coordinated transmission electron microscopy and isotopic imaging studies have shown that isotopically anomalous organic globules having rounded and often hollow structures are abundant and widespread amongst the most primitive components of meteoritic materials. These studies suggest that such organic grains were among the most important primary building blocks of the Solar System.