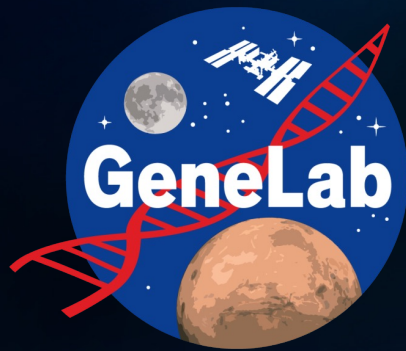



# Biological Data for Deep Space Mission Support



National Aeronautics and  
Space Administration



Ryan T. Scott, ALSDA Project Scientist   
HRP-IWS, Tuesday, Feb 7, 2022  
Contact: [ryan.t.scott@nasa.gov](mailto:ryan.t.scott@nasa.gov)  
NASA Open Science Data Repository (OSDR)

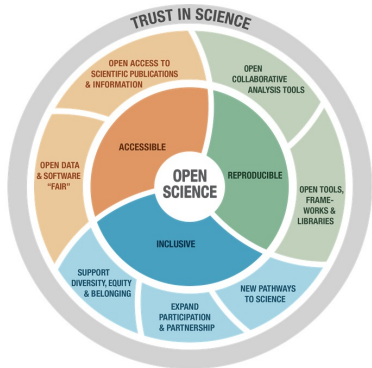


# Open Science, Social Equity, Opportunity

## Leadership



Greater access to taxpayer-funded research can help fuel American innovation. We're proud to launch the Year of Open Science — with actions across the federal government to spur equitable innovatio



**Alondra Nelson** @Alondra... · 1/12/23  
The Biden-Harris Administration is committed to advancing open, equitable research.

Announcing the YEAR OF OPEN SCIENCE, actions to provide access to taxpayer-supported research and data, accelerate innovation, and promote public participation and trust.



**Thomas Zurbuchen** @Dr... · 9/16/22  
So, take initiative; hear these inspiring stories from open science practitioners & learn what open science means to them along with their best practices: [go.nasa.gov/3ROwXy4](https://go.nasa.gov/3ROwXy4)



**Alondra Nelson** @NASA is leading #publicaccess polic, activities represent a significant public investment. NASA holds this information, including publications...as a public trust to increase knowledge and serve the public good" [science.nasa.gov/researchers/sc...](https://science.nasa.gov/researchers/sc...)



**Alondra Nelson** @Alondra... · 8/25/22  
Thank you @NIHDirector for @NIH's leadership and partnership in the mission to accelerate the American public's access to the results of federally funded research.

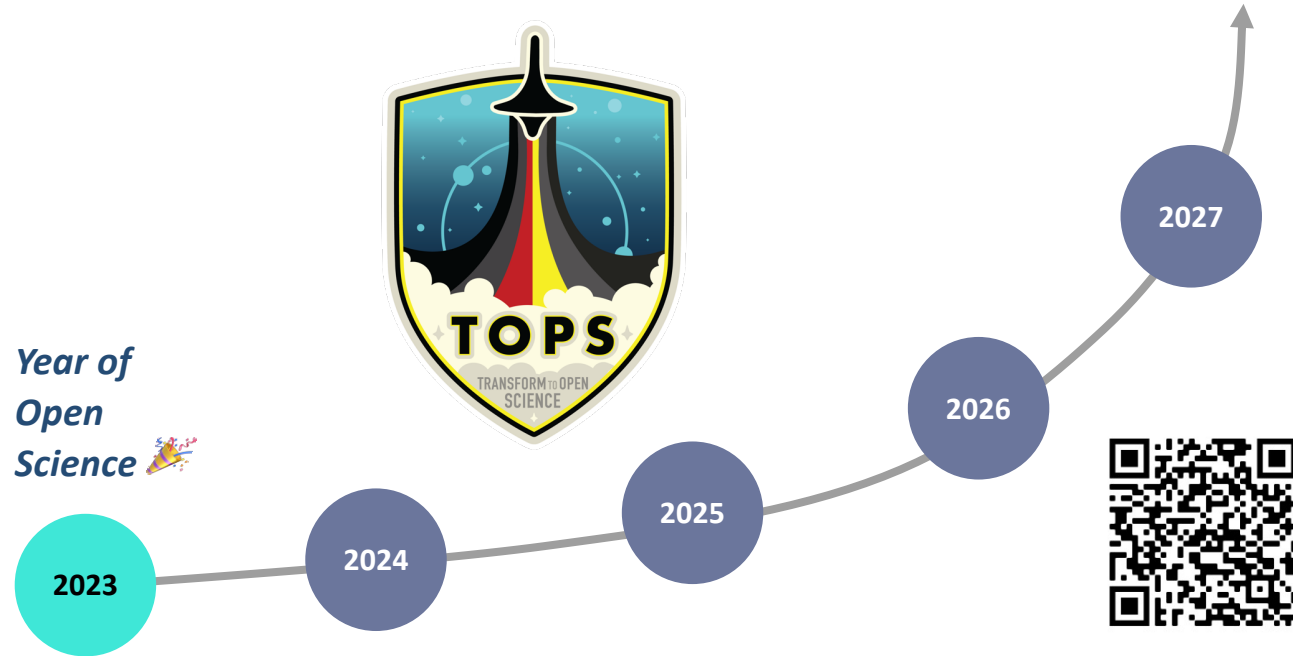


**Lawrence A. Tabak** · 8/25/22  
Today, @WHOSTP issued updated policy guidance directing federal agencies to speed access to results of federally funded research. #NIH has long championed principles of transpar...

## NASA's Transform to Open Science (TOPS)



Year of Open Science



## \$40 million 5-year NASA Science Mission Directorate Mission

### Goals:

- ★ Increase understanding & adoption of open science
- ★ Accelerate major scientific discoveries
- ★ Broaden participation by historically underrepresented communities

### Metrics:

- ★ 20k people earn Open Science Badge in next 5 years (curriculum/training)
- ★ 5+ major discoveries
- ★ Increase participation of underrepresented groups by 2x



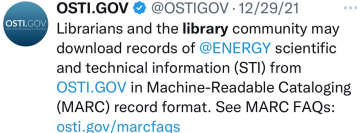
We're joining a multi-agency initiative to recognize 2023 as the Year of Open Science, an opportunity to advance adoption of open, equitable and science.



NLM is pleased to join @WHOSTP & @NASA in recognizing 2023 as the Year of #OpenScience. Through products like PubMed & PubMed



Happy Pollinator Week! Explore data and tools related to pollinators in the Ag Data Commons: [go.usa.gov/x6PYK](https://go.usa.gov/x6PYK)



Librarians and the library community may download records of @ENERGY scientific and technical information (STI) from OSTI.GOV in Machine-Readable Cataloging (MARC) record format. See MARC FAQs: [osti.gov/marcfaqs](https://osti.gov/marcfaqs)



# Data Sharing is Essential for Life in Space

## Knowledge Discovery

**Cell** Article  
**Comprehensive Multi-omics Analysis Reveals Mitochondrial Stress as a Central Biological Hub in Spaceflight Impact**  
 Graphical Abstract Authors: Wilson A. da Silva, Hossein Sami-Bon, Christopher E. Mason, Sylvain Alain Baril, et al.

