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Revision A

Genesis Research Sample Investigator's Guidebook

Astromaterials Acquisition and Curation Office/KT

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1. PURPOSE OF THIS GUIDEBOOK

The Genesis Research Sample Investigator's Guidebook is a reference source for Genesis sample investigators and prospective investigators with descriptions of specific procedures for requesting research samples and requirements for care of any samples allocated. Much of this guidebook addresses documentation. Where practical, electronic documentation or facsimiles are acceptable, and in many cases preferred for increased efficiency. However, signed paper copies are required for Loan Agreements., These files are maintained by the Genesis Curator.

2. OVERVIEW OF THE GENESIS SOLAR WIND SAMPLE COLLECTION

NASA's Genesis mission (August 2001 – September 2004) carried 301 polished collection surfaces comprised of materials listed in Table 1. These were arranged on arrays exposed to specific solar wind regimes. Due to the unplanned hard landing, the polished collectors were dislodged from their array frames and broken into more than 10,000 fragments. The fragment thicknesses are characteristic of the solar wind regime collected: bulk solar wind in 700 μm, transient solar wind associated with coronal mass ejections in 650 μm, high-speed solar wind from coronal holes in 600 μm, and low-speed interstream solar wind in 550 μm thick collectors.

Table 1 Array Collector Materials List

Material	Description
FZ Si	<100> single crystal silicon made by the Float Zone method
CZ Si	<100> single crystal silicon made by the Czochralski (crystal pulling) method
SOS	Epitaxially-grown single crystal silicon on single crystal sapphire
AlOS	Vapor deposited aluminum (about 250 nm thick) on single crystal sapphire
AuOS	Vapor deposited gold (about 250 nm thick) on single crystal sapphire
Sapphire	Single crystal sapphire
Diamond	Amorphous diamond like carbon (about 3 microns thick) on silicon
Ge	Single crystal germanium (only mm-sized fragments survived)

The fragments have been contaminated with both particulates and molecular films. Limited cleaning of fragments is offered, and this capability is still under development. Characterization of the fragment condition with regard to fragment thickness, surface damage, particle distribution and film thickness is provided. Systematic characterization of the entire collection has been initiated, but is expected to take several years. An online catalog of available samples can be found at: http://curator.jsc.nasa.gov/gencatalog/catalog.cfm. Contact the Genesis Solar Wind Sample Curator for updated characterization and cleaning information.

In addition to the array collectors, several experiment-specific collectors were recovered. The "early science" materials, the gold foil and the polished aluminum sheet, were recovered intact, but damaged. The investigator-dedicated molybdenum-covered platinum foils were badly wrinkled. The bulk metallic glass was intact, but suffered surface impact damage. Three of the four ion concentrator targets were intact, and 80% of the fourth was recovered.

A comprehensive description of the pre-flight condition of the collectors can be found in Jurewicz A. J. G. *et al.* (2002) *Space Science Reviews*, **105**, 535-560. Progress on the characterization and cleaning development are posted on the internet at: http://curator.jsc.nasa.gov/genesis/index.cfm

3. ACCESS TO GENESIS SOLAR WIND SAMPLES

NASA policies define Genesis solar wind samples as a limited national and future heritage resource. These polices require that samples be released only for approved applications in research, education, and public display. To meet that responsibility, NASA carefully screens all sample requests. The review process is delegated to the Genesis Allocation Subcommittee of the Curation Analysis and Planning Team for Extraterrestrial Materials (CAPTEM) and the Genesis Solar Wind Sample Curator. Subcommittee allocation approval and concurrence by the Director of the Solar System Division at NASA Headquarters allows the Genesis curator to prepare and send samples. This document does not address samples for educational activities and public display.

4. SUBMITTING SAMPLE REQUESTS

Sample requests should be submitted directly to the Genesis Solar Wind Sample Curator at the following address:

Judith H. Allton
Genesis Solar Wind Sample Curator
Mail Code KT
Johnson Space Center
2101 NASA Parkway
Houston , TX 77058

281-483-5766 voice
281-483-5347 fax
judith.h.allton@nasa.gov

Receipt of requests will be confirmed by the curator. Requests determined to be sufficiently mature to warrant consideration for use of Genesis materials will be forwarded to Genesis Allocation Subcommittee of CAPTEM by the Genesis Curator. Electronic submissions will expedite the allocation review process. The basic request should be no more than 10 pages (single spaced). There is no limit on the amount of attached documentation. The Subcommittee will process applications on an ongoing basis, as received. The Allocation Subcommittee may set up a teleconference with the applicant to discuss requests. All individuals requesting a Genesis solar wind sample must follow the appropriate requirements and guidelines in sections 4.1 and 4.2 below.

4.1 COLLECTOR ARRAY RESEARCH SAMPLES

The allocation request must provide documentation on the following topics:

4.1.1 A specific statement of science objectives and a description of the analyses to be made. A proposed level of sensitivity, precision and accuracy should be given based on the science objective(s). General precision/accuracy goals, as published in past mission documents, are given in Appendix A. If these goals can be

exceeded, there is no issue, but the Committee also recognizes that there may be cases where a lesser degree of precision might be scientifically justified. This is especially true in the initial round of analyses. Such a justification must be included in the submitted request.

4.1.2 The overall sensitivity, precision and accuracy of analytical techniques. These should be demonstrated on standards and other materials. A description must be provided of analytical blanks, background effects and how sample handing procedures will minimize contamination and interferences.

4.1.3 A plan for surface cleaning. The Project and the Curatorial Facility are committed to providing samples with clean surfaces. However, as cleanliness requirements will vary with the analysis proposed, surface cleanliness requirements and a plan for meeting these must be included with allocation requests. A simple type of cleaning plan would be a method to prove that the Curatorial Facility has cleaned the sample well enough to meet requirements. An alternative is for applicants to propose to receive samples dirty and do their own cleaning. In this case, cleaning tests must be documented to demonstrate that cleanliness requirements can be met.

4.1.4 The solar wind regime, collector material type, size and shape required. A catalog with images of available pieces is online. Samples may be requested by sample number from the catalog or in general terms: *e.g.*, X cm^2 of material Y from solar wind regime Z. A typical allocation is of existing fragments that meet size and shape requirements. However, subdivision of larger pieces can be done, by backside laser scribing/cleaving, manual cleaving or other techniques.

4.1.5 A sample shipping plan. Investigator-designed shipping containers are encouraged. The design of these should be worked out in advance with the Curatorial Facility staff and the plans included with the allocation request. Contact the Genesis curator for a list of shipping containers available from the Curatorial Facility.

4.2 CONCENTRATOR TARGET RESEARCH SAMPLES

Concentrator targets were specifically designed to enable analyses for oxygen and nitrogen. Calibration of the ion focusing is completed. The total area comprised by the targets is about 25 cm^2; therefore, allocations of material will be very carefully considered.

In similar manner for the array collector samples, requests for concentrator target materials will require: a) a statement of science objectives, b) overall sensitivity, precision and accuracy of analytical techniques, c) a plan for surface cleaning (if needed), d) material type (SiC, 13-C Vapor-Deposited diamond, amorphous diamond-like-carbon on silicon), size and shape, and e) a shipping plan. Subdivision of concentrator targets by laser scribing/cleaving is under development. Check with the Genesis sample curator for the status of target calibration and specimen subdivision by laser scribing/cleaving.

5 LOAN AGREEMENTS AND USER AGREEMENTS

Definitions:

Principal Investigator – the person to whom responsibility for security and accountability for the Genesis solar wind sample is assigned. Usually this is the person who submitted the request for samples. This person signs the **Loan Agreement** and signs the Genesis Sample Assignment form when samples are received.

Sample Collaborator – a person working with the Principal Investigator who may have temporary custody of the sample for analytical purposes. This person signs the **User Agreement**.

After the Genesis Allocation Committee endorsement and concurrence by the Director of Solar System Division at NASA Headquarters, the Genesis Solar Wind Sample Curator will prepare a **Loan Agreement** for the Principal Investigator. The agreement delineates the responsibilities of the new investigator, including security and accountability procedures required to minimize prospects for theft or unauthorized use of Genesis samples (example Loan Agreement is shown in Appendix B). Upon return receipt of the properly executed loan agreement, the Genesis Solar Wind Sample Curator prepares the authorized samples and sends them to the investigator.

