

Stardust Allocation Subcommittee report

CAPTEM Nov 9, 2016

Andrew Westphal, Berkeley, Chair

Andy Davis, Chicago

Philipp Heck, Field Museum

Scott Sandford, NASA/ARC

George Flynn, SUNY Plattsburgh

Rhonda Stroud, Naval Research Lab

Requests and allocations summary

Future of Stardust Research white paper

Request summary through 9 Nov16

#170 Westphal+ *6 interstellar candidates in picokeystones for STXM analysis*

#171 Ebel+ *SXRF and Raman analysis of cometary track*

#172 Frank+ *Cometary tracks for O isotopes*

Compendium maintained on a shared Papers collection

148 refereed publications

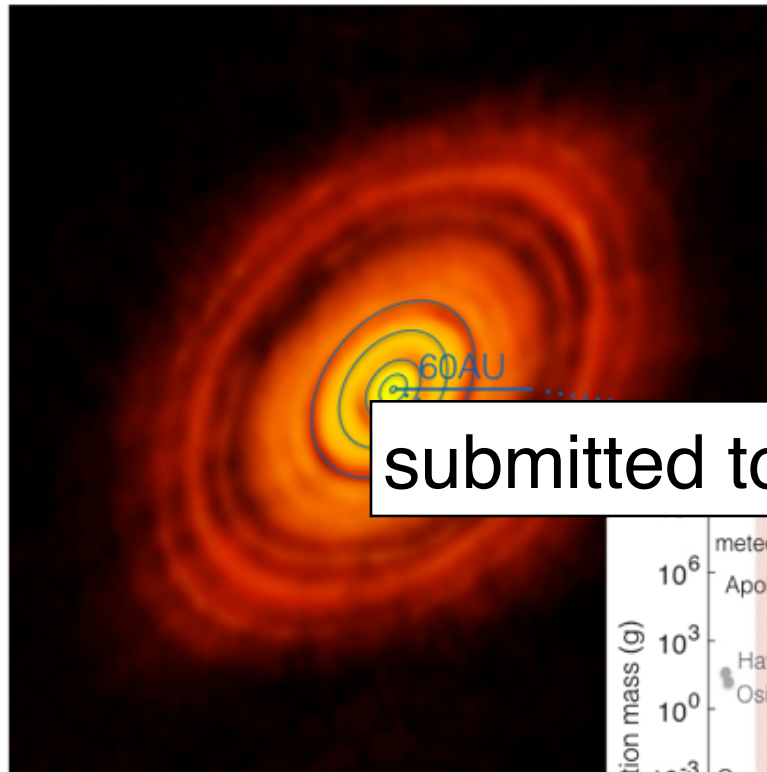
• 	Ryan C Ogliore et al.	Oxygen isotopic comp...	Geochimica et...	2015
• 	Frans J M Rietmeijer	The smallest comet 81...	Meteorit Planet...	2015 *
• 	Zack Gainsforth et al.	Constraints on the for...	Meteorit Planet...	2015
• 	Gerardo Dominguez et al.	Nanoscale infrared sp...	Nature Commu...	2014
• 	David R Frank et al.	Olivine in terminal par...	Geochimica et...	2014
• 	Frank E Brenker et al.	Stardust Interstellar P...	Meteorit Planet...	2014
• 	Anna L Butterworth et al.	Stardust Interstellar P...	Meteorit Planet...	2014
• 	George J Flynn et al.	Stardust Interstellar P...	Meteorit Planet...	2014
• 	F Postberg et al.	Stardust Interstellar P...	Meteorit Planet...	2014
• 	Alexandre S Simionovici et al.	Stardust Interstellar P...	Meteorit Planet...	2014
• 	Veerle J Sterken et al.	Stardust Interstellar P...	Meteorit Planet...	2014
• 	Andrew J Westphal et al.	Final reports of the St...	Meteorit Planet...	2014
• 	Andrew J Westphal et al.	Stardust Interstellar P...	Meteorit Planet...	2014
• 	Andrew J Westphal et al.	Evidence for interstell...	Science	2014
• 	Don Brownlee	The Stardust Mission:...	Annual Review...	2014
• 	A Rotundi et al.	Two refractory Wild 2...	Meteorit Planet...	2014
• 	Julien Stodolna et al.	Characterization of pr...	Earth and Plan...	2014
• 	Julien Stodolna et al.	Iron valence state of fi...	Geochimica et...	2013
• 	N F Foster et al.	Identification by Rama...	Geochimica et...	2013
• 	Hugues Leroux and Damien Jacob	Fine-grained material...	Meteorit Planet...	2013
• 	G Matrajt et al.	The Origin of the 3.4 μ ...	The Astrophysi...	2013
• 	Christine Floss et al.	The Abundance of Pre...	The Astrophysi...	2013
• 	Hans A Bechtel et al.	Stardust Interstellar P...	Meteorit Planet...	2013
• 	Z Gainsforth et al.	Stardust Interstellar P...	Meteorit Planet...	2013
• 	Zack Gainsforth et al.	Stardust Interstellar P...	Meteorit Planet...	2013
• 	Rhonda M Stroud et al.	Stardust Interstellar P...	Meteorit Planet...	2013
• 	Daisuke Nakashima et al.	Oxygen isotopes in cr...	Earth and Plan...	2012
• 	Hans A Bechtel et al.	Surface modifications...	Meteorit Planet...	2012