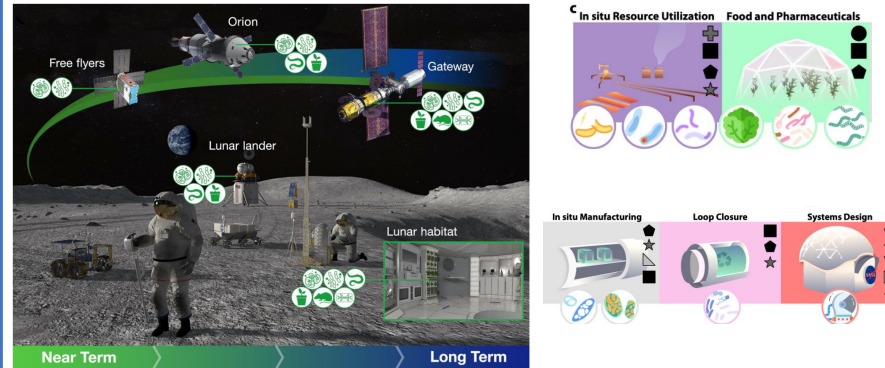
**npj** Microgravity  
**Bone health in spaceflight rodents and primates: systematic**  
 ARTICLE OPEN in F. Condon<sup>1</sup>, Martin Morris<sup>2</sup> and Svetlana V. Komarova<sup>3,4</sup>

**Machine Learning Models to Predict Cognitive Impairment of Rodents Subjected to Space Radiation**  
 Mona Metar<sup>1\*</sup>, Suleyman A. Gokoglu<sup>1</sup>, Matthew T. Pralich<sup>1</sup>, Christopher A. Gallo<sup>1</sup>, Asad K. Iqbal<sup>2</sup>, Richard A. Britten<sup>3</sup>, R. K. Prabhu<sup>4</sup> and Jerry G. Myers Jr.<sup>1</sup>

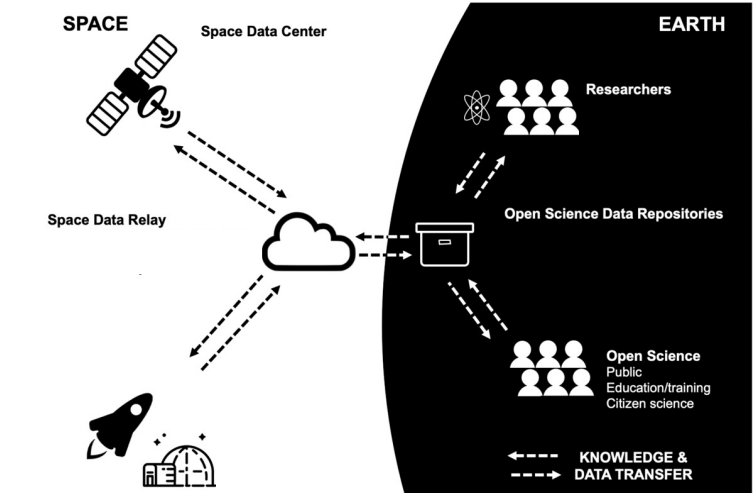
**Invariant Risk Minimisation for Cross-Organism Inference: Substituting Mouse Data for Human Data in Human Risk Factor Discovery**  
 Odhran O'Donoghue, Paul Duckworth, Giuseppe Ughi, Linus Scheibenreif, Kia Khezeli, Adrienne Hoarfrost, Samuel Budd, Patrick Foley, Nicholas Chia, John Kalantari, Graham Mackintosh, Frank Soboczenski, Lauren Sanders

arXiv:2111.07348

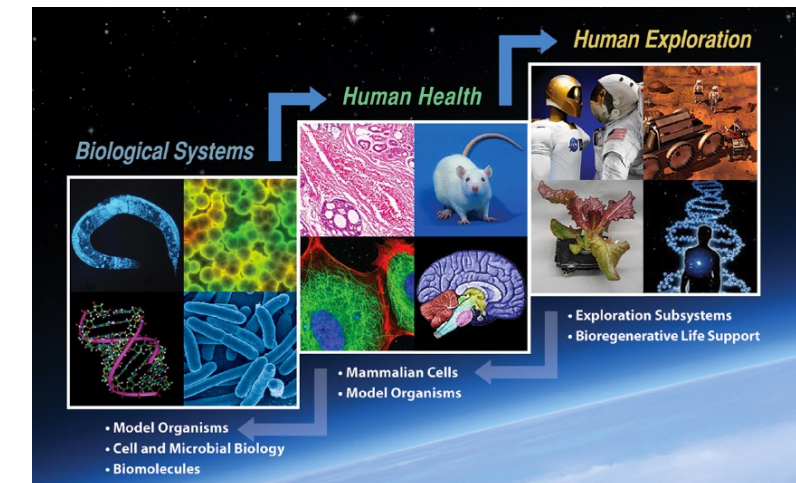
## Novel Ecosystem, Platform, and Countermeasure Development



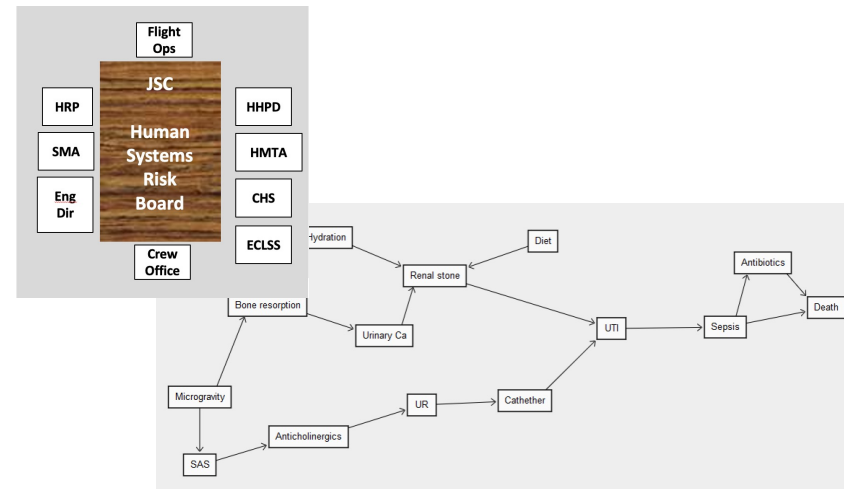
## Involve the World in Spaceflight



## Translational Science



## Support for Human Health Risks



**Across Hazards**

**Across Missions, Species, Data Types**

**Longitudinal, Biomonitoring, & Experimental**

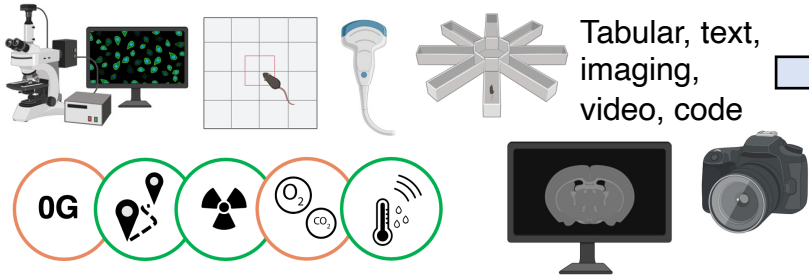
**High Quality for AI/ML/Modeling/KGs/DAGs**

(Valinia et al., 2022, <https://ntrs.nasa.gov/citations/20220002905>; Everroad et al., 2021 <https://ntrs.nasa.gov/citations/20210023324>; Scott et al., 2021, <https://arxiv.org/abs/2112.12554>; Sanders et al., 2021, <https://arxiv.org/abs/2112.12582>; Alwood et al., 2017, <https://doi.org/10.1038/s41526-016-0002-8>)