The term of the Loan Agreement is 5 years from date of last signature, and the agreement covers all samples issued during this term. Each individual sample issued has a loan period of 5 years from date of issue, unless otherwise stated on the the Sample Assignment Form for that sample. The Sample Assignment Form also indicates if permission is given for destructive analysis.

The Principal Investigator signing the Loan Agreement is the accountable person responsible for the security and tracking of the specimens assigned to him or her. Because Genesis samples often require collaborative analyses at different locations, the accountable Principal Investigator may send samples to qualified collaborators for short periods. However, the accountable Principal Investigator is still responsible for the samples. The collaborator receiving samples becomes a qualified Sample Collaborator by signing, and having on file with the Genesis Curator prior to receipt of samples, a **User Agreement** (example User Agreement is shown in Appendix B). User Agreements detail the sample handling, storage and transfer protocols required to protect the Genesis solar wind samples from theft or loss. A signed facsimile on file with the curator is adequate. The accountable Principal Investigator shall not send Genesis solar wind samples to anyone not having a signed User Agreement on file with the Genesis Curator.

6 CONTINUATION AS A GENESIS SOLAR WIND SAMPLE PRINCIPAL INVESTIGATOR

Any Principal Investigator or Sample Collaborator's privilege for retention and use of Genesis solar wind samples is contingent upon fulfilling the following obligations: (1) maintenance of, and adherence to, the Genesis Sample Loan Agreement or User Agreement; (2) timely

cooperation with annual Genesis solar wind sample inventory; (3) timely cooperation with sample recalls, and d) continued need for retention of samples for planned, timely experiments.

7 GENESIS SAMPLE ACCOUNTABILITY AND SECURITY

Genesis solar wind samples are the property of the United States Government, and it is NASA's policy that Genesis solar wind sample materials will be used only for authorized purposes. It is therefore essential that rigorous accountability and security procedures be followed by all persons who have access to Genesis solar wind materials.

7.1 GENESIS SAMPLE SECURITY

A Genesis research Principal Investigator is responsible for the control and safeguarding of all Genesis solar wind samples consigned to his/her custody. Keeping Genesis samples under supervision or control of the Investigator and/or their designee is required. When not in use, the samples must be locked in a safe or secure storage cabinet equipped with a combination padlock, or, if controlled environment is required, in a locked laboratory. Combination to the storage safe or cabinet will be under the exclusive control of the Investigator and/or his/her designee. During use the samples must remain under the control of the Investigator. At the end of each use an inventory shall be made to insure the accountability of the samples. Such inventories shall be maintained as a permanent record and shall be made accessible to NASA at all reasonable times. Requirements for supervision of samples during transit are given in section 8 below. In no case may the Genesis solar wind samples be stored with money, precious stones or minerals, classified material, or any other item that is considered to be of high theft potential. In the event a sample is missing, lost, or cannot be accounted for, the Investigator must immediately report it to the Genesis Sample Curator.

7.2 GENESIS SOLAR WIND SAMPLE ACCOUNTABILITY

Genesis solar wind Principal Investigators are expected to maintain complete records of the use of Genesis solar wind samples in their possession. The samples become the Principal Investigator's responsibility when he or she accepts delivery of the samples from NASA, and that responsibility ends only when (1) the samples have been returned to NASA in the manner authorized, and (2) all sample material has been accounted for. The following sections specify requirements of sample accountability which must be met by a Genesis solar wind Principal Investigator.

7.2.1 Use of Electronic Documents

Electronic documents may be used to increase efficiency under these conditions: a) verification of sample transfers by electronic media shall be from Investigators using institutional computer accounts secured with password protection under the exclusive control of the Investigator, b) facsimile copies must be signed and be comparable to a signature on record with the Curator (for example, the Loan Agreement). The Curator will print paper copies of transfer documents and other documents for inclusion in the Curator's permanent record for Principal Investigators. Paper documents are required for the Loan Agreements.

7.2.2 Documentation of Sample Transfers Between Curator and Investigator

All sample transfers between the Genesis Curator and Principal Investigators must be documented. By signing the transfer document, the recipient Principal Investigator becomes accountable for the sample. An Investigator may delegate authority to another person to receive samples in his/her name. Such a delegation of authority must be in writing and a copy must be on file with the Genesis Curator (e-mail to the Genesis Curator is acceptable and will be printed for file copy). A delegation of authority does not relieve the Principal Investigator of responsibility for samples received by his or her delegated alternate.

7.2.2.1 Samples transmitted by the Genesis Curator are accompanied by a *Genesis Sample Assignment* form, an example of which is shown as Appendix C. Upon receipt of samples, the form must be signed by the Principal Investigator and returned to the Genesis Sample Curator (signed facsimile is acceptable; however, the investigator assumes the responsibility of verifying that the form was received by the Genesis Curator).

7.2.2.2 Transfers of sample accountability are not permitted between or among investigators. Samples must be returned to the Genesis curator for re-issue.

7.2.3 Sample Return Documentation

All Genesis solar wind samples and residues remaining at the completion of experiments or investigations are to be returned to the Genesis Curator. Upon the receipt of the samples and sample accountability and history documentation from a Principal Investigator, the database will be updated and the Genesis Curator will issue a *Genesis Sample Return Receipt* (Appendix D) for research samples.

For each sample returned to the curator, a history of the sample handling by the Investigator shall be provided. This history shall include analytical or cleaning procedures applied to the sample and exposure to any environments or chemicals that alter the sample.

7.2.4 Investigator Responsibility for Internal Sample Transfers

Genesis specimen research often requires analytical capabilities of several institutions applied to an individual sample, requiring rapid transfer between investigators at different locations. The accountable Principal Investigator may send samples to a Sample Collaborator having a valid Loan Agreement or User Agreement on file with the Genesis curator for short periods (less than two months). The Principal Investigator who accepted responsibility for the sample, by signing the Sample Assignment Form, remains responsible for sample security and accountability activities of their Sample Collaborators until the samples are officially returned to the Curator.

8. GENESIS SOLAR WIND SAMPLE INVENTORY

Annually, the Genesis Curator will provide each Principal Investigator with a complete inventory listing of samples in the Investigator's possession for which the Investigator is

accountable. The Principal Investigator is expected to review and verify the listing of current sample holdings to ensure that all samples are appropriately listed. The residues from any samples consumed during analysis shall be returned to the Curator. The annual inventory must be personally supervised by the Principal Investigator and witnessed by a security official or other official of the investigator's institution. The verified inventory listing is to be promptly returned to the Genesis Curator. Appendix E is an example of an inventory listing.

Where samples are in the possession of a Sample Collaborator at the time of the annual inventory, the Principal Investigator may authorize (in writing, signed facsimile is adequate) the collaborator to conduct the inventory and account for those samples assigned to the Principal Investigator. The properly witnessed verification must be provided to the accountable Principal Investigator, who will transmit it to the Genesis Curator as part of his or her total inventory verification. In no case will the verification of sample inventory by any person other than a Principal Investigator or Sample Collaborator, having a valid User Agreement, be accepted by the Genesis Curator.

Definitions for CONSUMED and DESTROYED samples;

Genesis samples consist of solar atoms implanted into a flight hardware substrate. The numbered specimen is represented by the flight hardware substrate fragment, since atoms cannot be observed for accountability purposes. Consequently, all of the solar wind can be consumed, leaving the specimen of no scientific value for future solar wind analyses. Yet, an observable, identifiable fragment remains for accounting purposes.

CONSUMED – all or most of the solar wind has been used up, leaving the sample of no value for future analyses. The residue which remains must be returned to the curator.

DESTROYED – Nothing remains of the solar wind or the substrate. Nothing remains to be returned to the curator. An example of a destroyed sample is dissolution of silicon.

9. NUMBERING OF SAMPLES

Permanent numbers for samples are assigned by the Genesis Sample Curator's staff. Principal Investigators are required to identify all subsamples they create by a designated numbering system and account for them in their sample history. This numbering scheme must be explicitly written and available for inspection by NASA when security and inventory spot checks are conducted.