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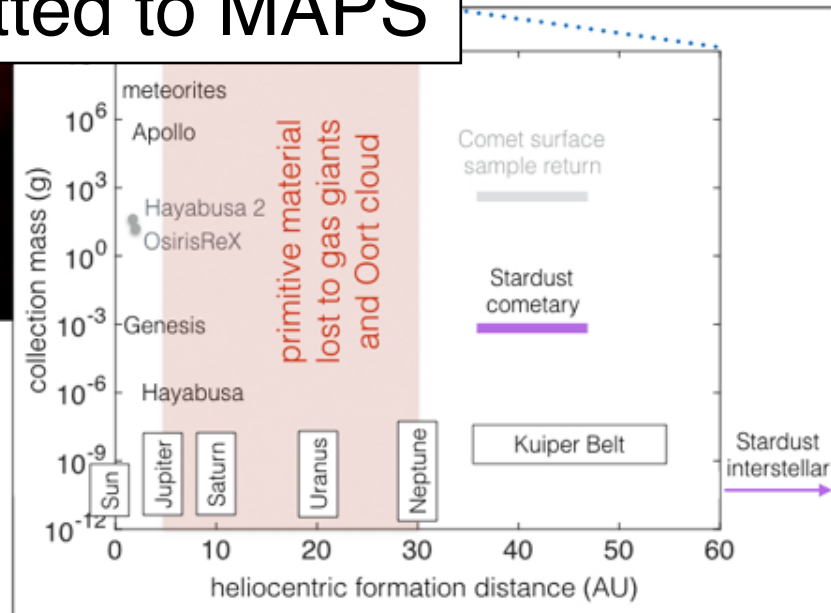
The Future of Stardust Science
A Special Report to NASA
Feb 29, 2016

A. J. Westphal¹, J. C. Bridges², D. E. Brownlee³, A. L. Butterworth¹, B. T. De Gregorio⁴, G. Dominguez⁵, Z. Gainsforth¹, G. J. Flynn⁶, H. A. Ishii⁷, D. Joswiak³, L. R. Nittler⁸, R. C. Ogliore⁹, R. O. Pepin¹⁰, R. Palma¹⁰, T. Stephan¹¹, M. E. Zolensky¹²



Comets are undersampled with respect to asteroids by $\sim 10^{13}$.

submitted to MAPS



crowd-sourced impact identification in Stardust Interstellar foil collectors

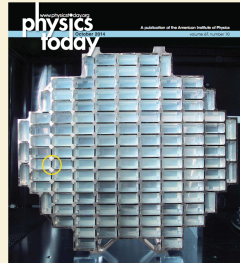
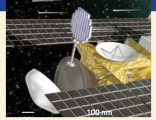
IDENTIFICATION OF CANDIDATE INTERSTELLAR DUST IMPACT FEATURES ON STARDUST FOIL I1020W,1

R. M. Stroud¹, B. T. De Gregorio¹, N. D. Bassim¹, A. J. Westphal², A. L. Butterworth², R. Lettieri², W. Marchant², D. Zevin², 90 stardust@home "dusters"³

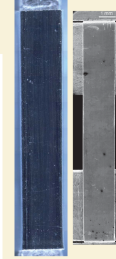
¹Naval Research Laboratory, Code 6366, 4555 Overlook Ave. SW, Washington, DC 20375, USA

²Space Sciences Laboratory, University of California at Berkeley, Berkeley, CA 94720, USA

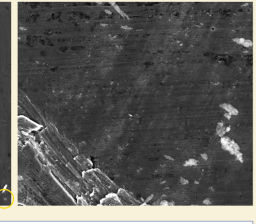
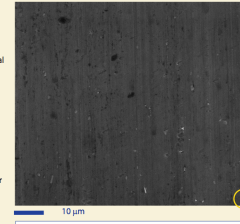
³worldwide



Tray schematic showing locations of foils mapped during preliminary examination (green) and newly mapped I1020W (cyan). Approximate locations of identified impact features are shown (red).



