Activity 1: Labeling the Parts of a Flowering Plant

Curricular Unit
Student Materials

Instructions: Label the parts of the model plant and write a function for each part.

Brassica Image Credit: Yang, C., Zhang, C., Lu, Y., Jin, J., & Wang, X. (2011). The mechanisms of brassinosteroids' action: from signal transduction to plant development. *Molecular plant, 4 4*, 588-600 .

Activity 2: Model Organisms

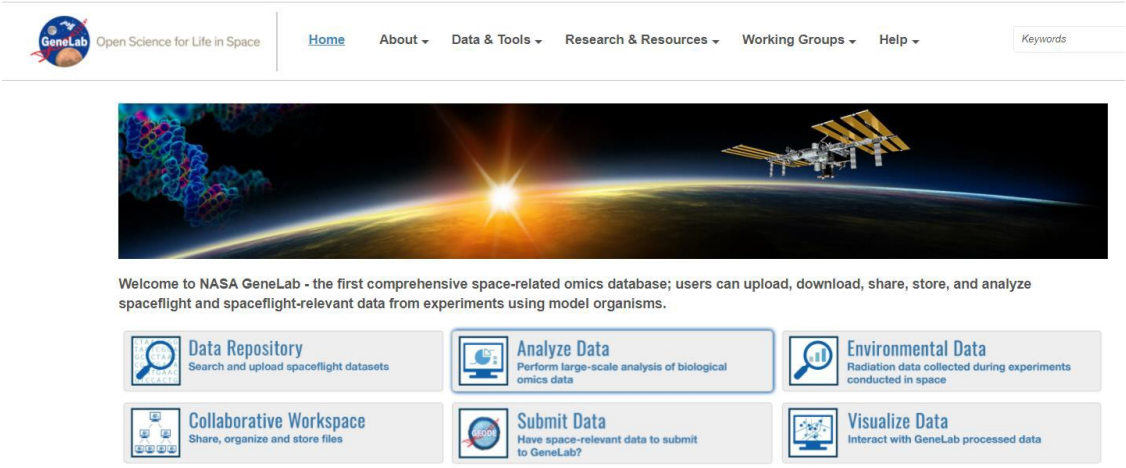
Instructions: Complete the chart below using the links provided to retrieve information and to address each of the questions in the header.

	What is one area of research in which this organism is used?	Why is it a good model organism for this area of study?	What else makes it a good model organism?
Fruit fly (*Drosophila melanogaster*)			
Wall cress (*Arabidopsis thaliana*)			
Nematode (ex: *Caenorhabditis elegans*—called *C. elegans*)			
Rodents (ex: mouse, *Mus musculus*)			

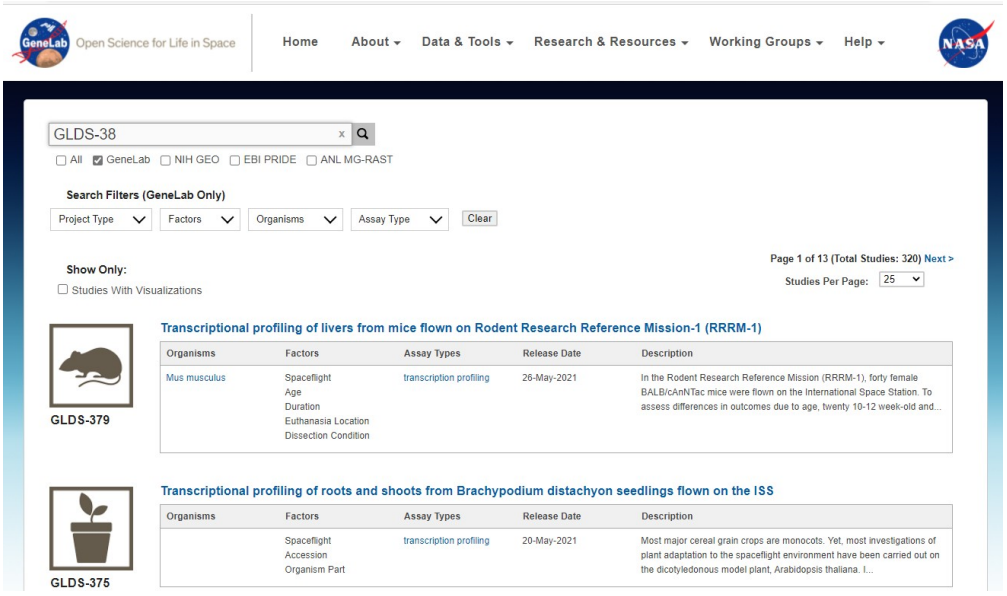
Activity 3: Metadata Analysis Using GLDS-38