10. SAMPLE SHIPPING

Samples may be transferred by Federal Express or equivalent reliable courier service that provides online, real-time tracking of shipment. The advantage of using online, real-time tracking is that delivery of the sample package can be verified the day of delivery and a search immediately initiated, if needed. The process for shipping has three steps. First, the shipper (usually the Genesis curatorial staff) communicates with the recipient to verify that someone will be there to accept delivery on a certain day. Second, the shipper sends an e-mail announcing that the package has been sent for delivery on a certain date. This

message includes the tracking number and a reminder that the recipient should promptly acknowledge receipt of package. Third, if no response is received on delivery date from the recipient, the shipper will send an e-mail query asking for confirmation of delivery. A search shall begin immediately, if needed.

Fed Ex forms require a value of package contents. This value shall be recorded as "zero". To preclude inadvertent opening by mail room employees, place inside the box a prominent message "MAIL ROOM EMPLOYEES: THIS PACKAGE CONTAINS MATERIALS TO BE OPENED ONLY IN A CLEANROOM". Samples should be sealed in at least two layers of packaging so that exterior packaging can be removed prior to cleanroom entry.

Appendix A

Sensitivity and Precision Goals

Precision and Accuracy of Elemental and Isotopic Analyses:

Elemental Accuracy (2σ limits) = ±10% of the number of atoms of each element per cm^2 on the collector materials (see Table 2 below).

Isotopic Precision (2σ limits on the abundance ratios of the different isotopes of an element compared to a terrestrial reference standard)

C and N	±4 ‰
O and Ti	±1 ‰
Others	±10 ‰

A special effort will be made to measure the rare gas isotopes, and the abundant ones will be measured to much better than 10 ‰. However, it is recognized that 10 ‰ may not be achievable for ^{124}Xe, ^{126}Xe, and ^{78}Kr.

These goals remain the basic point of reference for the Subcommittee, but we recognize that Cosmochemical knowledge has evolved since these goals were written in 1996. For example, it is likely that measurements of the N and O isotopic compositions with lesser precision than given would answer major science questions. Consequently, the Subcommittee is open to allocation requests that define a level of precision consistent with meeting the proposed science objectives.

An acceptable alternative to meeting *elemental* accuracy goals, analogous to those given here, is to improve on present knowledge of spectroscopic photospheric abundances by at least a factor of 3. The Subcommittee adopts the error estimates of photospheric abundances as given by M. Asplund, N. Grevesse, and A. J. Sauval (2005) The solar chemical composition. In *Cosmic Abundances as Records of Stellar Evolution and Nucleosynthesis* (Eds. F. N. Bash and T. G. Barnes), ASP Conference Series, in press (astro-ph 0410214). Their Table 1 is given below.

Table 1. Element abundances in the present-day solar photosphere and in meteorites (CI chondrites). Indirect solar estimates are marked with [..]

	Elem.	Photosphere	Meteorites		Elem.	Photosphere	Meteorites
1	H	12.00	8.25 ± 0.05	44	Ru	1.84 ± 0.07	1.77 ± 0.08
2	He	[10.93 ± 0.01]	1.29	45	Rh	1.12 ± 0.12	1.07 ± 0.02
3	Li	1.05 ± 0.10	3.25 ± 0.06	46	Pd	1.69 ± 0.04	1.67 ± 0.02
4	Be	1.38 ± 0.09	1.38 ± 0.08	47	Ag	0.94 ± 0.24	1.20 ± 0.06
5	B	2.70 ± 0.20	2.75 ± 0.04	48	Cd	1.77 ± 0.11	1.71 ± 0.03
6	C	8.39 ± 0.05	7.40 ± 0.06	49	In	1.60 ± 0.20	0.80 ± 0.03
7	N	7.78 ± 0.06	6.25 ± 0.07	50	Sn	2.00 ± 0.30	2.08 ± 0.04
8	O	8.66 ± 0.05	8.39 ± 0.02	51	Sb	1.00 ± 0.30	1.03 ± 0.07
9	F	4.56 ± 0.30	4.43 ± 0.06	52	Te		2.19 ± 0.04
10	Ne	[7.84 ± 0.06]	-1.06	53	I		1.51 ± 0.12
11	Na	6.17 ± 0.04	6.27 ± 0.03	54	Xe	[2.27 ± 0.02]	-1.97
12	Mg	7.53 ± 0.09	7.53 ± 0.03	55	Cs		1.07 ± 0.03
13	Al	6.37 ± 0.06	6.43 ± 0.02	56	Ba	2.17 ± 0.07	2.16 ± 0.03
14	Si	7.51 ± 0.04	7.51 ± 0.02	57	La	1.13 ± 0.05	1.15 ± 0.06
15	P	5.36 ± 0.04	5.40 ± 0.04	58	Ce	1.58 ± 0.09	1.58 ± 0.02
16	S	7.14 ± 0.05	7.16 ± 0.04	59	Pr	0.71 ± 0.08	0.75 ± 0.03
17	Cl	5.50 ± 0.30	5.23 ± 0.06	60	Nd	1.45 ± 0.05	1.43 ± 0.03
18	Ar	[6.18 ± 0.08]	-0.45	62	Sm	1.01 ± 0.06	0.92 ± 0.04
19	K	5.08 ± 0.07	5.06 ± 0.05	63	Eu	0.52 ± 0.06	0.49 ± 0.04
20	Ca	6.31 ± 0.04	6.29 ± 0.03	64	Gd	1.12 ± 0.04	1.03 ± 0.02
21	Sc	3.05 ± 0.08	3.04 ± 0.04	65	Tb	0.28 ± 0.30	0.28 ± 0.03
22	Ti	4.90 ± 0.06	4.89 ± 0.03	66	Dy	1.14 ± 0.08	1.10 ± 0.04
23	V	4.00 ± 0.02	3.97 ± 0.03	67	Ho	0.51 ± 0.10	0.46 ± 0.02
24	Cr	5.64 ± 0.10	5.63 ± 0.05	68	Er	0.93 ± 0.06	0.92 ± 0.03
25	Mn	5.39 ± 0.03	5.47 ± 0.03	69	Tm	0.00 ± 0.15	0.08 ± 0.06
26	Fe	7.45 ± 0.05	7.45 ± 0.03	70	Yb	1.08 ± 0.15	0.91 ± 0.03
27	Co	4.92 ± 0.08	4.86 ± 0.03	71	Lu	0.06 ± 0.10	0.06 ± 0.06
28	Ni	6.23 ± 0.04	6.19 ± 0.03	72	Hf	0.88 ± 0.08	0.74 ± 0.04
29	Cu	4.21 ± 0.04	4.23 ± 0.06	73	Ta		-0.17 ± 0.03
30	Zn	4.60 ± 0.03	4.61 ± 0.04	74	W	1.11 ± 0.15	0.62 ± 0.03
31	Ga	2.88 ± 0.10	3.07 ± 0.06	75	Re		0.23 ± 0.04
32	Ge	3.58 ± 0.05	3.59 ± 0.05	76	Os	1.45 ± 0.10	1.34 ± 0.03
33	As		2.29 ± 0.05	77	Ir	1.38 ± 0.05	1.32 ± 0.03
34	Se		3.33 ± 0.04	78	Pt		1.64 ± 0.03
35	Br		2.56 ± 0.09	79	Au	1.01 ± 0.15	0.80 ± 0.06
36	Kr	[3.28 ± 0.08]	-2.27	80	Hg		1.13 ± 0.18
37	Rb	2.60 ± 0.15	2.33 ± 0.06	81	Tl	0.90 ± 0.20	0.78 ± 0.04
38	Sr	2.92 ± 0.05	2.88 ± 0.04	82	Pb	2.00 ± 0.06	2.02 ± 0.04
39	Y	2.21 ± 0.02	2.17 ± 0.04	83	Bi		0.65 ± 0.03
40	Zr	2.59 ± 0.04	2.57 ± 0.02	90	Th		0.06 ± 0.04
41	Nb	1.42 ± 0.06	1.39 ± 0.03	92	U	<-0.47	-0.52 ± 0.04
42	Mo	1.92 ± 0.05	1.96 ± 0.04				

There are two ways to measure *elemental* abundances: Absolute Fluence and Relative. The Absolute Fluence approach is to divide the number of atoms of the element measured by the area analyzed. The Relative approach eliminates the necessity to measure an analyzed area by measuring the abundance ratio of an element to some major element such as Mg, Si, Ca, or Fe. For the Relative approach, the relevant precision goal is the analytical error in the measured element ratio compared to the propagated error in the photospheric abundance ratio. Many analyses should be able to use both approaches.