(Berliner et al., 2022 <https://doi.org/10.1038/s44172-022-00012-9>; Antonsen & Reynolds, 2020 <https://ntrs.nasa.gov/citations/20210023324>; <https://www.nasa.gov/hsp/hsp>; Antonsen et al. 2022 <https://ntrs.nasa.gov/citations/20220015709>)

# Integration into OSDR

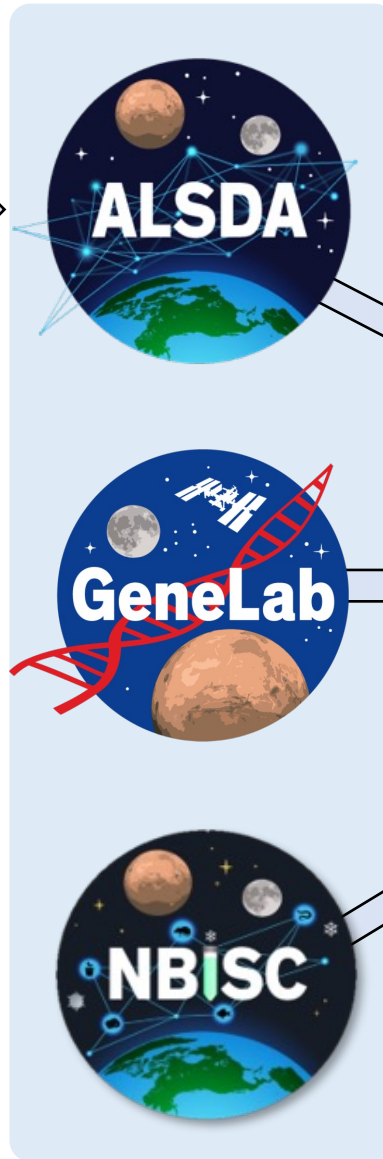
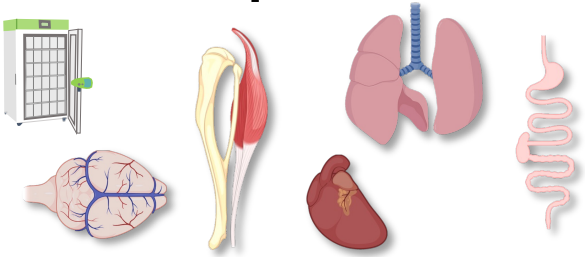
## Physiological/Phenotypic/Imaging/ Environmental Telemetry Data



## Molecular/Omics Data

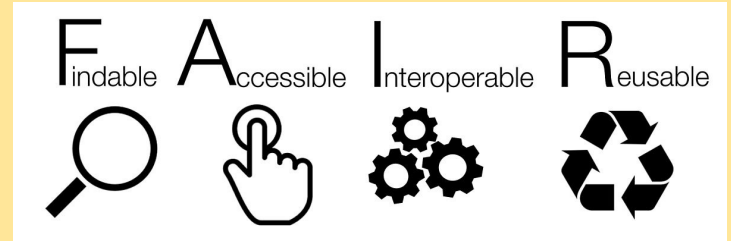


## Biospecimens



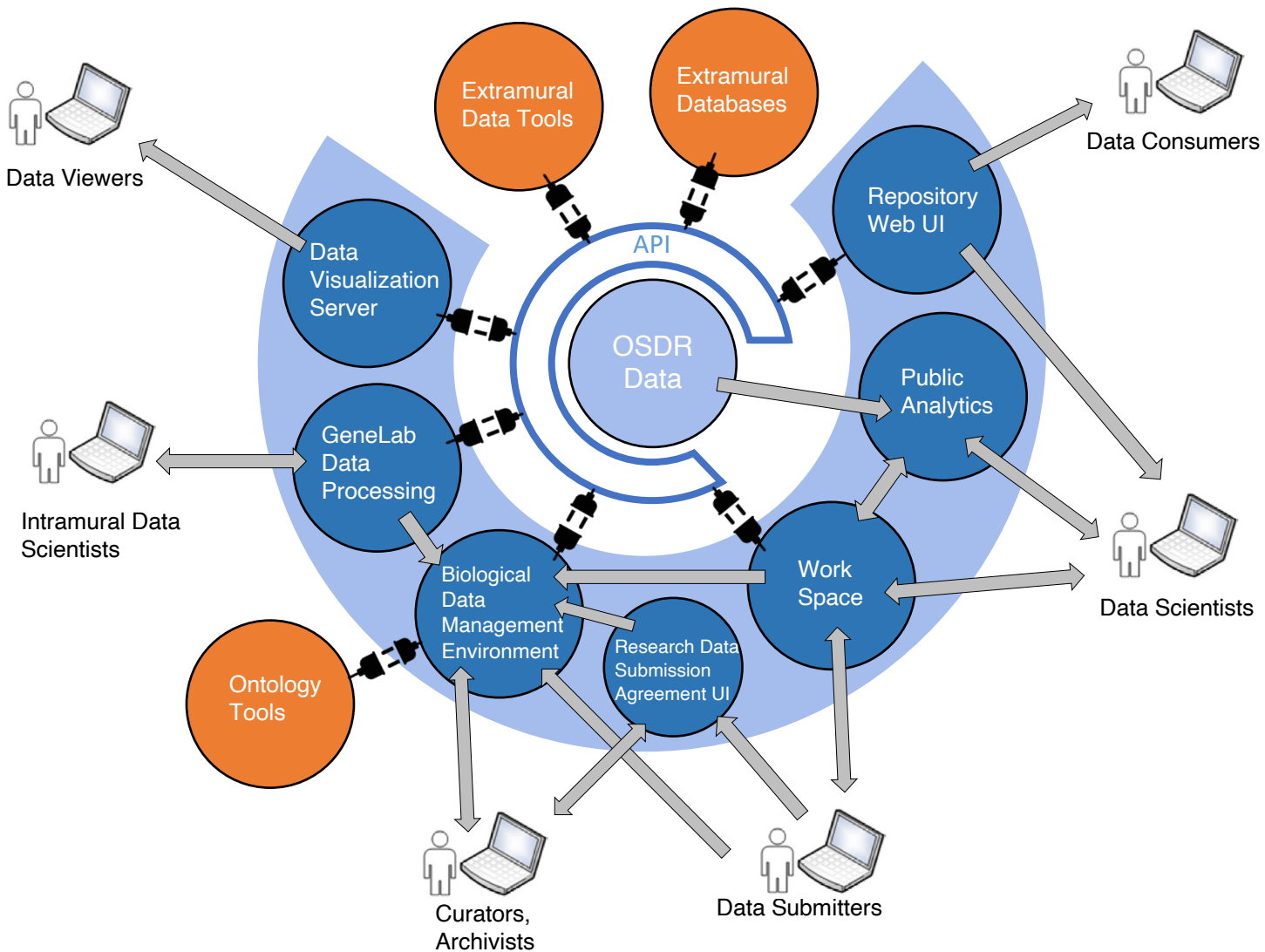
## NASA Open Science Data Repository *osdr.nasa.gov/bio*

- Single Submission Portal (BDME)
- UI Tool for Research Data Submission Agreement
- Maximally Open Access with Necessary Controls for Sensitive Data
- Data Maximally FAIR