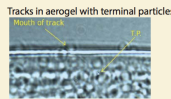
(far left) Level II optical documentation image of Foil I1020W on tray
(near left) SEM image of foil I1020W,1 mounted on archival stretcher. The foil is ~2 mm * 10 mm.
Side view of example stretcher



The Stardust Interstellar Dust Collector provides a unique sample set of captured contemporary interstellar dust for direct laboratory analysis. At the conclusion of Interstellar Preliminary Examination (IPE) in 2014, 3 particles captured in aerogel and 4 impact craters in the Al foils of probable interstellar origin were reported (Westphal et al. Science 2014) and accompanying papers in Meteoritics and Planetary Sci.). Approximately 3% of the available foil surface was analyzed during IPE, leaving the possibility of locating additional candidate interstellar dust impacts. The search for such features by multiple groups is ongoing, e.g., (Floss, 2015). We report here on the identification of new impact features on Foil I1020W,1.

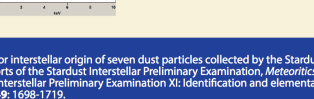
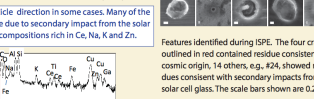
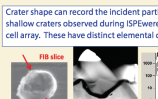
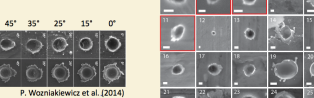
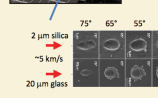
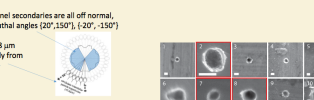
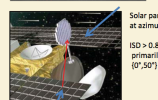
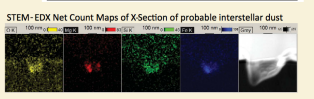
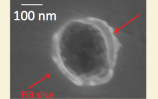
Foils are cut from the tray and mounted on stretchers to enable automated SEM imaging. SEM imaging is first performed at low magnification (here, 31.3 nm / px, at 5 mm working distance, 10 kV) to obtain a map of the entire foil. 7,026 individual 1768px x 2048px secondary electron images of I1020W,1 were recorded.

Finding the candidate impact features requires searching through thousands of images per foil. During IPE, a combination of manual visual inspection and computer algorithm searching were used to locate candidates. For the tracks in aerogel, an alternate approach of recruiting citizen scientists to participate in the search through an online virtual microscope (Stardust@home) was developed. Based on the success of the Stardust@home program, we've chosen to develop an extension of that effort for foil searching. Details of the Fols@home project are described on the companion poster presented at this meeting by Westphal et al.



Particle ID	Material	Composition	Structure	Location
SI001 (SI001/1020W,1)	Al	Aluminum (Al)	Single particle	~100
SI002 (SI002/1020W,1)	Al	Aluminum (Al)	Single particle	~100
SI003 (SI003/1020W,1)	Al	Aluminum (Al)	Single particle	~100
SI004 (SI004/1020W,1)	Al	Aluminum (Al)	Single particle	~100
SI005 (SI005/1020W,1)	Al	Aluminum (Al)	Single particle	~100
SI006 (SI006/1020W,1)	Al	Aluminum (Al)	Single particle	~100
SI007 (SI007/1020W,1)	Al	Aluminum (Al)	Single particle	~100
SI008 (SI008/1020W,1)	Al	Aluminum (Al)	Single particle	~100
SI009 (SI009/1020W,1)	Al	Aluminum (Al)	Single particle	~100
SI010 (SI010/1020W,1)	Al	Aluminum (Al)	Single particle	~100

Impact craters with residue in Al foil



References:

- Westphal et al. (2014) Evidence for interstellar origin of seven dust particles collected by the Stardust spacecraft. *Science* **345**: 786-791.
- Westphal et al. (2014) Final reports of the Stardust Interstellar Preliminary Examination. *Meteoritics & Planetary Science* **49**: 1720-1733.
- R. M. Stroud et al. (2014) Stardust Interstellar Preliminary Examination XI: Identification and elemental analysis of impact craters on Al foils from the Stardust Interstellar Dust Collector. *Meteoritics & Planetary Science* **49**: 1698-1719.
- Wozniakiewicz et al. (2014) Micro-scale hypervelocity impact craters: Dependence of crater ellipticity and rim morphology on impact trajectory, projectile size, velocity, and shape. *Meteoritics & Planetary Science* **49**: 1929-1927.
- Floss (2015) Identification of Impact Craters in Aluminum Foil from the Stardust Interstellar Dust Collector: An Update, *46th LPSC*, Abstract #1005.