Appendix A (con't). This table taken from Burnett D. S. *et al.* (2003) *Spa. Sci. Rev.*, 105: 509-534.

Table 2. Estimated Composition of Bulk Solar Wind (Note 1)

Z	Element	Solar system abundance (Note 2)	Solar wind flux ($cm^{-2}s^{-1}$)	2-yr. fluence (cm^{-2})	ppma (Note 3)	ppmw (Note 4)
3	Li	5.7E+01	1.7E+00	1.1E+08	2.2E-04	5.3E-05
4	Be	7.3E-01	2.2E-02	1.4E+06	2.8E-06	8.9E-07
5	B	2.1E+01	6.4E-01	4.0E+07	8.0E-05	3.1E-05
6	C	1.0E+07	1.0E+05	6.3E+12	1.3E+01	5.4E+00
7	N	3.1E+06	3.1E+04	2.0E+12	3.9E+00	2.0E+00
8	O	2.4E+07	2.4E+05	1.5E+13	3.0E+01	1.7E+01
9	F	8.4E+02	8.4E+00	5.3E+08	1.1E-03	7.2E-04
10	Ne	3.4E+06	3.4E+04	2.2E+12	4.3E+00	3.1E+00
11	Na	5.7E+04	1.7E+03	1.1E+11	2.2E-01	1.8E-01
12	Mg	1.1E+06	3.2E+04	2.0E+12	4.1E+00	3.5E+00
13	Al	8.5E+04	2.5E+03	1.6E+11	3.2E-01	3.1E-01
14	Si	1.0E+06	3.0E+04	1.9E+12	3.8E+00	3.8E+00
15	P	1.0E+04	2.1E+02	1.3E+10	2.6E-02	2.9E-02
16	S	5.2E+05	1.0E+04	6.5E+11	1.3E+00	1.5E+00
17	Cl	5.2E+03	5.3E+01	3.3E+09	6.7E-03	8.3E-03
18	Ar	1.0E+05	1.0E+03	6.4E+10	1.3E-01	1.7E-01
19	K	3.8E+03	1.1E+02	7.1E+09	1.4E-02	2.0E-02
20	Ca	6.1E+04	1.8E+03	1.2E+11	2.3E-01	3.3E-01
21	Sc	3.4E+01	1.0E+00	6.5E+07	1.3E-04	2.1E-04
22	Ti	2.4E+03	7.2E+01	4.5E+09	9.1E-03	1.5E-02
23	V	2.9E+02	8.8E+00	5.5E+08	1.1E-03	2.0E-03
24	Cr	1.4E+04	4.0E+02	2.6E+10	5.1E-02	9.4E-02
25	Mn	9.6E+03	2.9E+02	1.8E+10	3.6E-02	7.1E-02
26	Fe	9.0E+05	2.7E+04	1.7E+12	3.4E+00	6.8E+00
27	Co	2.2E+03	6.7E+01	4.3E+09	8.5E-03	1.8E-02
28	Ni	4.9E+04	1.5E+03	9.3E+10	1.9E-01	3.9E-01
29	Cu	5.2E+02	1.6E+01	9.9E+08	2.0E-03	4.5E-03
30	Zn	1.3E+03	3.8E+01	2.4E+09	4.8E-03	1.1E-02
31	Ga	3.8E+01	1.1E+00	7.2E+07	1.4E-04	3.5E-04
32	Ge	1.2E+02	3.6E+00	2.3E+08	4.5E-04	1.2E-03
33	As	6.6E+00	2.0E-01	1.2E+07	2.5E-05	6.6E-05
34	Se	6.2E+01	1.9E+00	1.2E+08	2.4E-04	6.6E-04
35	Br	1.2E+01	1.2E-01	7.3E+06	1.5E-05	4.2E-05
36	Kr	4.5E+01	4.5E-01	2.8E+07	5.7E-05	1.7E-04
37	Rb	7.1E+00	2.1E-01	1.3E+07	2.7E-05	8.2E-05
38	Sr	2.3E+01	7.0E-01	4.4E+07	8.9E-05	2.8E-04
39	Y	4.6E+00	1.4E-01	8.8E+06	1.8E-05	5.6E-05
40	Zr	1.1E+01	3.4E-01	2.2E+07	4.3E-05	1.4E-04
41	Nb	7.0E-01	2.1E-02	1.3E+06	2.6E-02	8.7E-06
42	Mo	2.5E+00	7.6E-02	4.8E+06	9.7E-06	3.3E-05
44	Ru	1.9E+00	5.6E-02	3.5E+06	7.0E-06	2.5E-05
45	Rh	3.4E-01	1.0E-02	6.5E+05	1.3E-06	4.8E-06
46	Pd	1.4E+00	4.2E-02	2.6E+06	5.3E-06	2.0E-05
47	Ag	4.9E-01	1.5E-02	9.2E+05	1.8E-06	7.1E-06
48	Cd	1.6E+00	4.8E-02	3.0E+06	6.1E-06	2.4E-05
49	In	1.8E-01	5.5E-03	3.5E+05	7.0E-07	2.9E-06

50	Sn	3.8E+00	1.1E-01	7.2E+06	1.4E-05	6.1E-05
51	Sb	3.1E-01	9.3E-03	5.8E+05	1.2E-06	5.1E-06
52	Te	4.8E+00	1.4E-01	9.1E+06	1.8E-05	8.3E-05
53	I	9.0E-01	1.8E-02	1.1E+06	2.3E-06	1.0E-05
54	Xe	4.7E+00	4.7E-02	3.0E+06	6.0E-06	2.8E-05
55	Cs	3.7E-01	1.1E-02	6.9E+05	1.4E-06	6.7E-06
56	Ba	4.5E+00	1.3E-01	8.5E+06	1.7E-05	8.3E-05
57	La	4.5E-01	1.3E-02	8.4E+05	1.7E-06	8.3E-06
58	Ce	1.1E+00	3.4E-02	2.2E+06	4.3E-06	2.1E-05
59	Pr	1.7E-01	5.0E-03	3.2E+05	6.3E-07	3.2E-06
60	Nd	8.3E-01	2.5E-02	1.6E+06	3.1E-06	1.6E-05
62	Sm	2.6E-01	7.7E-03	4.9E+05	9.8E-07	5.2E-06
63	Eu	9.7E-02	2.9E-03	1.8E+05	3.7E-07	2.0E-06
64	Gd	3.3E-01	9.9E-03	6.2E+05	1.2E-06	7.0E-06
65	Tb	6.0E-02	1.8E-03	1.1E+05	2.3E-07	1.3E-06
66	Dy	3.9E-01	1.2E-02	7.5E+05	1.5E-06	8.6E-06
67	Ho	8.9E-02	2.7E-03	1.7E+05	3.4E-07	2.0E-06
68	Er	2.5E-01	7.5E-03	4.7E+05	9.5E-07	5.6E-06
69	Tm	3.8E-02	1.1E-03	7.2E+04	1.4E-07	8.6E-07
70	Yb	2.5E-01	7.4E-03	4.7E+05	9.4E-07	5.8E-06
71	Lu	3.7E-02	1.1E-03	6.9E+04	1.4E-07	8.7E-07
72	Hf	1.5E-01	4.6E-03	2.9E+05	5.8E-07	4.2E-06
74	W	1.3E-01	4.0E-03	2.5E+05	5.0E-07	3.3E-06
75	Re	5.2E-02	1.6E-03	9.8E+04	2.0E-07	1.3E-06
76	Os	6.8E-01	2.0E-02	1.3E+06	2.6E-06	1.7E-05
77	Ir	6.6E-01	2.0E-02	1.3E+06	2.5E-06	1.7E-05
78	Pt	1.3E+00	4.0E-02	2.5E+06	5.1E-06	3.5E-05
79	Au	1.9E-01	5.6E-03	3.5E+05	7.1E-07	5.0E-06
80	Hg	3.4E-01	6.7E-03	4.3E+05	8.7E-07	6.1E-06
81	Tl	1.8E-01	5.5E-03	3.5E+05	6.9E-07	5.1E-06
82	Pb	3.2E+00	9.4E-02	6.0E+06	1.2E-05	8.8E-05
83	Bi	1.4E-01	4.3E-03	2.7E+05	5.5E-07	4.0E-06
90	Th	3.4E-02	1.0E-03	6.3E+04	1.3E-07	1.1E-06
92	U	9.0E-03	2.7E-04	1.7E+04	3.4E-08	2.9E-07

Note 1: Entries in this table refer to unconcentrated bulk solar wind.
Note 2: Solar system abundance relative to $Si=10^6$
Note 3: Solar wind concentration averaged over the outer 100 nm of the collector (assumed to be Si) in units of parts per million by number; i.e., (number of solar wind atoms $x10^6$)/(atoms of silicon).
Note 4: Solar wind concentration averaged over the outer 100 nm in units of parts per million by weight; i.e. (grams of solar wind element $X10^6$)/(grams of silicon).