Curricular Unit
Student Materials

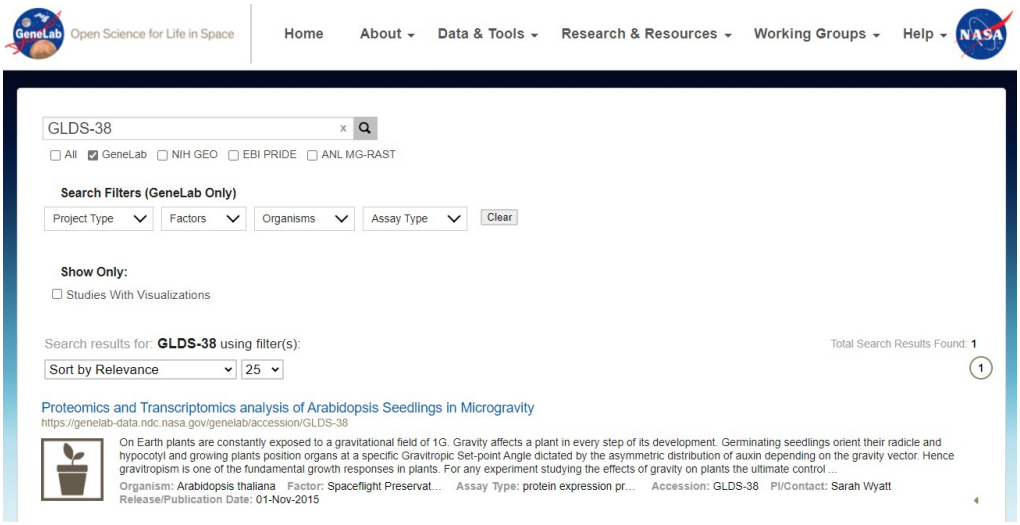
Instructions: Navigate a web browser to [NASA GeneLab: Open Science for Life in Space]



Once on the site, click on **Data Repository** and search for **GLDS-38**.



This will bring you to the study that we will be analyzing in this curricular unit**,** Proteomics andTranscriptomics analysis of Arabidopsis Seedlings in Microgravity.



Click on the hyperlink that corresponds to the study "Proteomics and Transcriptomicsanalysis of Arabidopsis Seedlings in Microgravity**"**.