# OSDR Ecosystem



# OSDR Successes

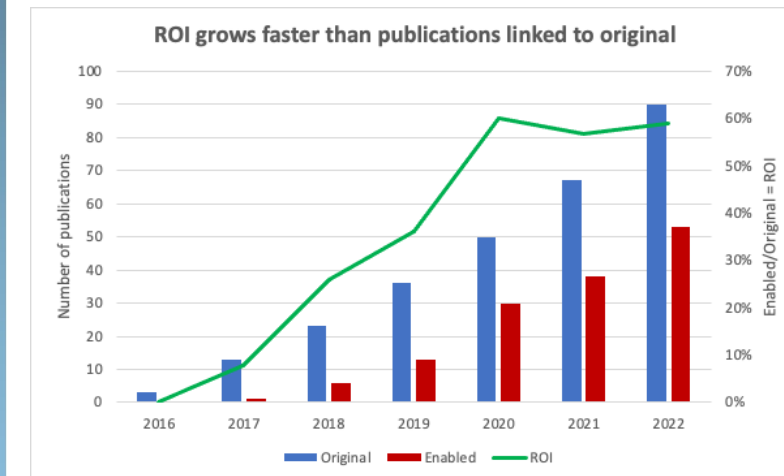
424 Studies  
 468 Datasets  
 45 Species  
 >15 Assays  
 >150TB Data

90

Original Publications linked to OSDR (GeneLab/ALSDA)

52

Publications Enabled by OSDR System, Data Sharing



*Original* – Publications with original dataset submitted to OSDR  
*Enabled* – Publications reusing data submitted to OSDR repository

# Current and Upcoming OSDR Tools

## UI for Research Data Submission Agreement

- New Grant?
- UI link to OSDR form
- Science overview
- General data types/assays
- Transfer timelines

## Visualization Portal for Omics

## Environmental Data Application

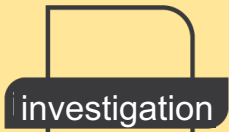
## AI/ML/KG Modeling Portal



# Breakdown of a Dataset: Architecture, Metadata, Data, FAIRness

## OSDR Data Model

Leverages/inspired by "ISAtab"



- Contacts, description, GUID, study factors, funding, provenance



- Table w/individual subject parameters, overall study design, independent variables, sample collection metadata



- Table with same individual samples with device name, device settings, targets, parameters, reagents, standards SME-driven



- Various formats to maximize reuse, machine-readable
- Tabular, text, images, video
- Molecular-omics, physiological-phenotypic-behavior-imaging
- Raw, submitted, & processed/transformed for reusability

## Open Science Dataset (OSD-488 Example)



**OSD-488** Version 1  
Characterizing SERCA of Spaceflight from R

257.05 KB

Study

Submitted Date:

28-Mar-2022

Initial Release Date:

20-Jan-2023

ALSDA ID: LSDS-13

DOI: 10.26030/3nve-tk61

Cite this Study

### Version History

Selected Version

Version 1

Updated Date: 20-Jan-2023

Changes: New data release

Files Added (4)

LSDS-13\_calc

Uptake\_Final F

LSDS-13\_catc

OSDR Submission Portal

The Biological Data Management Environment (BDME) is a web-based

software for managing and publishing data to the Open Science Data Repository.

New here, create an account

Register account

Already have a NASA Account?

Log in



Global Unique Identifiers Indexing



Secure Credentialing



### Description

Description

It is well established that microgravity exposure causes significant muscle weakness and atrophy via disproportionate loss in muscle force and size with the loss in muscle force occurring at a faster rate than muscle relaxation and maintaining low intracellular Ca<sup>2+</sup> ([Ca<sup>2+</sup>]<sub>i</sub>). SERCA dysfunction contributes to muscle weakness and atrophy observed with spaceflight. Here, we investigate and reactive oxygen/nitrogen species (RONS) protein adduction in murine skeletal muscle after 35-3 spaceflight led to drastic impairments in Ca<sup>2+</sup> uptake despite significant increases in SERCA1a protein production and elevated total protein tyrosine (T) nitration and cysteine (S) nitrosylation. Continued enhancement in Ca<sup>2+</sup> uptake, which we attribute to a shift towards a faster muscle fiber type (i.e., II), elevated total protein T-nitration and S-nitrosylation. Thus, spaceflight affects SERCA function differently from the calcium uptake (spectrofluorometry) assay.

Factor(s)

Factor

Spaceflight

Tissue

Space Mission

Organism(s)

Mus musculus

Ontology: Concept

Space Flight

tissue

Space Mission

Assay(s)

Calcium Uptake

Spectrofluorimetric Assay

Project

Project ID: PR-1, PR-9

Project Title: Rodent Research 1 (RR-1) (ARC0001146), Rodent Research 9 (RR9) (ARC0000200)

Project Type: Spaceflight Study

Flight Program: ISS

Experiment Platform: Rodent Habitat

Space Program: NASA

NASA Center: Ames Research Center (ARC)

Funding Source: This research was funded by an internal (Brook University) unrestricted grant to V.A.F. and a C. Platoro and Remondino Through the Lifespan to V.A.F. J.L.B. was supported by a CHR by a QRI doctoral award. We thank the NASA Ames Life Sciences Data Archive and the NASA Collection for the provision of the samples and the entire NASA Ames Research Center team missions. We also thank the Brook Library Open Access Publishing Fund.

Contact(s): Val A. Figardo, Jessica L. Braun, Mia S. Geronzi, Sophie I. Hamstra, Holt N. Messner



Rich Metadata



Open Metadata Metadata Normalization

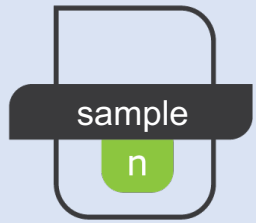


Persistent Metadata



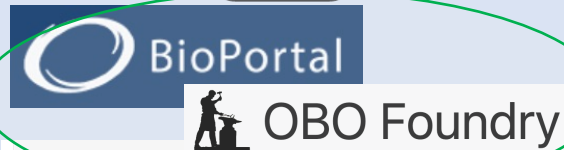
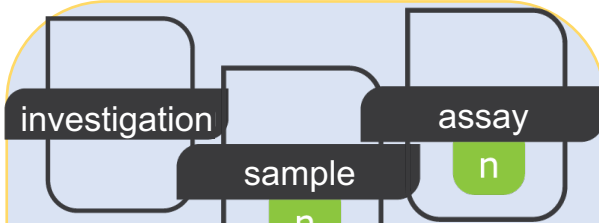
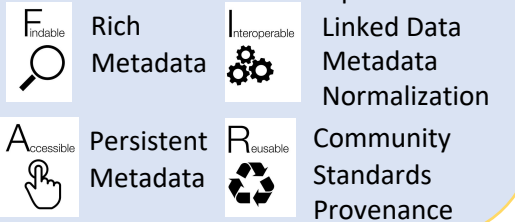
Provenance Community Standards

# Science Curation Levels for Findability, Accessibility, Interoperability, Reusability



- Individual Subject/Sample Independent Variable Metadata
- Study Design Metadata
- e.g names of muscle