APPENDIX B

GENESIS SOLAR WIND SAMPLE DOMESTIC LOAN AGREEMENT,

GENESIS SOLAR WIND SAMPLE INTERNATIONAL LOAN AGREEMENT

and

GENESIS SOLAR WIND SAMPLE USER AGREEMENT

Nonreimbursable Agreement between the National Aeronautics and Space Administration Johnson Space Center and [Principal Investigator Name] and [Institution Name] for the Loan of Genesis Samples

AUTHORITY AND PARTIES

In accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113), this Loan Agreement is entered into by the National Aeronautics and Space Administration Johnson Space Center, located at Houston, Texas (hereinafter referred to as "NASA" or "JSC") and the Principal Investigator (hereafter referred to as "PI") located at [Institution Name, Institution Location] and [Institution Name] (herein referred to as "the Institution"). NASA, the PI and the Institution may be individually referred to as a "Party" and collectively referred to as the "Parties."

PURPOSE

Genesis samples distributed by Johnson Space Center of the National Aeronautics and Space Administration, hereinafter referred to as JSC, are property of the US Government and are under the custody and curatorial control of JSC.

The Johnson Space Center of the National Aeronautics and Space Administration, a Federal Agency, desires to enter into a Loan Agreement and to make certain Genesis samples available to the PI. The PI proposes to use the said Genesis samples to undertake, at his / her own direction, scientific investigations. These investigations are described in a sample request submitted by the PI to the Genesis Curator. Approval of a sample request is a prerequisite to this Loan Agreement and subsequent loan of the Genesis samples.

The use of the Genesis samples will permit beneficial contact among representatives of JSC, the PI and the Institution; will provide opportunities for discovery and dissemination of information to the scientific community and to the general public; will promote the maximum utilization of Genesis samples by JSC; and will provide opportunities for dissemination of information concerning the activities of NASA.

RESPONSIBILITIES:

The Parties Agree to the Following:

1. The Genesis samples made subject to this Loan Agreement shall be assigned to the PI on sample assignment forms signed by the JSC Genesis Curator and the PI.

2. The Genesis samples are the property of the United States Government, and are therefore made available to investigators only under a carefully controlled and monitored program. It is therefore essential that rigorous security and accountability procedures be followed by all persons who have access to the Genesis samples. The PI and the Institution shall be responsible for the receipt, use (including security during use), and accountability of the Genesis samples, as follows:

a. As determined by NASA, the Genesis samples shall be either hand-carried, at the expense of the Institution, by an authorized official of the Institution, or mailed at JSC's expense, to the PI via registered mail or by a shipping service approved by JSC. JSC reserves the right, at the expense of the Institution, to direct the mode of transportation for the return of the Genesis samples.

b. Only the PI or the PI's Designee may receive and open the package. The PI or Designee shall record all of the Genesis samples promptly upon receipt, and a record of receipt shall be maintained while the Genesis samples are in the custody, possession or control of the PI.

c. During the use for research purposes, the Genesis samples must be under the constant control of the PI or Designee. At the end of each use of the Genesis samples, an inventory of the investigated samples shall be made.

d. When not being actively investigated, the Genesis samples must be locked in a safe or secure storage cabinet equipped with a combination padlock or equivalent. The combination to the storage safe or cabinet shall be under the exclusive control of the PI and, if appropriate, the Institution security organization. If a controlled environment is required for scientific purposes, samples not being actively investigated must be stored in a locked laboratory.

e. In no case may astromaterials on loan from NASA be stored with money, precious stones or minerals, classified material or any other item that is considered to be of high theft value.

f. To insure that appropriate security arrangements are followed, the storage space holding the Genesis samples shall be subject to inspection by NASA representatives upon request.

g. The PI shall report immediately the loss or damage of the Genesis samples to the JSC Genesis Curator.

3. The PI shall be responsible for accurate accounting of all Genesis samples by sample name / number and location. The PI shall perform an inventory of the Genesis samples on an annual basis using the sample inventory form provided by the JSC Genesis Curator, and submit this form to the JSC Genesis Curator in a timely manner. This inventory includes any samples consumed or destroyed in the course of the research. This inventory shall be signed by the PI and certified by an official or security representative of the Institution. At the termination of this Loan Agreement, unless an extension of the loan has been granted, the Genesis samples shall be returned to JSC with a full accounting of such Genesis samples, using the sample return form provided by the JSC Genesis Curator.

4. The PI may use the Genesis samples at his/her own Institution, or may carry the samples to use them at other locations consistent with the approved sample request. If the approved sample request entails collaborative work at another institution, the Genesis samples shall be either hand-carried, at the expense of the Institution, by an authorized official of the Institution, or mailed at the Institution's expense, via registered mail or by a shipping service approved by JSC. The PI shall keep a record of all such transfers, inform the JSC Genesis Curator when such transfers occur, and note them in the annual inventory. When the samples are in use by a collaborator, the original PI is responsible for extending the security requirements set forth in this agreement and shall retain responsibility for the Genesis samples. When the collaborator has finished planned work on the samples, they must be immediately returned to the PI.

5. This Loan Agreement is not transferable to another institution or investigator. If the PI relocates to another institution and wishes to continue research on the Genesis samples, a new Loan Agreement must be completed among the PI, the new Institution and NASA before Genesis samples can be transferred. If the PI is finished with a sample, but another investigator is interested in studying this sample, a new sample request must be submitted to the Genesis Curator, and if approved a new Loan Agreement must be completed by the new Investigator.

6. Return of samples to JSC may arise from several circumstances. If the PI completes or terminates research on Genesis samples, the samples must be returned to the JSC Genesis Curator. If the PI relocates to a new institution without executing a new loan agreement, the samples must be returned. Upon the circumstances of death or incapacitation of the PI, the Institution will be responsible for returning the Genesis samples. Finally, if this agreement expires without renewal or is terminated by any of the Parties, the Genesis samples must be returned.

7. The use of Genesis samples shall be solely for the purposes set forth in the approved sample request. This Loan Agreement does / or does not allow the PI to use destructive analytical procedures, as specified in the approved sample request. The PI may request from the Genesis Curator an amendment to the sample request in order to perform additional research on the samples.

8. When requested to do so during the period of the use, the PI or the Institution shall provide to representatives of JSC a copy of any publication(s) resulting from the research and confer any scientific knowledge acquired as a result of such use, provided that no proprietary knowledge shall be disclosed involuntarily in the discharge of this obligation.

9. Title to the Genesis samples shall remain with the US Government and shall not be affected by the incorporation, attachment, or mixture thereof to or with property not owned by NASA.

10. NASA, the PI or the Institution may, consistent with Federal law and this Loan Agreement, release general information regarding their own participation in this Loan Agreement as desired.

LIABILITY AND RISK OF LOSS

1. Notwithstanding any other provision of this Agreement, the PI and / or the Institution shall not be liable for loss of or damage to the Genesis samples, except that the PI and / or the Institution shall be responsible for any such loss or damage:

a. which results from willful misconduct, lack of good faith, or negligence on the part of the PI and / or the Institution's directors or officers, or on the part of any of the Institution's superintendents or any other equivalent representatives, who have supervision or direction of all or substantially all of the Institution's business; or

b. which results from a failure on the part of the PI and / or the Institution due to the willful misconduct, lack of good faith, or negligence on the part of any of the Institution's directors, officers, or other representatives mentioned in (a) above (i) to maintain and administer, in accordance with the provisions of this Loan Agreement the program for delivery, protection, and preservation of Government property, or (ii) to take all reasonable steps to comply with any written directions from JSC with respect to the delivery, protection, and preservation of Government property.