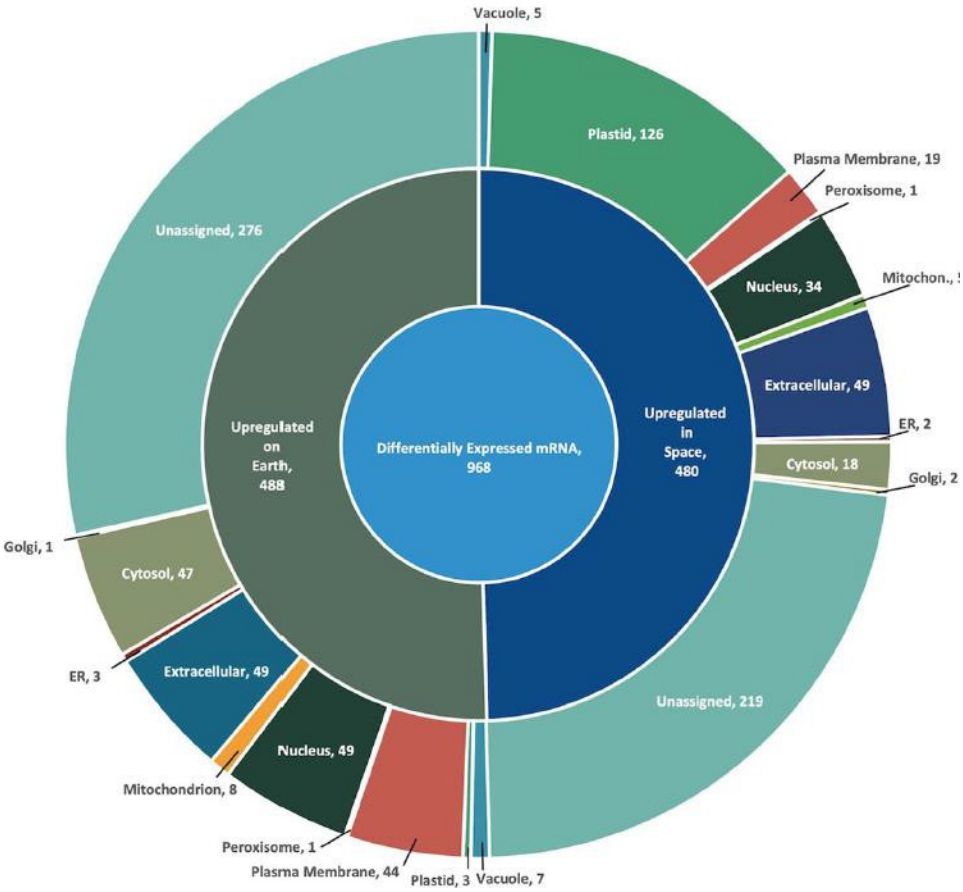
1. According to the **Study Description**, what is one of the fundamental growth responses in plants? What is the ultimate control for any experiment studyingthe effects of gravity in space?

2. What is the model organism for this study?

3. In the **Samples** section under **Factor Value**, what two groups are being compared in the study? What is being compared?

4. Under the **Protocol** section, how was nucleic acid extracted? What platform wasused to sequence it?

5. Look at the figure below.



The figure shows an overview of transcripts differentially expressed duringspaceflight. How do the upregulated in space compare to those on earth?

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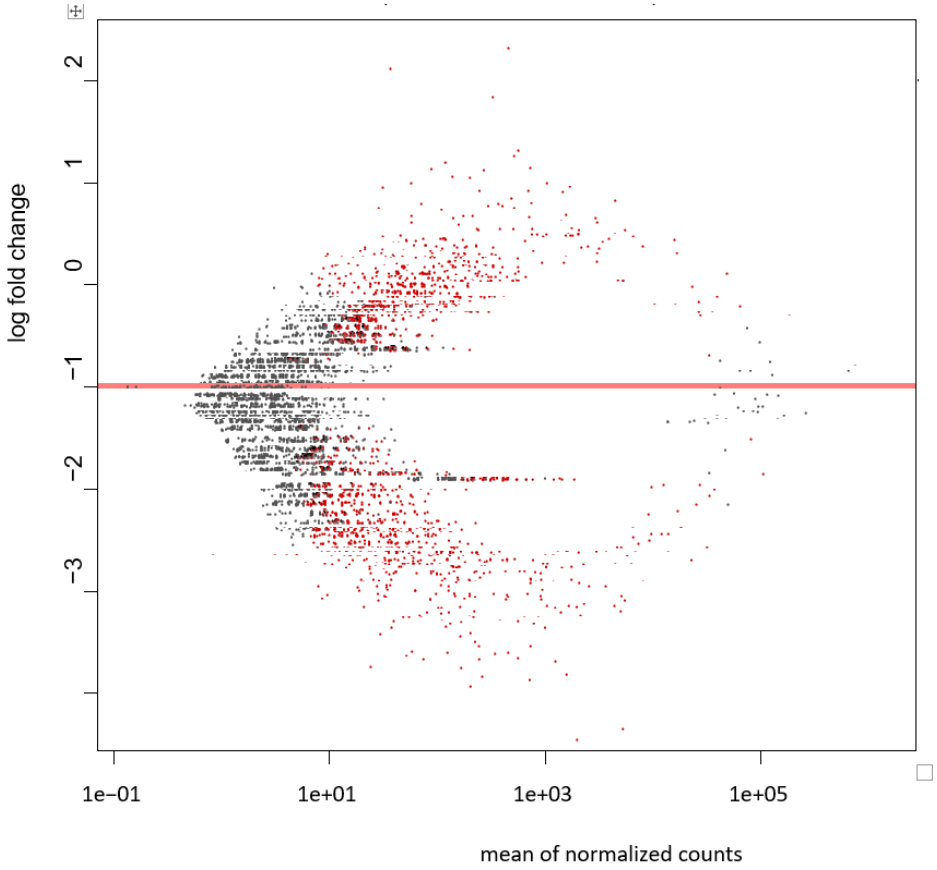
Activity 4: Arabidopsis Study (GLDS-38) MA-plot for Spaceflight vs Ground Control