Source Name	Sample Name	Inter Voxel Habitat	Parameter Value	Assay Method	Collection Condition	Parameter Value	Sample Storage %
RR9_Viv13	Viv13_sol	IUM Cage	Hut	Sample Collection	Carbon Dioxide	Collected Upon Live Return	-80 degr
RR9_Viv14	Viv14_sol	IUM Cage	Hut	Sample Collection	Carbon Dioxide	Collected Upon Live Return	-80 degr
RR9_Viv15	Viv15_sol	IUM Cage	Hut	Sample Collection	Carbon Dioxide	Collected Upon Live Return	-80 degr
RR9_Viv16	Viv16_sol	IUM Cage	Hut	Sample Collection	Carbon Dioxide	Collected Upon Live Return	-80 degr
RR9_Viv17	Viv17_sol	IUM Cage	Hut	Sample Collection	Carbon Dioxide	Collected Upon Live Return	-80 degr
RR9_Viv18	Viv18_sol	IUM Cage	Hut	Sample Collection	Carbon Dioxide	Collected Upon Live Return	-80 degr
RR9_Viv19	Viv19_sol	IUM Cage	Hut	Sample Collection	Carbon Dioxide	Collected Upon Live Return	-80 degr
RR9_Viv20	Viv20_sol	IUM Cage	Hut	Sample Collection	Carbon Dioxide	Collected Upon Live Return	-80 degr
RR9_F11	F11_sol	Int Habitat					-80 degr
RR9_F12	F12_sol	Int Habitat					-80 degr

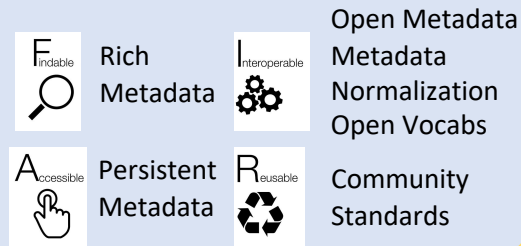


Find an ontology

Start typing ontology name, then choose from list

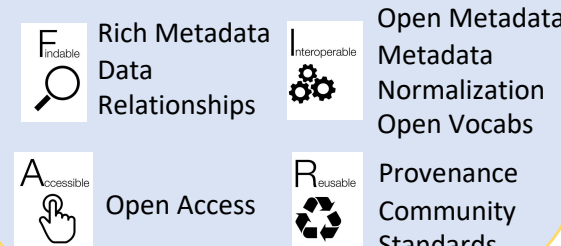
Browse Ontologies

- Spatial Behavior
- Crowding
- Orientation, Spatial
- Personal Space
- Spatial Learning
- Maze Learning
- Elevated Plus Maze Test
- Morris Water Maze Test
- Open Field Test
- Spatial Navigation
- Spatial Processing
- Territoriality



- How assay was conducted
- Dependent Variable Metadata
- Specs of device, settings, software, processing details, etc

Sample Name	Assay Name	Assay Method	Assay Condition	Assay Value	Assay Storage %
RR9_G1	GC11	Group	Control	muscd	1.0001
RR9_G2	GC11	Group	Control	muscd	1.0001
RR9_G3	GC11	Group	Control	muscd	1.0001
RR9_G4	GC11	Group	Control	muscd	1.0001
RR9_G5	GC11	Group	Control	muscd	1.0001
RR9_G6	GC11	Group	Control	muscd	1.0001
RR9_G7	GC11	Group	Control	muscd	1.0001
RR9_G8	GC11	Group	Control	muscd	1.0001
RR9_G9	GC11	Group	Control	muscd	1.0001
RR9_G10	GC11	Group	Control	muscd	1.0001
RR9_V12	Viv12	Group	Control	muscd	1.0011
RR9_V13	Viv13	Group	Control	muscd	1.0011
RR9_V14	Viv14	Group	Control	muscd	1.0011
RR9_V15	Viv15	Group	Control	muscd	1.0011
RR9_V16	Viv16	Group	Control	muscd	1.0011
RR9_V17	Viv17	Group	Control	muscd	1.0011
RR9_V18	Viv18	Group	Control	muscd	1.0011
RR9_V19	Viv19	Group	Control	muscd	1.0011
RR9_V20	Viv20	Group	Control	muscd	1.0011
RR9_F12	F12	Space	Control	muscd	1.0011
RR9_F13	F13	Space	Control	muscd	1.0011
RR9_F14	F14	Space	Control	muscd	1.0011
RR9_F15	F15	Space	Control	muscd	1.0011
RR9_F16	F16	Space	Control	muscd	1.0011
RR9_F17	F17	Space	Control	muscd	1.0011



- Raw, Processed; Submitted Transformed
- Tabular, text, imaging, video
- AWG standardized nomenclature
- AWG-vetted format templates
- Maximally human & machine-readable

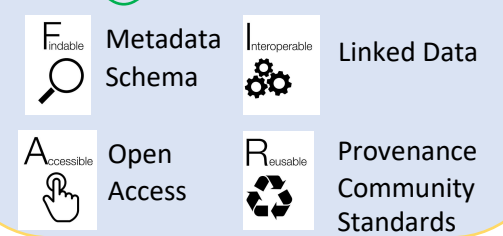
Files

Study Files Selected: 0

Search Files

- 250-488
- Calcium Uptake
- ALSDA Processed Data Files
- L205-13 Calcium Uptake\_NeuroTRANSFORMED\_73\_M4.ov
- L205-13 Calcium Uptake\_NeuroTRANSFORMED\_72\_85\_83.ov
- Original Submitted Results
- Study Metadata

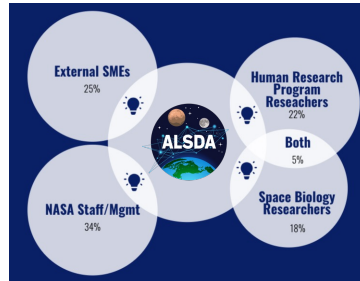
Sample Name	Assay Name	Assay Method	Assay Condition	Assay Value	Assay Storage %
RR9_G1	GC11	Group	Control	muscd	1.0001
RR9_G2	GC11	Group	Control	muscd	1.0001
RR9_G3	GC11	Group	Control	muscd	1.0001
RR9_G4	GC11	Group	Control	muscd	1.0001
RR9_G5	GC11	Group	Control	muscd	1.0001
RR9_G6	GC11	Group	Control	muscd	1.0001
RR9_G7	GC11	Group	Control	muscd	1.0001
RR9_G8	GC11	Group	Control	muscd	1.0001
RR9_G9	GC11	Group	Control	muscd	1.0001
RR9_G10	GC11	Group	Control	muscd	1.0001
RR9_V12	Viv12	Group	Control	muscd	1.0011
RR9_V13	Viv13	Group	Control	muscd	1.0011
RR9_V14	Viv14	Group	Control	muscd	1.0011
RR9_V15	Viv15	Group	Control	muscd	1.0011
RR9_V16	Viv16	Group	Control	muscd	1.0011
RR9_V17	Viv17	Group	Control	muscd	1.0011
RR9_V18	Viv18	Group	Control	muscd	1.0011
RR9_V19	Viv19	Group	Control	muscd	1.0011
RR9_V20	Viv20	Group	Control	muscd	1.0011
RR9_F12	F12	Space	Control	muscd	1.0011
RR9_F13	F13	Space	Control	muscd	1.0011
RR9_F14	F14	Space	Control	muscd	1.0011
RR9_F15	F15	Space	Control	muscd	1.0011
RR9_F16	F16	Space	Control	muscd	1.0011
RR9_F17	F17	Space	Control	muscd	1.0011



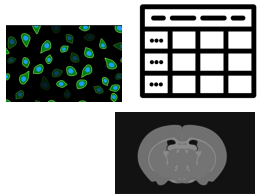


# ALSDA Analysis Working Group (~100 members)

## Community for Both Data Ingress & Egress



Standards & User Feedback for Ingestion



Standards & User Feedback for Maximal Reuse/Mining



## Assay Metadata Configurations

Accomplishments:

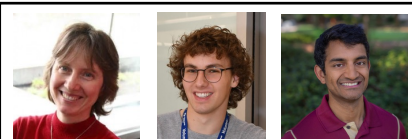
- 20 uploaded & live
- ~10 more created
- ~20 on radar

- Feedback from SMEs
- Science consensus
- Join the ALSDA AWG!
- Know OCT, MRI, clinical chemistry?