Loss or damage to the Genesis samples caused by failure to follow proper safeguarding standards as set forth in this Loan Agreement shall be considered in selecting recipients for future Genesis sample loans.

2. NASA, its officers, and employees shall not be liable for any loss, damage, expense, or liability of whatsoever nature or kind arising out of, or as a result of, or in connection with the possession or use of the samples during the term of the loan or any extension thereof.

3. The PI and the Institution hereby waive any claims against NASA, its employees, its related entities, (including, but not limited to, contractors and subcontractors at any tier, grantees, investigators, customers, users, and their contractors and subcontractors, at any tier) and employees of NASA's related entities for any injury to, or death of, Institution employees or the employees of the Institution's related entities, or for damage to, or loss of, the Institution's property or the property of its related entities arising from or related to activities conducted under this Loan Agreement, whether such injury, death, damage, or loss arises through negligence or otherwise, except in the case of willful misconduct. The Institution further agrees to extend this unilateral waiver to its related entities by requiring them, by contract or otherwise, to waive all claims against NASA, its related entities, and employees of NASA and employees of NASA's related entities for injury, death, damage, or loss arising from or related to activities conducted under this Loan Agreement.

FINANCIAL OBLIGATIONS

There shall be no transfer of funds between the Parties under this Agreement and each Party shall fund its own participation. All activities under or pursuant to this Agreement are subject to the availability of funds, and no provision of this Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, (31 U.S.C. § 1341).

PRIORITY OF USE

Any schedule or milestone in this Agreement is estimated based upon the Parties' current understanding of the projected availability of NASA goods, services, facilities, or equipment. In the event that NASA's projected availability changes, the PI shall be given reasonable notice of that change, so that the schedule and milestones may be adjusted accordingly. The Parties agree that NASA's use of the goods, services, facilities, or equipment shall have priority over the use planned in this Agreement. Should a conflict arise, NASA in its sole discretion shall determine whether to exercise that priority. Likewise, should a conflict arise as between two or more non-NASA Parties, NASA, in its sole discretion, shall determine the priority as between those Parties. This Agreement does not obligate NASA to seek alternative government property or services under the jurisdiction of NASA at other locations.

NONEXCLUSIVITY

This Agreement is not exclusive; accordingly, NASA may enter into similar agreements for the same or similar purpose with other private or public entities.

USE OF NASA NAME, INITIALS, AND EMBLEM

The PI or the Institution shall not use "National Aeronautics and Space Administration" or "NASA" in a way that creates the impression that a product or service has the authorization, support, sponsorship, or endorsement of NASA, which does not, in fact, exist. The PI or the Institution must submit any proposed public use of the NASA name or initials (including press releases and all promotional and advertising use) to the NASA Assistant Administrator for the Office of Communication or designee ("NASA Communications") for review and approval. Approval by NASA Communications shall be based on applicable law and policy governing the use of the NASA name and initials.

Use of NASA emblems (*i.e.*, NASA Seal, NASA Insignia, NASA logotype, NASA Program Identifiers, and the NASA Flag) is governed by 14 C.F.R. Part 1221. The PI or the Institution must submit any proposed use of the emblems to NASA Communications for review and approval.

TERMS OF AGREEMENT -- DURATION, TERMINATION, AND MODIFICATION

This Loan Agreement becomes effective upon the date of the last signature below ("effective date") and shall remain in effect until the completion of all obligations of the Parties hereto, or five years from the effective date. If the PI still holds Genesis samples, a new or renewal Loan Agreement must be agreed upon by NASA and the PI or the samples must be returned to the JSC Genesis Curator. If the Genesis samples are required for additional research the PI may request, in writing, a loan extension from the JSC Genesis Curator. If the request is approved, the loan period shall be extended by the amount of time agreed to by the JSC Genesis Curator.

The Parties may unilaterally terminate this Loan Agreement by providing thirty (30) calendar days written notice to the other Parties. Upon termination the PI or the Institution must return the Genesis samples held to the JSC Genesis Curator within thirty (30) days. However, if any provision of this Loan Agreement is violated, NASA may request the return of all the Genesis samples and the PI or the Institution shall return the Genesis samples immediately. Any modification to this Agreement shall be executed, in writing, and signed by the PI and an authorized representative of the Institution and of NASA.

POINTS OF CONTACT

The following personnel are designated as the Points of Contact among the Parties in the performance of this Agreement:

NASA JSC Curator

Name

Title

Email

Telephone

Fax

Address

Institution Official

Name

Title

Email

Telephone

Fax

Address

Principal Investigator

Name

Email

Telephone

Fax

Address

DISPUTE RESOLUTION

All disputes concerning questions of fact or law arising under this Loan Agreement shall be referred by the claimant in writing to the appropriate persons identified in this Agreement as the "Points of Contact." The persons identified as the "Point of Contact" for NASA, the PI and the Institution shall consult and attempt to resolve all issues arising from the implementation of this Loan Agreement. If the Parties are unable to resolve the dispute, then the NASA signatory or that person's Designee, as applicable, shall issue a written decision that shall be the final agency decision for the purpose of judicial review. Nothing in this article limits or prevents any of the Parties from pursuing any other right or remedy available by law upon the issuance of the final NASA decision.

APPLICABLE LAW

U.S. Federal law governs this Loan Agreement for all purposes, including, but not limited to, determining the validity of the Loan Agreement, the meaning of its provisions, and the rights, obligations and remedies of the Parties.

SIGNATORY AUTHORITY

The signatories to this Loan Agreement covenant and warrant that they have authority to execute this Loan Agreement. By signing below, the undersigned agrees to the above terms and conditions.

NASA JSC Curator

_____

Name

_____

Date

Institution Official

_____

Name

_____

Date

Principal Investigator

_____

Name

_____

Date

Agreement between the National Aeronautics and Space Administration Johnson Space Center and [Principal Investigator Name] and [Institution Name] for the Loan of Genesis Samples

AUTHORITY AND PARTIES

In accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113), this Loan Agreement is entered into by the National Aeronautics and Space Administration Johnson Space Center, located at Houston, Texas (hereinafter referred to as "NASA" or "JSC") and the Principal Investigator (hereafter referred to as "PI") located at [Institution Name, Institution Location] and [Institution Name] (herein referred to as "the Institution"). NASA, the PI and the Institution may be individually referred to as a "Party" and collectively referred to as the "Parties."

PURPOSE

Genesis samples distributed by Johnson Space Center of the National Aeronautics and Space Administration, hereinafter referred to as JSC, are property of the US Government and are under the custody and curatorial control of JSC.

The Johnson Space Center of the National Aeronautics and Space Administration, a Federal Agency, desires to enter into a Loan Agreement and to make certain Genesis samples available to the PI. The PI proposes to use the said Genesis samples to undertake, at his / her own direction, scientific investigations. These investigations are described in a sample request submitted by the PI to the Genesis Curator. Approval of a sample request is a prerequisite to this Loan Agreement and subsequent loan of the Genesis samples.

The use of the Genesis samples will permit beneficial contact among representatives of JSC, the PI and the Institution; will provide opportunities for discovery and dissemination of information

to the scientific community and to the general public; will promote the maximum utilization of Genesis samples by JSC; and will provide opportunities for dissemination of information concerning the activities of NASA.

RESPONSIBILITIES:

The Parties Agree to the Following:

1. The Genesis samples made subject to this Loan Agreement shall be assigned to the PI on sample assignment forms signed by the JSC Genesis Curator and the PI.

