National Aeronautics and Space Administration

Biological and Physical Sciences

GeneLab: Enabling discovery through Open Science

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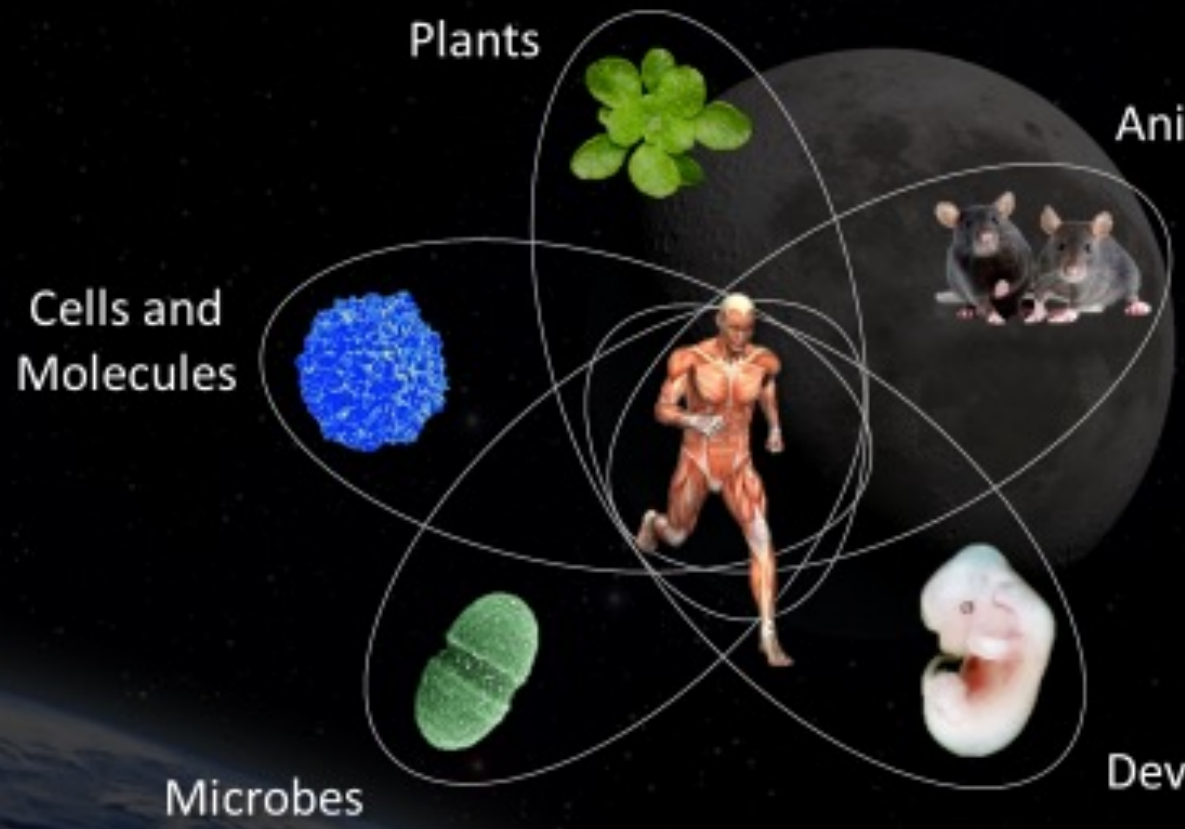
To pursue safe and successful space exploration Space Biology investigates five elements:



Basic life processes → Applications for human space travel

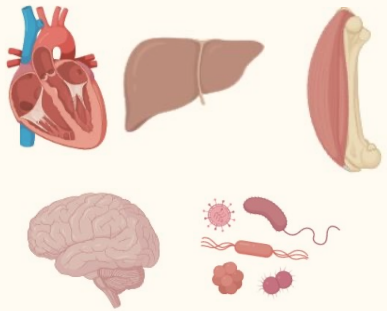
NASA Biological Open Science Resources

Biospecimen Sharing Program (BSP)