Current Configs' Available for Curation
Flow Cytometry (Flow Cytometry)
Behavior (Elevated Plus Maze)
Behavior (Novel Object Recognition)
Calcium Uptake (Spectrofluorimetry)
Protein Quantification (Western Blot)
Molecular Cellular Imaging (Light/Fluorescence Microscopy)
Bone Microstructure (Micro-Computed Tomography)
Behavior (Unconstrained Cognitive Flexibility)
Behavior (Attentional Set-Shifting)
Behavior (Object in Place)
Immunoassay (ELISA)
Behavior (Radial Arm Water Maze)
Behavior (Open Field)
Behavior (3-Chamber Social Interaction)
Behavior (Barnes Maze)
Behavior (Gait)
Echocardiogram (Ultrasonography)
Histological Assay (Histomorphometry)
Mechanical Testing (3pt/4pt Bend/Torsion)
Intra-Ocular Pressure (Tonometry)

## 'SOLSTICE' Citizen Science AWG Project

- Space Open Life Science Team for International Collaborative Exploration
- Literature Mining, Data Extraction, Meta-Analysis, and ALSDA Submission



Svetlana Komarova Mattias Neset Sunny Narayanan

- 2 posters @Canadian Space Health Research Symposium
- 2 Citizen Science grants submitted (CSA, NASA)
- Poster P23240 IWS2023 Poster Session A Today, 4:30-6p



OSD-471, 475, 474, 472, 486



~80 Citizen Scientists Recruited to Team

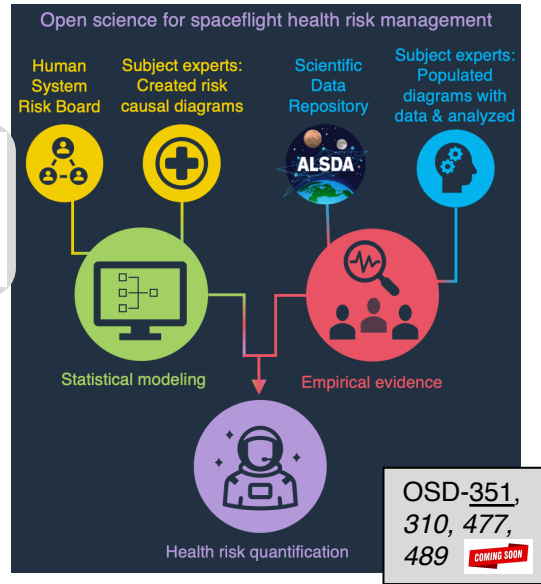
## Open Science Bioimaging Best Practices

- Accomplishments:
- Trade study/SME feedback from Jackson Labs, EBI, OME, Bioimaging North America
  - Poster Presentation at AGU2022

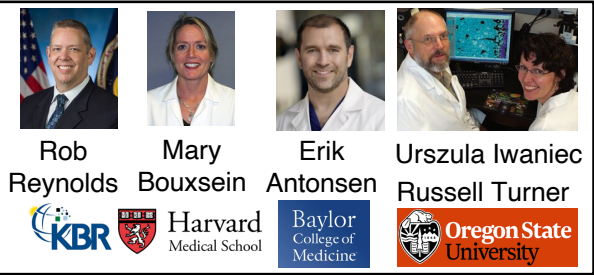
Assay/Modality Metadata	File & Format Conversions	Raw, Processed, Results, and Analysis	Visualization, Downloading
<p>Assay metadata parameters, based on domain norms. Ontology selection for interoperability</p>	<p>162 formats. OME-TIFF format; NGFF. Pixels, openness, utility, export, multiple images, pyramid (multiple resolutions)</p>	<p>Raw, processed, and image results accessible through API</p>	<p>Image viewer for users. Option, but not required to download locally. Zarr is backend ability for chunked data accession</p>

# FAIReuse Examples and Collaborations

## 1st ALSDA AWG Pub!



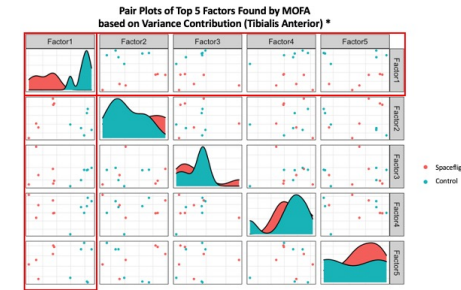
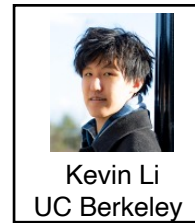
Article  
**Validating Causal Diagrams of Human Health Risks for Spaceflight: An Example Using Bone Data from Rodents**  
 Robert J. Reynolds <sup>1,\*</sup>, Ryan T. Scott <sup>2</sup>, Russell T. Turner <sup>3</sup>, Urszula T. Iwaniec <sup>3</sup>, Mary L. Bousein <sup>4,5</sup>, Lauren M. Sanders <sup>6</sup> and Erik L. Antonsen <sup>7</sup>



## Explainable AI on Muscle Loss

- RR1 & RR9 Muscle Data
- Omics & Physiological Data
- Qlattice
- Talk @ASGSR22
- Manuscript soon

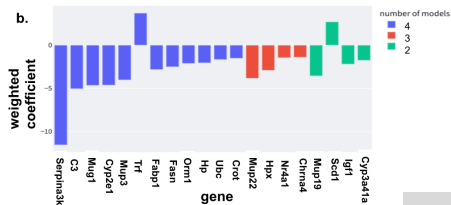
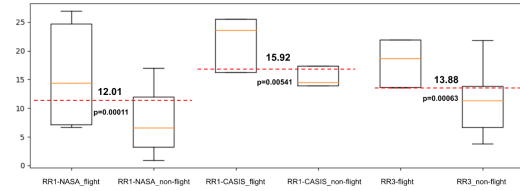
- Soleus (SOL) Muscle Data:**
- Proteomics (quantitative mass spectrometry)
  - Transcriptomics (bulk RNA-seq)
  - Epigenomics (DNA methylation)
  - Calcium Reuptake
- Tibialis Anterior (TA) Muscle Data:**
- Transcriptomics (bulk RNA-seq)
  - Epigenomics (DNA methylation)
  - Calcium Reuptake



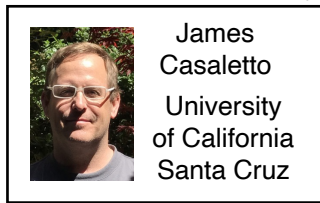
OSD-104, 105, 488

## Analyzing the Relationship Between Gene Expression and Phenotype in Space-Flown Mice Using a Causal Inference Machine Learning Ensemble

- Transcriptomics & Histology
- April 2023 'Inspiration 4/JAXA/Space Biology Package'
- Submitted to npj Microgravity