2. The Genesis samples are the property of the United States Government, and are therefore made available to investigators only under a carefully controlled and monitored program. It is therefore essential that rigorous security and accountability procedures be followed by all persons who have access to the Genesis samples. The PI and the Institution shall be responsible for the receipt, use (including security during use), and accountability of the Genesis samples, as follows:

a. As determined by NASA, the Genesis samples shall be either hand-carried, at the expense of the Institution, by an authorized official of the Institution, or mailed at JSC's expense, to the PI via registered mail or by a shipping service approved by JSC. JSC reserves the right, at the expense of the Institution, to direct the mode of transportation for the return of the Genesis samples.

b. Only the PI or the PI's Designee may receive and open the package. The PI or Designee shall record all of the Genesis samples promptly upon receipt, and a record of receipt shall be maintained while the Genesis samples are in the custody, possession or control of the PI.

c. During the use for research purposes, the Genesis samples must be under the constant control of the PI or Designee. At the end of each use of the Genesis samples, an inventory of the investigated samples shall be made.

d. When not being actively investigated, the Genesis samples must be locked in a safe or secure storage cabinet equipped with a combination padlock or equivalent. The combination to the storage safe or cabinet shall be under the exclusive control of the PI and, if appropriate, the Institution security organization. If a controlled environment is required for scientific purposes, samples not being actively investigated must be stored in a locked laboratory.

e. In no case may astromaterials on loan from NASA be stored with money, precious stones or minerals, classified material or any other item that is considered to be of high theft value.

f. To insure that appropriate security arrangements are followed, the storage space holding the Genesis samples shall be subject to inspection by NASA representatives upon request.

g. The PI shall report immediately the loss or damage of the Genesis samples to the JSC Genesis Curator.

3. The PI shall be responsible for accurate accounting of all Genesis samples by sample name / number and location. The PI shall perform an inventory of the Genesis samples on an annual basis using the sample inventory form provided by the JSC Genesis Curator, and submit this form to the JSC Genesis Curator in a timely manner. This inventory includes any samples consumed or destroyed in the course of the research. This inventory shall be signed by the PI and certified by an official or security representative of the Institution. At the termination of this Loan Agreement, unless an extension of the loan has been granted, the Genesis samples shall be returned to JSC with a full accounting of such Genesis samples, using the sample return form provided by the JSC Genesis Curator.

4. The PI may use the Genesis samples at his/her own Institution, or may carry the samples to use them at other locations consistent with the approved sample request. If the approved sample request entails collaborative work at another institution, the Genesis samples shall be either hand-carried, at the expense of the Institution, by an authorized official of the Institution, or mailed at the Institution's expense, via registered mail or by a shipping service approved by

JSC. The PI shall keep a record of all such transfers, inform the JSC Genesis Curator when such transfers occur, and note them in the annual inventory. When the samples are in use by a collaborator, the original PI is responsible for extending the security requirements set forth in this agreement and shall retain responsibility for the Genesis samples. When the collaborator has finished planned work on the samples, they must be immediately returned to the PI.

5. This Loan Agreement is not transferable to another institution or investigator. If the PI relocates to another institution and wishes to continue research on the Genesis samples, a new Loan Agreement must be completed among the PI, the new Institution and NASA before Genesis samples can be transferred. If the PI is finished with a sample, but another investigator is interested in studying this sample, a new sample request must be submitted to the Genesis Curator, and if approved a new Loan Agreement must be completed by the new Investigator.

6. Return of samples to JSC may arise from several circumstances. If the PI completes or terminates research on Genesis samples, the samples must be returned to the JSC Genesis Curator. If the PI relocates to a new institution without executing a new loan agreement, the samples must be returned. Upon the circumstances of death or incapacitation of the PI, the Institution will be responsible for returning the Genesis samples. Finally, if this agreement expires without renewal or is terminated by any of the Parties, the Genesis samples must be returned.

7. The use of Genesis samples shall be solely for the purposes set forth in the approved sample request. This Loan Agreement does / or does not allow the PI to use destructive analytical procedures, as specified in the approved sample request. The PI may request from the Genesis Curator an amendment to the sample request in order to perform additional research on the samples.

8. When requested to do so during the period of the use, the PI or the Institution shall provide to representatives of JSC a copy of any publication(s) resulting from the research and confer any scientific knowledge acquired as a result of such use, provided that no proprietary knowledge shall be disclosed involuntarily in the discharge of this obligation.

9. Title to the Genesis samples shall remain with the US Government and shall not be affected by the incorporation, attachment, or mixture thereof to or with property not owned by NASA.

10. NASA, the PI or the Institution may, consistent with Federal law and this Loan Agreement, release general information regarding their own participation in this Loan Agreement as desired.

LIABILITY AND RISK OF LOSS

1. Notwithstanding any other provision of this Agreement, the PI and / or the Institution shall not be liable for loss of or damage to the Genesis samples, except that the PI and / or the Institution shall be responsible for any such loss or damage:

a. which results from willful misconduct, lack of good faith, or negligence on the part of the PI and / or the Institution's directors or officers, or on the part of any of the Institution's superintendents or any other equivalent representatives, who have supervision or direction of all or substantially all of the Institution's business; or

b. which results from a failure on the part of the PI and / or the Institution due to the willful misconduct, lack of good faith, or negligence on the part of any of the Institution's directors, officers, or other representatives mentioned in (a) above (i) to maintain and administer, in accordance with the provisions of this Loan Agreement the program for delivery, protection, and preservation of Government property, or (ii) to take all reasonable steps to comply with any written directions from JSC with respect to the delivery, protection, and preservation of Government property.

Loss or damage to the Genesis samples caused by failure to follow proper safeguarding standards as set forth in this Loan Agreement shall be considered in selecting recipients for future Genesis sample loans.

2. NASA, its officers, and employees shall not be liable for any loss, damage, expense, or liability of whatsoever nature or kind arising out of, or as a result of, or in connection with the possession or use of the samples during the term of the loan or any extension thereof.

3. The PI and the Institution hereby waive any claims against NASA, its employees, its related entities, (including, but not limited to, contractors and subcontractors at any tier, grantees, investigators, customers, users, and their contractors and subcontractors, at any tier) and employees of NASA's related entities for any injury to, or death of, Institution employees or the employees of the Institution's related entities, or for damage to, or loss of, the Institution's property or the property of its related entities arising from or related to activities conducted under this Loan Agreement, whether such injury, death, damage, or loss arises through negligence or otherwise, except in the case of willful misconduct. The Institution further agrees to extend this unilateral waiver to its related entities by requiring them, by contract or otherwise, to waive all claims against NASA, its related entities, and employees of NASA and employees of NASA's related entities for injury, death, damage, or loss arising from or related to activities conducted under this Loan Agreement.

FINANCIAL OBLIGATIONS

There shall be no transfer of funds between the Parties under this Agreement and each Party shall fund its own participation. All activities under or pursuant to this Agreement are subject to the availability of funds, and no provision of this Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, (31 U.S.C. § 1341).

PRIORITY OF USE

Any schedule or milestone in this Agreement is estimated based upon the Parties' current understanding of the projected availability of NASA goods, services, facilities, or equipment. In the event that NASA's projected availability changes, the PI shall be given reasonable notice of

that change, so that the schedule and milestones may be adjusted accordingly. The Parties agree that NASA's use of the goods, services, facilities, or equipment shall have priority over the use planned in this Agreement. Should a conflict arise, NASA in its sole discretion shall determine whether to exercise that priority. Likewise, should a conflict arise as between two or more non-NASA Parties, NASA, in its sole discretion, shall determine the priority as between those Parties. This Agreement does not obligate NASA to seek alternative government property or services under the jurisdiction of NASA at other locations.

NONEXCLUSIVITY

This Agreement is not exclusive; accordingly, NASA may enter into similar agreements for the same or similar purpose with other private or public entities.

USE OF NASA NAME, INITIALS, AND EMBLEM

The PI or the Institution shall not use "National Aeronautics and Space Administration" or "NASA" in a way that creates the impression that a product or service has the authorization, support, sponsorship, or endorsement of NASA, which does not, in fact, exist. The PI or the Institution must submit any proposed public use of the NASA name or initials (including press releases and all promotional and advertising use) to the NASA Assistant Administrator for the Office of Communication or designee ("NASA Communications") for review and approval. Approval by NASA Communications shall be based on applicable law and policy governing the use of the NASA name and initials.

Use of NASA emblems (*i.e.*, NASA Seal, NASA Insignia, NASA logotype, NASA Program Identifiers, and the NASA Flag) is governed by 14 C.F.R. Part 1221. The PI or the Institution must submit any proposed use of the emblems to NASA Communications for review and approval.