- *Dissects and preserves* rodent tissues from Flight and Ground investigations
- *Coordinates* internal tissue sharing

NASA Biological Institutional Scientific Collection (NBISC)

- *Collection* of non-human specimens and space microbial culture



Ames Life Sciences Data Archive (ALSDA)

- *Collects and curates* mission, project and imaging data

GeneLab (GL)

- *Collects and curates* omics data

GeneLab

www.genelab.nasa.gov

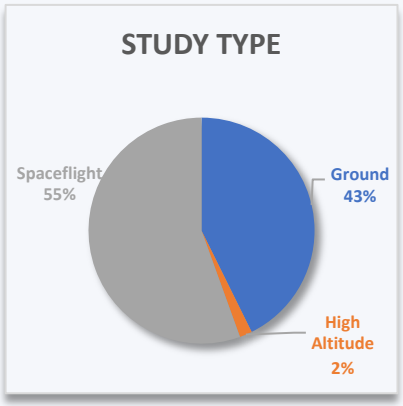
378 Studies

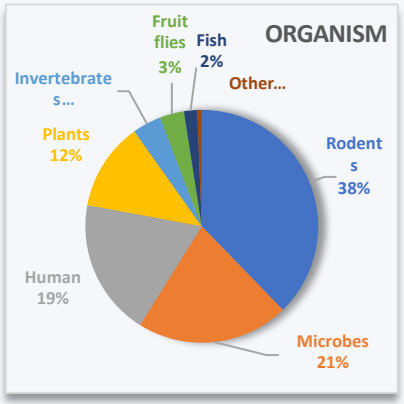