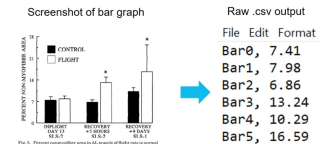
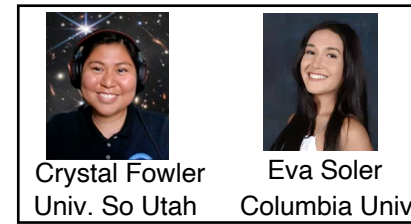


OSD-47, 48, 137, 158



## Mining Legacy Data and Data Extraction for Curation

- SLS1 & SLS2 Data
- Poster @ASGSR22

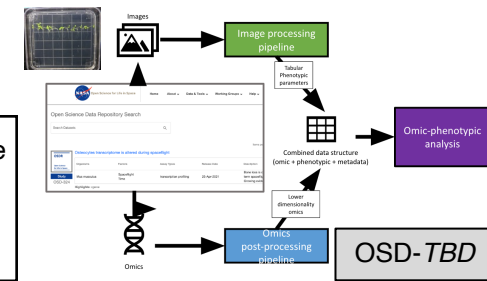
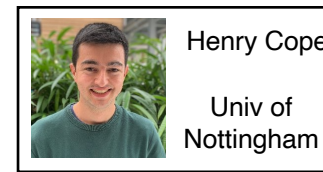


WebPlotDigitizer

OSD-TBD

## Omic to Phenotypic Pipeline w/Data Extraction from Bioimaging

- ISS/CARA Plant Data
- Manuscript soon



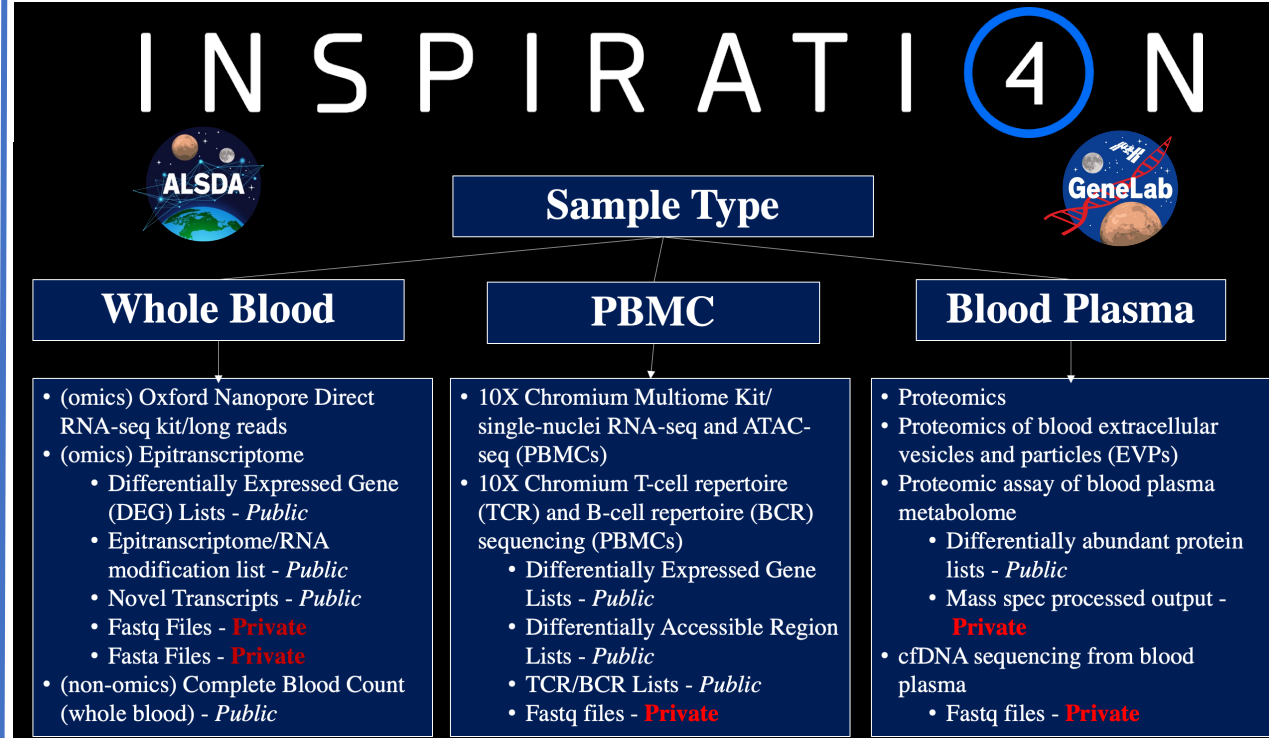


# Inspiration 4 Human Data into OSDR

## SpaceX Inspiration4 Spaceflight Omic and Medical Data Release

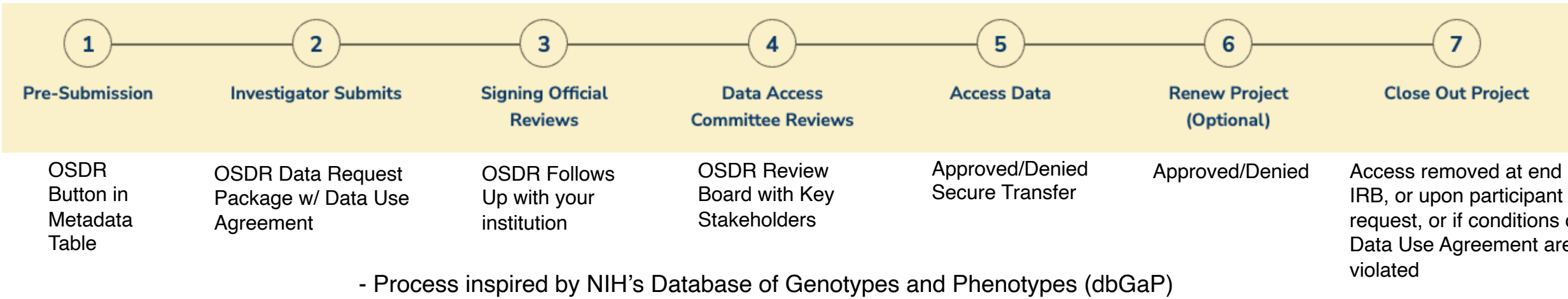
		Data Location												Descriptive Profile	Comparative Profile Differentials	Processed Data	
Samples	Assays	Raw Data	Pre-Flight			Flight			Post Flight			Recovery					
			L-92	L-44	L-3	FD1	FD2	FD3	R+1	R+45	R+82	R+194					
Blood	Whole Blood	Whole Genome Sequencing	●	●	●					●	●	●	●	✓		●	
		Clonal Hematopoiesis	●	●	●					●	●	●	●				●
		Complete Blood Count (CBC)	●	●	●					●	●	●	●				
	Serum	Direct RNA-seq	●	●	●					●	●	●	●	✓	Expressed Genes, m <sup>6</sup> A Modifications		●
		Cytokine/Chemokine Biomarker Panel	●	●	●					●	●	●	●		Biomarker Concentrations		●
		Cardiovascular Biomarker Panel	●	●	●					●	●	●	●		Biomarker Concentrations		●
	PBMCs	Comprehensive Metabolic Panel	●	●	●					●	●	●	●				
		Single-Nuclei RNA-seq	●	●	●					●	●	●	●		Expressed Genes		●
		Single-Nuclei ATAC-seq	●	●	●					●	●	●	●		Accessible Chromatin		●
		Single-Cell TCR-seq	●	●	●					●	●	●	●	✓			●
Plasma	Single-Cell BCR-seq	●	●	●					●	●	●	●				●	
	Proteomics	●	●	●					●	●	●	●		Protein Abundance		●	
	Metabolomics	●	●	●					●	●	●	●		Metabolite Abundance		●	
EVPs	cfDNA	●	●	●					●	●	●	●	✓			●	
	Proteomics	●	●	●					●	●	●	●		Protein Abundance		●	
Dried Blood Spot	Telomere qPCR	●	●	●	●	●			●	●	●	●					
Oral	Microbiome Swabs	Metagenome	●	●	●		●	●	●	●	●	●	●	✓	Microbial Taxonomies & Functions	●	
		Metatranscriptome	●	●	●		●	●	●	●	●	●	●	✓	Microbial Gene Expression	●	
Nasal	Microbiome Swabs	Metagenome	●	●	●		●	●	●	●	●	●	✓	Microbial Taxonomies & Functions	●		
		Metatranscriptome	●	●	●		●	●	●	●	●	●	●	✓	Microbial Gene Expression	●	
Skin	Biopsy	Spatially Resolved Transcriptomics	●	●	●				●	●	●	●		Expressed Genes		●	
		Metagenome	●	●	●				●	●	●	●	✓	Microbial Taxonomies & Functions	●		
		Metatranscriptome	●	●	●				●	●	●	●	✓	Microbial Gene Expression	●		

