

Project Introduction

GeneLab collects and enables analysis of spaceflight and ground-based spaceflight simulation genomic data, RNA and protein expression, and metabolic profiles. It interfaces with other existing databases containing spaceflight omic data. The 2011 National Research Council (NRC) Decadal Survey on NASA Life and Physical Sciences called for increased opportunities for multi-investigator spaceflight opportunities and greater use of genomic approaches to meet the needs of NASA researchers. To address these recommendations of the NRC Decadal Survey, the Space Life and Physical Sciences Research and Applications Division of NASA's Human Exploration and Operations Mission Directorate has initiated a transition to an Open Science architecture to increase research opportunities, and has developed the GeneLab Platform based on highly leveraged and integrated bioinformatics analytics. GeneLab is an interactive, open-access resource where scientists can upload, download, store, search, share, transfer, and analyze omics data from spaceflight and corresponding analogue experiments. Users can explore GeneLab datasets in the Data Repository, analyze data using the Analysis Platform, visualize high-order data and create collaborative projects using the Collaborative Workspace. Our primary goal is to maximize the utilization of the valuable biological research conducted aboard the International Space Station (ISS) by collecting genomic, transcriptomic, proteomic, and metabolomics data known as "omics". By providing a portal linking processed data to flight parameters, GeneLab enables exploration of the molecular network responses of terrestrial biology to the space environment. This allows researchers to understand the complex responses of biological systems to the space environment. This technology development activity was transferred from the Human Exploration and Operations Mission Directorate to the Science Mission Directorate Division of Biological and Physical Sciences (BPS) in October 2020.

Anticipated Benefits

NASA Biological and Physical Sciences (previously known as NASA Space Life and Physical Sciences) have developed new technology tools to enable 21st century genomic data analysis, and to create an online communication hub where scientists, researchers, teachers and students can connect with their peers, share their results, and communicate with NASA. These data sets have been made open to the scientific research community (academic and commercial) to encourage innovation and competition in the analysis and dissemination of the data. NASA incentivizes the use of ISS-derived scientific data by offering numerous grants to drive the research required to translate the GeneLab Platform data into information that will greatly increase the knowledge and discovery output from what would have traditionally been a single Principal Investigator opportunity. This requires that NASA work with outside partners to assure the GeneLab informatics system can interface with, and leverage other existing databases for genomic, transcriptomic, proteomic, metabolomics, and systems biology, ensuring the contemporary relevance of

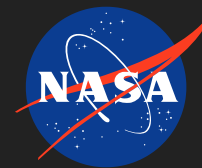


Open Science for Life in Space

GeneLab Project logo

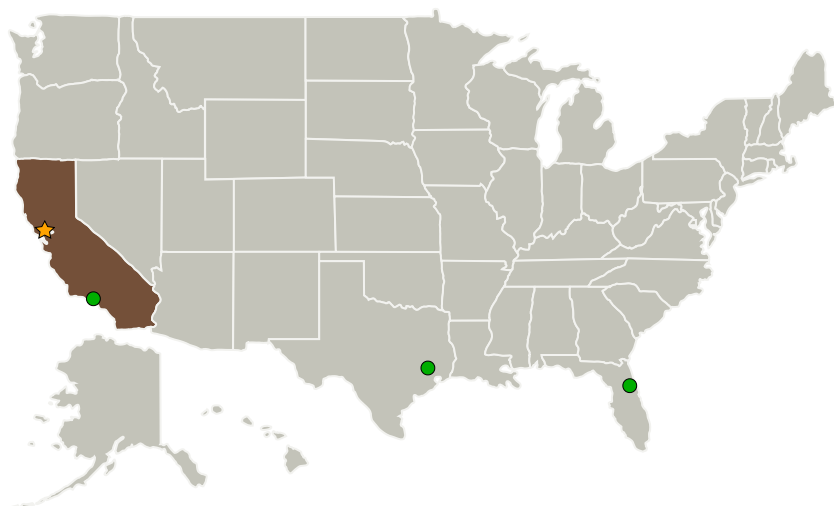
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this platform. GeneLab data will be useful for the development of countermeasures, monitoring the microbes that colonize the space station, understanding how plants (food) could be modified to grow better in space, and unraveling the responses of humans and other organisms to the combined effects of altered gravity and space radiation.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, CA
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, CA
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, TX
● Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, FL

Organizational Responsibility

Responsible Mission Directorate:

Human Exploration and Operations Mission Directorate (HEOMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Space Biology Program

Project Management

Program Directors:

Craig E Kundrot
Diane C Malarik

Program Manager:

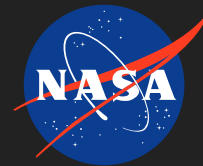
Nicole A Rayl

Project Manager:

Sylvain V Costes

Principal Investigator:

Jonathan M Galazka



Co-Funding Partners	Type	Location
Science Mission Directorate(SMD)	NASA Mission Directorate	

Primary U.S. Work Locations
California

Images



GeneLab

GeneLab Project logo
(<https://techport.nasa.gov/image/39995>)

Links

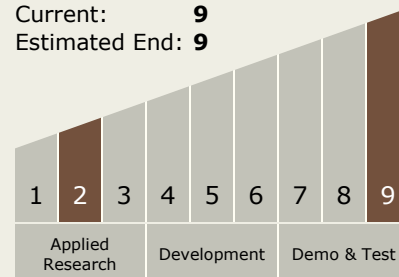
GeneLab informational video
(https://genelab.nasa.gov/genelab_video)

Project Website:

<http://genelab.nasa.gov>

Technology Maturity (TRL)

Start: 2
Current: 9
Estimated End: 9



Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
 - TX11.4 Information Processing
 - TX11.4.4 Collaborative Science and Engineering

Target Destinations

Earth, Mars, Foundational Knowledge

Supported Mission Type

Planned Mission (Pull)