429 Datasets

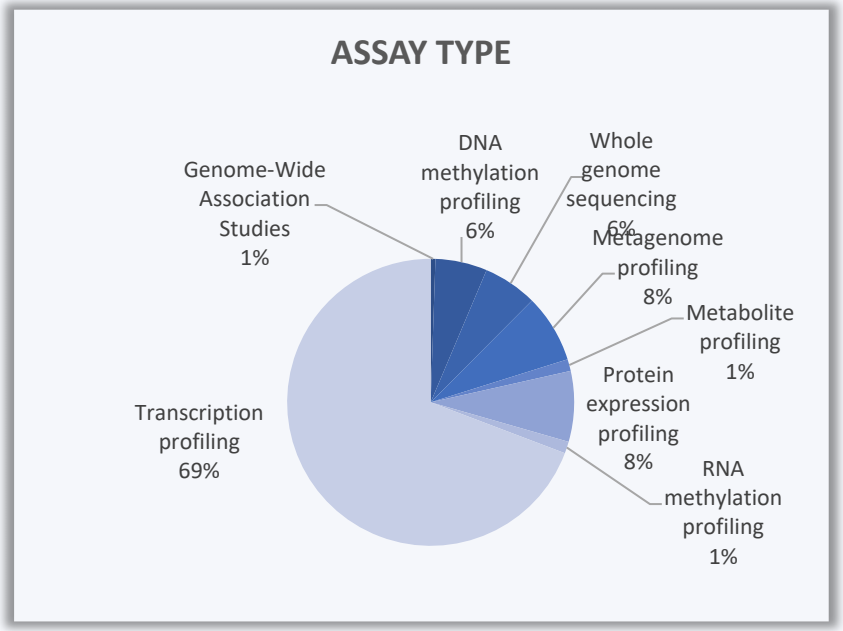
45 Species

>10 Assays

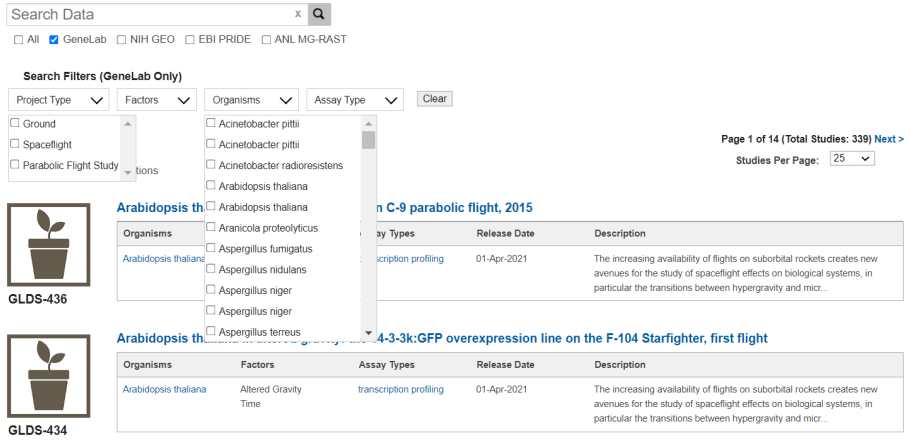
>130 TB Data



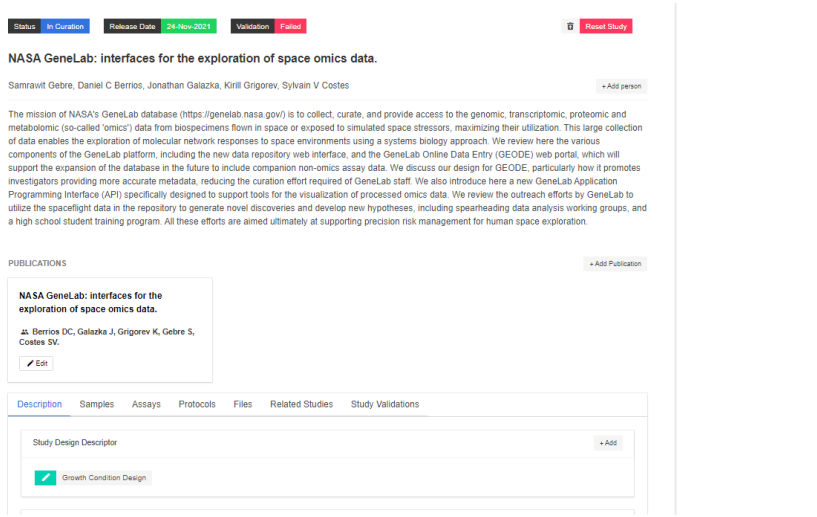




DISCOVER

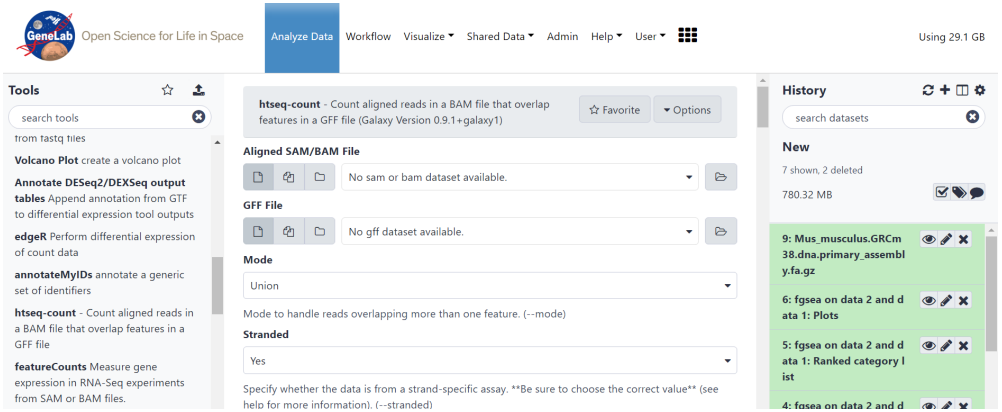


CONTRIBUTE



EXPLORE

ANALYZE



Opportunities for Students & Educators

GeneLab for High Schools (GL4HS): A four-week intensive training summer program for rising high school juniors and seniors to learn bioinformatics and computational biology methods and techniques to analyze space omics data.