- April 2023 'Inspiration 4/JAXA/Space Biology Package'
- In Peer Review at Nature
- Credit to Chris Mason's Lab and Overbey et al., 2023



- Assays by ALSDA and GeneLab released Dataset
- 3 New ALSDA Assay Metadata Configs to Enable
  - Comprehensive Metabolic Panel (Spectrophotometry & Ion Selective Electrode)
  - Complete Blood Count (Hematology Analyzer)
  - Cytokine Panel (Multiplex)

# I4, Data Management, and OSDR Privacy Control



## Example of I4 Human Dataset Request

Assays

Assay Name: transcription profiling

Technology Platform: Illumina

Technology Type: RNA Sequencing (RNA-Seq)

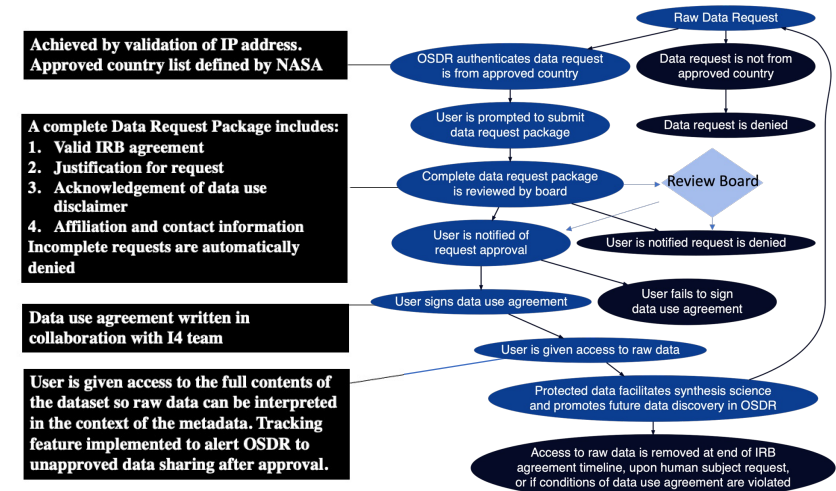
Select Export Columns

OSDR users may request data by clicking a request button above the protected data in the assay table, at the top of the dataset page or under the files tab

**Request Data**

Sample Name	Assay	Extract Name	Protocol REF	Parameter Value: Library Selection	Parameter Value: Library Layout	Protocol REF	Parameter Value: Sequencing Instrument	Parameter Value: Read Length	Assay Name	Raw Data File
GSM5808428	IA Integrity	GSM5808428	Library Construction	cDNA	SINGLE	Nucleic Acid Sequencing	NextSeq 500	75 base pair	RNA-seq	GLDS-481_rna-seq_GSM5808428_raw.fastq.gz
GSM5808429	IA Integrity	GSM5808429	Library Construction	cDNA	SINGLE	Nucleic Acid Sequencing	NextSeq 500	75 base pair	RNA-seq	GLDS-481_rna-seq_GSM5808429_raw.fastq.gz
GSM5808430	IA Integrity	GSM5808430	Library Construction	cDNA	SINGLE	Nucleic Acid Sequencing	NextSeq 500	75 base pair	RNA-seq	GLDS-481_rna-seq_GSM5808430_raw.fastq.gz
GSM5808431	IA Integrity	GSM5808431	Library Construction	cDNA	SINGLE	Nucleic Acid Sequencing	NextSeq 500	75 base pair	RNA-seq	GLDS-481_rna-seq_GSM5808431_raw.fastq.gz
GSM5808432	IA Integrity	GSM5808432	Library Construction	cDNA	SINGLE	Nucleic Acid Sequencing	NextSeq 500	75 base pair	RNA-seq	GLDS-481_rna-seq_GSM5808432_raw.fastq.gz
GSM5808433	IA Integrity	GSM5808433	Library Construction	cDNA	SINGLE	Nucleic Acid Sequencing	NextSeq 500	75 base pair	RNA-seq	GLDS-481_rna-seq_GSM5808433_raw.fastq.gz

## Approval Process Flowchart





ACKNOWLEDGE



# Open Science Data Repository

## Collaborators

### ALSDA AWG

~100 Members

### AI/ML AWG

~40 Members

### 2021 AI/ML Workshop Participants

~100 Participants

### I4 Team

C. Mason, E. Overbey

### ALSDA

- Danielle Lopez
- Evelyn Wong
- Xavier-Palmer Lewis
- Alan Wood
- Sylvain Costes

### GeneLab & Data System Support

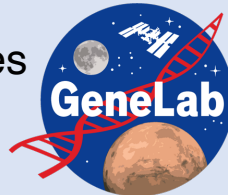
- Lauren Sanders
- San-huei Lai Polo
- Kristen Peach
- Sam Gebre
- Ana Uriarte Acuna
- Nico Garcia
- Jamie Bales
- Sylvain Costes

### AI for Life in Space

- James Casaletto
- Lauren Sanders
- David Loftus
- Graham Mackintosh
- Sylvain Costes

### NBISC

- Joey Varelas
- Alison French
- Ahleah Rohr Daniel



## Stakeholders-Management

NASA Space Biology Program

NASA Biological and Physical Sciences

NASA Human Research Program



Poster: Tues., 4:30-6:00  
Exhibit Hall A

A field guide to NASA's Life Sciences Data Repositories



Robert Beaton

Talk: Wed., 12:30-2  
Exhibit Hall B

Mapping peripheral immune signatures of mouse and human responses to space radiation for biomarker identification



Lauren Sanders

Poster: Wed., 3:45-5:15  
Exhibit Hall A

Spaceflight environmental-telemetry data for biological science



Danielle Lopez

Poster: Wed., 3:45-5:15  
Exhibit Hall A

Discovery through biospecimen sharing: The NASA Biological Institutional Scientific Collection (NBISC)



Joseph Varelas

Talk: Thur., 1:30-3:00  
Grand Ballroom B

Genomic and phenotypic predictors of human ex vivo sensitivity to simulated deep space radiation



Sylvain Costes