TERMS OF AGREEMENT -- DURATION, TERMINATION, AND MODIFICATION

This Loan Agreement becomes effective upon the date of the last signature below ("effective date") and shall remain in effect until the completion of all obligations of the Parties hereto, or

five years from the effective date. If the PI still holds Genesis samples, a new or renewal Loan Agreement must be agreed upon by NASA and the PI or the samples must be returned to the JSC Genesis Curator. If the Genesis samples are required for additional research the PI may request, in writing, a loan extension from the JSC Genesis Curator. If the request is approved, the loan period shall be extended by the amount of time agreed to by the JSC Genesis Curator.

The Parties may unilaterally terminate this Loan Agreement by providing thirty (30) calendar days written notice to the other Parties. Upon termination the PI or the Institution must return the Genesis samples held to the JSC Genesis Curator within thirty (30) days. However, if any provision of this Loan Agreement is violated, NASA may request the return of all the Genesis samples and the PI or the Institution shall return the Genesis samples immediately. Any modification to this Agreement shall be executed, in writing, and signed by the PI and an authorized representative of the Institution and of NASA.

POINTS OF CONTACT

The following personnel are designated as the Points of Contact among the Parties in the performance of this Agreement:

NASA Headquarters, Office of International and Interagency Relations

Name
Title
Email
Telephone
Fax
Address

NASA JSC Curator

Name
Title
Email
Telephone
Fax
Address

Institution Official

Name
Email
Telephone
Fax
Address

Principal Investigator

Name
Email
Telephone
Fax
Address

DISPUTE RESOLUTION

All disputes concerning questions of fact or law arising under this Loan Agreement shall be referred by the claimant in writing to the appropriate persons identified in this Agreement as the "Points of Contact." The persons identified as the "Point of Contact" for NASA, the PI and the Institution shall consult and attempt to resolve all issues arising from the implementation of this Loan Agreement. If the Parties are unable to resolve the dispute, then the NASA signatory or that person's Designee, as applicable, shall issue a written decision that shall be the final agency decision for the purpose of judicial review. Nothing in this article limits or prevents any of the Parties from pursuing any other right or remedy available by law upon the issuance of the final NASA decision.

APPLICABLE LAW

U.S. Federal law governs this Loan Agreement for all purposes, including, but not limited to, determining the validity of the Loan Agreement, the meaning of its provisions, and the rights, obligations and remedies of the Parties.

SIGNATORY AUTHORITY

The signatories to this Loan Agreement covenant and warrant that they have authority to execute this Loan Agreement. By signing below, the undersigned agrees to the above terms and conditions.

NASA HEADQUARTERS, OFFICE OF INTERNATIONAL AND INTERAGENCY RELATIONS

_____

Name

_____

Date

NASA JSC Curator

_____

Name

_____

Date

Institution Official

_____

Name

_____

Date

Principal Investigator

_____

Name

_____

Date

Appendix B
GENESIS SOLAR WIND SAMPLE USER AGREEMENT

I, _____ (sample recipient's name, printed) am collaborating with Genesis Principal Investigator _____ (Investigator's name, printed). I have read the sample security protocols below and agree to abide by them.

1. The samples (hereinafter referred to as the PROPERTY) made subject to this agreement are assigned to _____ (Principal Investigator's name, printed).

2. The PROPERTY is the property of the United States Government, is considered irreplaceable, and is therefore made available to users only under a carefully controlled and monitored program. It is therefore essential that rigorous security and accountability procedures be followed by all persons who have access to the PROPERTY. The Principal Investigator will be responsible for the receipt, use (including security during use), accountability, and return of the PROPERTY at the end of the designated time.

   a. Only persons authorized by the Principal Investigator may receive and open the package. The authorized recipient shall record all of the PROPERTY promptly upon receipt, and it shall be so identified so long as it remains in the custody, possession, or control of the recipient.

   b. Verification of sample transfers by electronic media shall be from persons authorized by the Sample Collaborator using institutional computer accounts which are secured with password protection and under the exclusive control of the authorized person.

   c. During use, the PROPERTY must be under the control of the recipient, acting for the accountable Principal Investigator.

   d. When not in use, the PROPERTY must be locked in a safe or secure storage cabinet equipped with a combination padlock, or, if controlled environment is required, in a locked laboratory.

   e. Combination to the storage safe or cabinet will be under the exclusive control of the Sample Collaborator and/or his/her designee.

   f. Report immediately the loss or damage of the PROPERTY to the Genesis Curator, Johnson Space Center, Houston, Texas 77058, telephone (281) 483-5766. Alternate number is Astromaterials Curator Carlton Allen (281) 483-5126.

   g. Transfer of samples among collaborators is allowed if the collaborator has submitted a signed Genesis Solar Wind Sample User Agreement to the Genesis Curator. The accountability for the sample remains the responsibility of the Principal Investigator to whom the sample is assigned. The Genesis Curator should be notified of samples transferred to collaborators.

   h. The PROPERTY shall be either hand-carried by the Principal Investigator's authorized persons or mailed via FedEx or equivalent responsible, real-time tracking courier. Shipping of samples among collaborators shall be carefully tracked and consists of 3 steps: 1) verify recipient is available to receive package on arrival date, 2) upon arrival, recipient immediately acknowledges receipt, and 3) sender inquires about package receipt if recipient does not respond on the day of expected arrival.

FOR: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

_____ _____

Judith Allton Date
Genesis Curator
Johnson Space Center

FOR: Collaborator of _____(Principal Investigator name, printed)

_____ _____

Signature Date

_____

Printed Full Name

_____

Title

E-mail: _____

Telephone: _____

As a clarification, the following definitions from Section 5 of the Genesis Research Principal Investigator's Guidebook are reprinted:

Principal Investigator – the person to whom responsibility for security and accountability for the Genesis solar wind sample is assigned. Usually this is the person who submitted the request for samples. This person signs the **Loan Agreement** and signs the Genesis Sample Assignment form when samples are received.

Sample Collaborator – a person working with the Principal Investigator who may have temporary custody of the sample for analytical purposes. This person signs the **User Agreement**.

Appendix C

National Aeronautics and
Space Administration
Lyndon B. Johnson Space Center

Genesis Solar Wind Curation
SAMPLE ASSIGNMENT FORM

CO#: 16123

Date: 09/05/2012

JSC Sample #	Material	Regime	Size (mm)
60966.0	SOS	B/C	9.746 x 7.046

Sample(s) Experiment and Cleaning History:
The sample has had UPW cleaning at JSC (March 2010), CO2 snow cleaning, HCL/HF cleaning, and HNO3 cleaning.

Sample(s) Assigned to:
Dr. John Smith
Planetary Science Dept.
Solar University
1500 Geoscience Avenue
New York, NY 00000
(555) 555-5555

Transfer From:
NASA Johnson Space Center
Attn: KT/Sample Control Center
2101 NASA Parkway
Houston, TX 77058
USA

Judith H. Allton, Genesis Curator
Phone: (281) 483-5766
Email: judith.h.allton@nasa.gov

_____
Judith H. Allton

Date:_____

Transfer to:
Dr. John Smith
Planetary Science Dept.
Solar University
1500 Geoscience Avenue
New York, NY 00000
(555) 555-5555

Processor: Melissa C. Rodriguez 281-813-1660
melissa.rodriguez-1@nasa.gov

Sample Due Date: 09/05/2017

Notes & Special Handling Instructions:
REQ#173.

I acknowledge receipt of, and responsibility for, the above sample(s):

_____ _____
Recipient's name, printed Signature & Date

_____
Title

UPON RECEIPT OF THE SAMPLE(S), PLEASE SIGN THIS FORM AND RETURN IT TO THE GENESIS SOLAR WIND SAMPLE CURATOR, MAIL CODE KT, JOHNSON SPACE CENTER, HOUSTON, TX 77058.

16123_20120905030952.pdf

Appendix D
Example
GENESIS SOLAR WIND SAMPLE RETURN RECEIPT

The Curator acknowledges receipt of materials identified by the following sample numbers:

FROM: [Investigator Name] ON: [Date]

60019
53201
21169

These samples are being processed back into the active collection and will be cleared from your inventory.

_____
Genesis Solar Wind Sample Curator

Appendix E
Example

GENESIS-FLOWN SAMPLE INVENTORY
For "Smith, J"

DATE: October 10, 2005

Sample	**Return Date**
30221	October 2006
33377	October 2006
55288	October 2006

I acknowledge that I have control of the above sample(s).

_____

Signature Date
Name printed:

I witnessed and verify the above inventory.

_____

Signature Date
Name printed: