PRELIMINARY SAMPLE ANALYSIS PLAN FOR THE COMETARY AND INTERSTELLAR SAMPLES BEING RETURNED BY THE STARDUST SPACECRAFT. M. Zolensky[1], S. Sandford[2], F. Hörz[1], D. Brownlee[3], P. Tsou[4], B. Clark[4], [1]ST, NASA Johnson Space Center, Houston, TX 77058, USA (michael.e.zolensky@nasa.gov); [2]NASA-Ames, Moffett Field, CA, USA; [3]Astronomy Dept., U. Washington, Seattle, WA, USA; [4]Jet Propulsion laboratory, Pasadena, CA, USA; [5]Lockheed Martin Astronautics, Denver, CO, USA.

Introduction: The NASA Stardust comet sample return mission is proceeding very well, and the science team breathed a collective sigh of relief following the successful comet sample collection phase which occurred during a 6.1 km/s, 340km-close flyby of comet Wild-2 on Jan 2 of this year. Multiple images of the comet nucleus were obtained and a variety of onboard instruments returned *in situ* data on the spatial distribution, particle size frequency and composition of the dust in the comet's coma. These data are currently being processed and analyzed. It is expected that 500-1000 comet particles >15µm were collected by impact into low density silica aerogel, as well as many more smaller grains. Previous tests with hypervelocity guns firing small particles into aerogel indicate that material should have successfully been collected by the Stardust aerogel [1&2]. In addition, many (~100) grains of interstellar material newly entering the Solar System should have been collected by the spacecraft during its cruise phase to the comet. The interstellar collection occurred into an aerogel tray that was located back-to-back with the comet collector tray. All of these samples will return to Earth on January 15, 2006 via parachute recovery of the sample return capsule (SRC) at the Utah Test and Training Range (UTTR). These samples will be immediately returned to a new dedicated class 100 curation laboratory at NASA's Johnson Space Center curatorial facility. This new laboratory, The Stardust Laboratory, will be constructed during 2004, and thus be completed 1 year prior to sample return. Following a ~6 month period of examination by a Preliminary Examination Team (PET) the samples will be made generally available to researchers by an allocation system modeled after NASA lunar sample and cosmic dust programs. The goal of the preliminary examination will be to: (A) provide an initial scientific assessment of the samples, and (B) generate information needed for informed sample requests and optimum utilization of the precious samples.

Preliminary Examination Team Plan: Given the exceptional value of these returned samples, and obvious desire for release of exciting results to the planetary science community and general public at large, we are planning on running the preliminary examination in an accelerated, and hopefully exciting manner. The structure of the preliminary examination plan is in the final stages of being defined. In order to optimize the examination process, we propose to involve a broad cross-section of the extraterrestrial sample community to participate in the preliminary examination phase.

The PET will be organized around a set of PET sub-teams, each focused on different analytical techniques and scientific issues. These sub-teams include efforts focused on isotopes, mineralogy-petrology, small impact features, organics, optical properties, and bulk composition. Since there is frequently considerable overlap in terms of analytical techniques and the scientific issues they can address, it is expected that the various sub-teams will work very interactively, both within the sub-teams and between the sub-teams.

Sub-teams will receive a limited number of samples, generally prepared to be ready for business-as-usual analysis by existing state-of-the art techniques. Investigators will mainly receive microtome slices or the equivalents of "potted butts" and normally they would not have to deal with aerogel extraction processes. The analyses to be performed will be coordinated and phased to make maximum advantage of the samples.

Although we expect that the six-month period of PET will focus on the cometary samples, we will make a preliminary assessment of the interstellar grains. However, as they should be much smaller and sparser than the cometary grains, we expect that complete

extraction and analysis for these grains may be beyond the scope of planned PET effort. We will just have to wait and see what we can immediately do with these critical samples. At the very least, the PET will provide a preliminary assessment of the number and relative size of any captured interstellar grains.

Since the Science Team for Stardust has been small, and till now focused on the critical step of actually *obtaining* the samples, we clearly feel the need to expand the team during the preliminary examination phase. It is our intention to add ~three new Science Team members in the current months; this activity requires the approval of NASA. Thus at this point we can identify the following PET sub-team leaders:

Organics – Scott Sandford
Small Impact Features – Fred Hörz
Mineralogy-Petrology – Mike Zolensky
Isotopes – to be named later
Optical Properties – to be named later
Bulk Composition – to be named later

As Principal Investigator and Deputy PI, respectively, Don Brownlee and Peter Tsou will oversee the PET and aerogel documentation process. The various sub-teams will then be populated by qualified volunteers from the planetary materials community at large.

It should be stressed that the goal of the PET sub-teams is **not** to produce a comprehensive scientific understanding of cometary materials. Rather it is to validate the scientific value of the returned samples and provide the basic scientific baseline needed to ensure that subsequent peer-reviewed allocations of this precious material are made in an informed fashion. The PET sub-teams will focus on a few basic problems such as comparison of the comet samples with known extraterrestrial material types and estimation of the ratio of pre-solar to nebular solids in Wild 2. The PET sub-teams must work quickly and will be required to publish the preliminary investigations with all group members as co-authors. It is anticipated that some PET members would apply for funding from the NASA Participating Scientist Program, and that such participants would participate in project responsibility for organization and coordination of sub-group activities. We encourage interested and qualified scientists to consider how they might participate in the analysis of the returned samples, either through active participation in the preliminary examination process. We would hope that these PET "volunteers" would be able to apply to other programs for funds to permit their active involvement in the PET process. We especially encourage non-US workers to participate. We encourage all interested persons to contact the members of the Stardust Science Team for more information on participating in the PET process. We also encourage interested workers to read up on the literature on particle extraction from aerogel [2-5].

After the preliminary examination period samples will be open to general allocation to interested researchers, including PET members, through a peer-review process which will be organized by the Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM).

Samples Available Now: To help workers prepare for analysis of Stardust samples, the JSC curation facility has obtained the following critical materials: (1) several hundred flight-spare aerogel pieces, (2) flight space aerogel trays, loaded with aerogel, (3) witness plates exposed during all phases of spacecraft fabrication, construction, testing and bakeout, (4) samples of critical spacecraft materials, and (5) samples of fluids used to clean the spacecraft. All of these materials are available to interested workers through the Stardust Curator (Mike Zolensky). In addition, Dr. Fred Hörz has samples of silica aerogel used to capture particles in the lab as well as on orbit on the Mir Station. These samples can be obtained from Dr. Hörz.

References: [1] Horz et al. (2000) *Icarus* **147**, 559-579, [2] Barrett et al. (1992) *Proc. 19th Lunar Planet. Sci. Conf.*, 203-212, [3] Snead et al (2003) *Lunar Planet. Sci. XXXIV*, [4] Westphal et al. (2003) *Lunar .Planet. Sci. XXXIV*, [5] Westphal et al. (2002) *MAPS* **37**, 855-866.