Learn more and apply at: https://www.nasa.gov/ames/genelab-for-high-schools

GeneLab for Colleges/Universities (GL4U):

For educators and students to learn how analyze omics data using GeneLab standard pipelines and space-relevant data

Access to course materials: https://github.com/nasa/GeneLab-Training/tree/main/GL4U

SLSTP: Provides undergraduate students entering their junior or senior years, and entering graduate students, with professional experience in space life science disciplines including:

Applications open! https://www.nasa.gov/ames/research/space-life-sciences-training-program

Connecting the world through science

- *Kicked-off on January 25th, 2018*
- *150+ scientists from multiple space agencies, international institutions, and industry.*
- *Scientists meet monthly with each group to analyze data in the GeneLab repository.*
- Published over 10 collaborative peer-reviewed papers
- **Join the breakout sessions today to learn more and sign up!**

ANIMAL

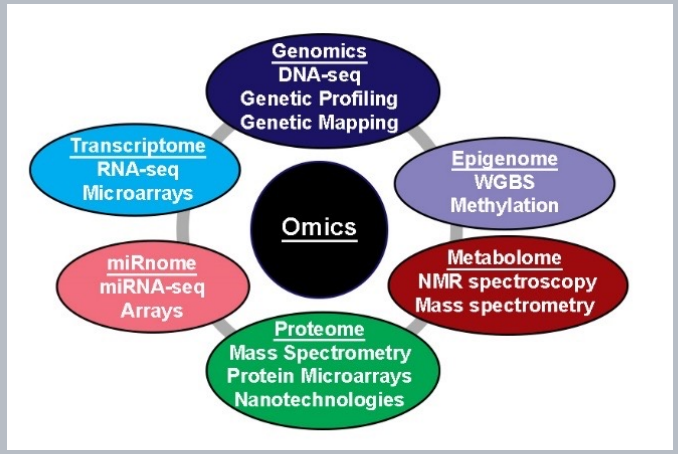
68 members

Facilitates the use of omics in understanding basic mechanisms by which animals and constituent tissues and cells adapt to the spaceflight environment.

MULTI-OMICS

181 members

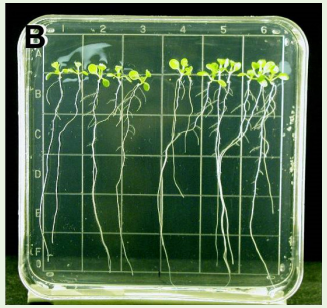
Interactions between the different omics to provide a better understanding of the systemic response.



PLANTS

58 members

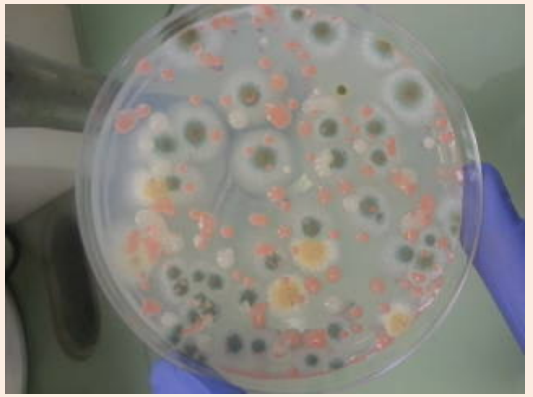
Share and discuss the latest developments in ***AstroBotany*** *– the discipline of botany concerned with interactions between plant biology and space environment.*



MICROBES

50 members

Focuses on analyzing microbial datasets within GeneLab that includes gene-expression, proteomic, metabolomic and environmental metagenomic datasets.