Acknowledgements: This work was supported in part by the NASA LARS program and the NASA Institute for Nanoscale Science.



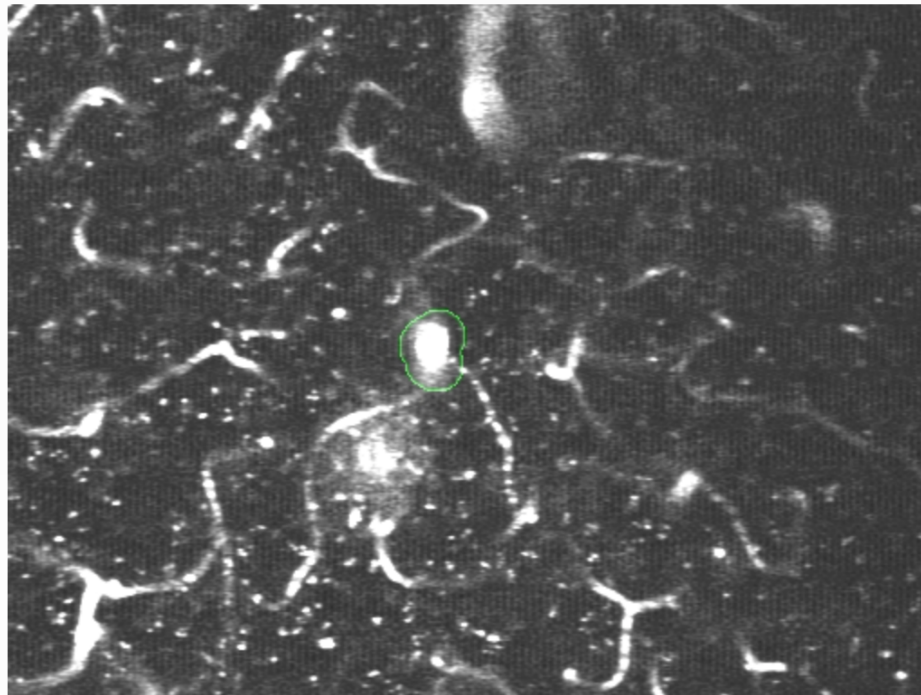
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Layer number:21

☒ Show feedback **Score: 0**



Flowing

Play a Game, Speed up
Alzheimer's Research

Start here

CAPTEM Informatics Subcommittee

Current membership:

Andrew Westphal, Chair, Stardust Rep (Berkeley)

Tim McCoy (Natural History Museum)

Denton Ebel (American Museum of Natural History)

Conel Alexander (CIW), Meteorites rep

Dave Joswiak (UW), Hayabusa Rep

Larry Nittler (CIW), Cosmic Dust Rep

Jeff Taylor (Hawai'i), Lunar Rep

Dimitri Papanastassiou (Caltech), Genesis Rep

Recommendation for future of Informatics committee.

Charter:

The primary responsibilities of the Informatics Subcommittee of CAPTEM are:

- To develop a prioritized, long-term vision for capabilities of the external interface for JSC curation, in consultation with the PI community and JSC Curation.*
- To support development of a strategic plan for Informatics, which may include different funding scenarios.*
- To represent the PI community in the development of external requirements for the JSC databases and catalogs.*
- **To provide ongoing, periodic assessments of external aspects of JSC databases and catalogs.***
- To provide findings to JSC Curation on the capability and sustainability of current informatics technology as applied to collections.*

We propose to focus on the last three items on the charter in the next two years, in particular on Bullet 4. In this sense, the IC will play a role similar to the CAPTEM Facilities Committee.

Recommendation for future of Informatics committee.

Recruit one representative for each collection (Lunar, Meteorite, CD, Stardust, Genesis, Hayabusa, RSH) to the IC. This might be a past or current Committee member or Chair, or another experienced person from the community. Thus there will be 7 committee members (up from the current three).

For each collection, the responsible member will develop an assessment procedure for the online catalog, in collaboration with the Curator. An example of such a procedure might be:

- obtain a list of samples from the Curator in a spreadsheet
- randomly select a small number (<10) samples from the comprehensive list
- assess the catalog entries for the samples against a checklist of desired information and capability (e.g., discoverability, photodocumentation, allocation history, classification, basic mineralogy, etc.)

Because each collection has unique characteristics, each assessment procedure will be different, and will be compatible with community expectations of the catalog. The assessment procedures will be discussed, approved and documented by the committee, and presented to CAPTEM.

The IC members will carry out this assessment semi-annually, and will report the results at each CAPTEM meeting.

Catalog assessments

Complete document anticipated soon, draft available.

Concentrating on functionality and content, not yet on assessment of data quality and completeness.