Curricular Unit
Student Materials

Instructions: Look at the MA plot below and answer the questions.



1. **What do the dots represent?**
2.

3. **What do the red dots represent?**

4. **After discussing the impacts of spaceflight on plants and looking at the MAplot, what can you infer?**

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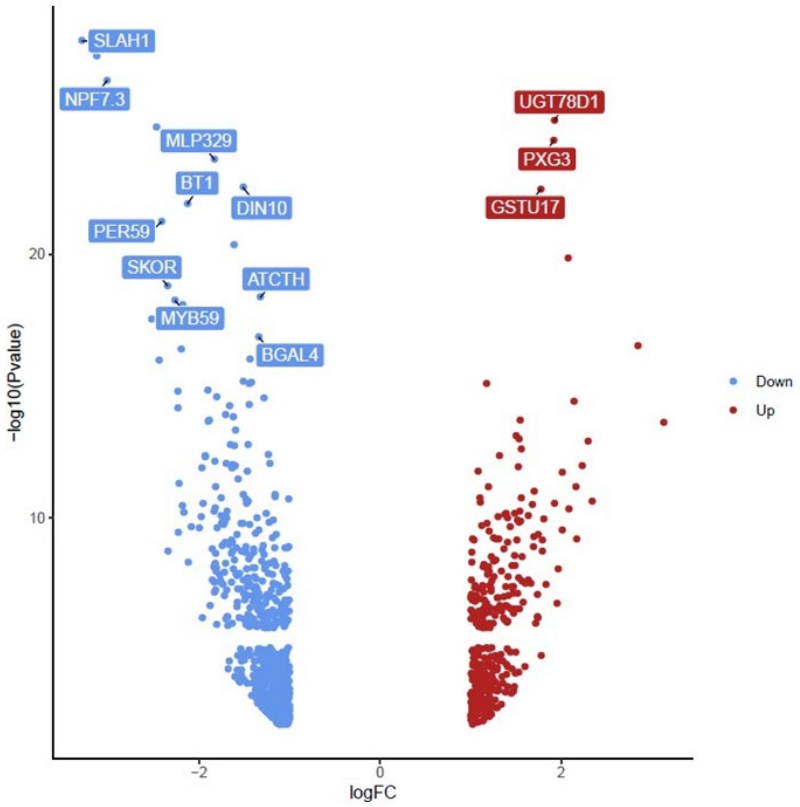
Activity 5: Arabidopsis Study (GLDS-38) Volcano Plot

Instructions: Look at the volcano plot below and answer the questions.



1. **What do the blue dots on the volcano plot represent?**

2. **What do the red dots on the volcano plot represent?**

3. **Which gene was the most downregulated? Upregulated?**

4. **Go to TAIR - Home Page (arabidopsis.org) and search for the function of these genes.** Propose reasons that explain why regulation of these genes would change in space. (*You will learn more about genes and their expression in a future lesson.)*