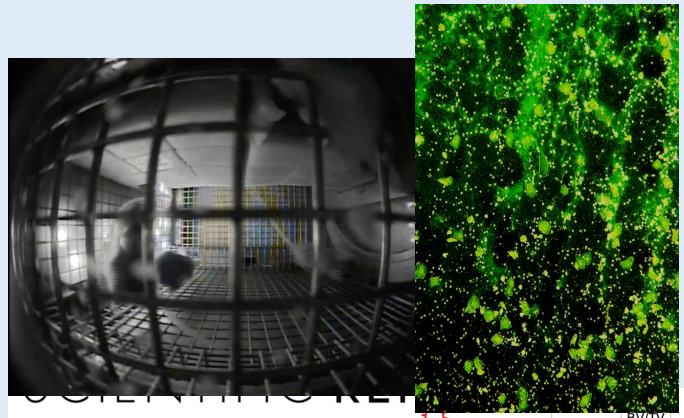
Ames Life Sciences Data Archive (ALSDA) and its AWG

ALSDA

- Data from Human Research Program and Space Biology
- Phenotypic-Physiological-Behavioral-Level Data
- Federated with GeneLab (Omics-Level Data)

AWG: ~150 members

- Recruiting members to support data standards and novel methods to analyze cross mission and platform data
- Establish standards for various assays' metadata
- Provide feedback on database and tools



OPEN

Microgravity induces proteomi
changes involved in endoplasm
reticulum stress and mitochon
protection

Received: 01 June 2016
Accepted: 05 September 2016

ORIGINAL ARTICLE

JBM

Inner Ear Vestibular Signals Regulate Bone Remodeli
via the Sympathetic Nervous System

Guillaume Vignaux,[1] Jean DLC Ndon

[1]Department of Medicine, Vanderbilt University
[2]Department of Orthopaedic Surgery & Rehabilita
Vanderbilt Center for Bone Biology, Nashville, T

TRT	Mouse #	BV/TV (%)	Mean	SD	SE	CV (%)	(1/mm³)	M
CTL	2	21.24					221.19	
CTL	11	22.60					230.26	
CTL	16	23.39					227.63	
CTL	18	23.08					278.20	
CTL	20	21.32					209.89	
CTL	30	22.52					248.13	
CTL	40	21.62					225.86	
CTL	50	21.82					235.42	
CTL	59	22.00					231.38	
CTL	62	20.52	22.01	0.89	0.28	4	241.18	23
HLU	9	19.75					212.04	
HLU	14	19.84					264.40	
HLU	17	15.70					223.30	
HLU	34	17.76					219.51	
HLU	51	21.63					238.95	
							229.40	
							263.83	
							266.46	
							252.28	
							265.08	24

	TbTh. (02/02/16)	LSM	Std. Error		N
4	HU,Loaded,Vehicle	0.058349	0.001322	0.0037402	8
8	HU,Loaded,Zolendronate	0.059839	0.001399	0.0039583	8
3	HU,No Compress,Vehicle	0.04973	0.001322	0.003740	
7	HU,No Compress,Zolendron	0.0549	0.001399	0.0039583	
2	NA,Loaded,Vehicle	0.058587	0.001616	0.0042755	
6	NA,Loaded,Zolendronate	0.062817	0.001275	0.0036060	
1	NA,No Compress,Vehicle	0.052693	0.001616	0.0042755	
5	NA,No Compress,Zolendron	0.056735	0.001275	0.0036060	

	TbN. (02/02/16)	LSM	Std. Error		
4	HU,Loaded,Vehicle	2.6581136	0.15513024	0.4387745	
8	HU,Loaded,Zolendronate	3.51881173	0.16461955	0.465614	
3	HU,No Compress,Vehicle	2.18411235	0.15513024	0.4387745	
7	HU,No Compress,Zolendronat	3.37023673	0.16461955	0.465614	
2	NA,Loaded,Vehicle	3.09758836	0.18195737	0.48141395	7
6	NA,Loaded,Zolendronate	3.8183936	0.15339879	0.4338773	8
1	NA,No Compress,Vehicle	2.69824693	0.18195737	0.48141395	7
5	NA,No Compress,Zolendronat	3.7565211	0.15339879	0.4338773	8

Analysis Working Groups

Charter

Purpose

- The purpose of the GeneLab Analysis Working Groups (AWGs) is to optimize the processing of raw omics data from the GeneLab repository in order to maximize the gain of new knowledge from such complex datasets. The AWGs will also assess and improve the effectiveness of the GeneLab Data System (GLDS) through intensive utilization of the analytics to be deployed therein.

Organization and Function

- The AWGs aspire to scientific excellence, and participation in **AWGs is strictly on a volunteer basis.** The primary activity of each AWG is to establish analytical processes to generate higher order data from data housed in the GLDS with relevance to one or more specific application areas. For example, a mammalian AWG would analyze all data relevant to mammalian systems (human, mouse, rat, etc.). The GeneLab AWGs aspire to yield:
  - *Canonical data analysis pipelines*
  - *Processed ("higher-order") space biology data.*
  - *Critiques of the GLDS.*
  - *Scientific communication of available analyses and interpretations.*

Precisely how each AWG reaches these goals will be determined by the AWGs themselves, but, in general, AWGs should hold frequent in-person or virtual meetings to organize work and review progress. The schedule for delivering the above products is set by the Chair in consultation with GeneLab and the other AWG participants.

Analysis Working Groups

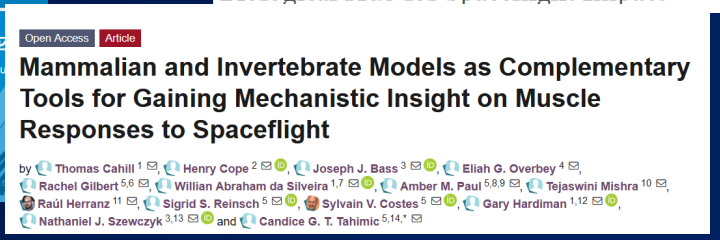
Charter

Expectations for AWG Participation

- Participation in GeneLab AWGs is open to all investigators (academic, government, private sector); however, participants must be willing to:
  - – Contribute significantly to the goals of the AWG.
  - – Take part in group activities including periodic teleconferences. Participants are expected to actively contribute to the group goals (see above).
  - – Share AWG products with other AWG participants via the collaborative workspace provided by the GLDS.

Benefits of AWG Participation

- By participating within a GeneLab AWG, investigators will join a group of scientific excellence and may co-author a landmark paper. They will help set data and analysis standards for the community, and may develop relationships that could lead to additional collaborations.



10:40 – 11:40 am PT: *GeneLab Grant Recipients*

Sushma Naithani, PhD
Oregon State University
10:40 - 11:00 am

Sarah Wyatt, PhD
Ohio University
11:00 - 11:20 am

Pankaj Jaiswal, PhD
Oregon State University
11:20 - 11:40 am

10:10 – 10:40 am PT: *Keynote Speaker*

Kathleen "Kate" Rubins, PhD
NASA Astronaut
10:10 - 10:40 am

11:40 – 12:30 pm PT: *AWG Status Updates*

Nathaniel Szewczyk, PhD
Ohio University
11:40 - 11:50 am

Braden Tierney, PhD
Weill Cornell Medicine
11:50 am- 12:00 pm

Afshin Beheshti, PhD
NASA ARC
Broad Institute
12:00 - 12:10 pm

Colin Kruse, PhD
Lawrence Livermore National Labs
12:10 - 12:20 pm

Ryan Scott, MS
NASA ARC
12:20 - 12:30 pm

12:30 – 12:50 pm PT:

Break

12:50 – 1:15 pm PT: *AWG Early Career Lightning Science Talks*

Henry Cope
University of Nottingham
12:50 - 12:55 pm

Jaden Hastings, PhD
Weill Cornell Medicine
12:55 – 1:00 pm

Rebecca Finch, MS
Staffordshire University
1:00 - 1:05 pm

Emma Canaday
Ohio University
1:05 - 1:10 pm

1:15 – 2:30 pm PT: *AWG Science Talks*

Richard Barker, PhD
University of Wisconsin - Madison
1:15 - 1:30 pm

Nicholas Brereton, PhD
University of Montreal
1:30 - 1:45 pm

Jean Calleja Agius, PhD
University of Malta
1:45 – 2:00 pm

Erik Antonsen, PhD
Baylor College of Medicine
2:00 – 2:15 pm

Masafumi Muratani, PhD
University of Tsukuba
2:15 - 2:30 pm