



Plants and Space

A snapshot

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Plants in microgravity / non 1 *g* gravity

- Finding mechanisms hidden by gravity
- Finding mechanisms underlying responses to microgravity
- Bioregenerative Life Support (BLISS)

Spaceflight – plant research

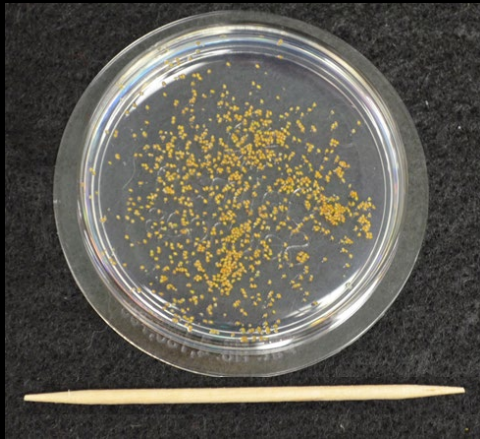
Approaches

1. Proteomics
2. RNAseq
 1. sRNA regulation
 2. Gravi-course
3. DNA integrity
4. GeneLab/ AWGs

Hardware

- BRIC/PDFU
- Veggie
- Advanced Plant Habitat

Petri Dish Fixation Unit (PDFU)

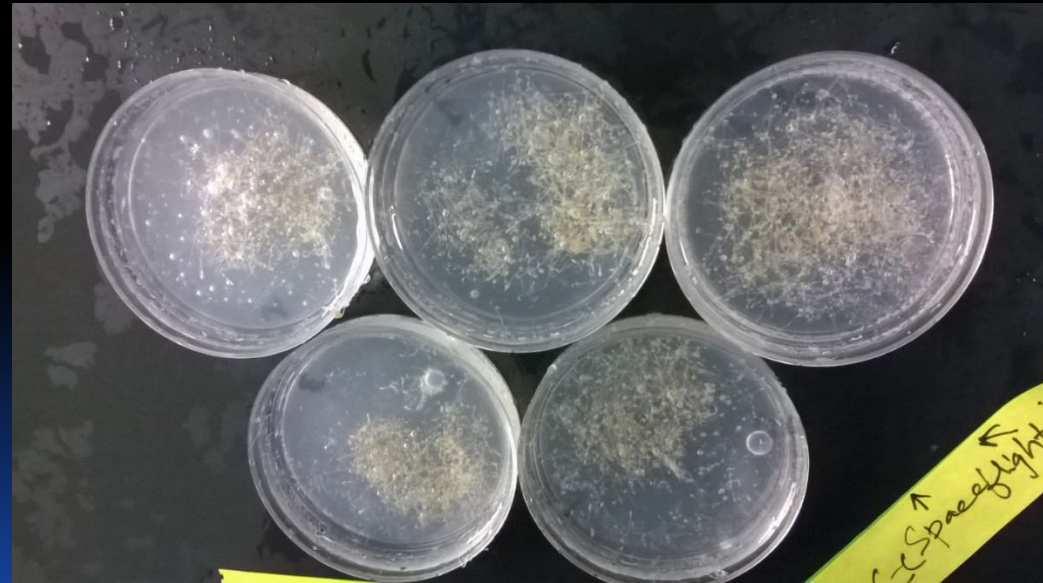
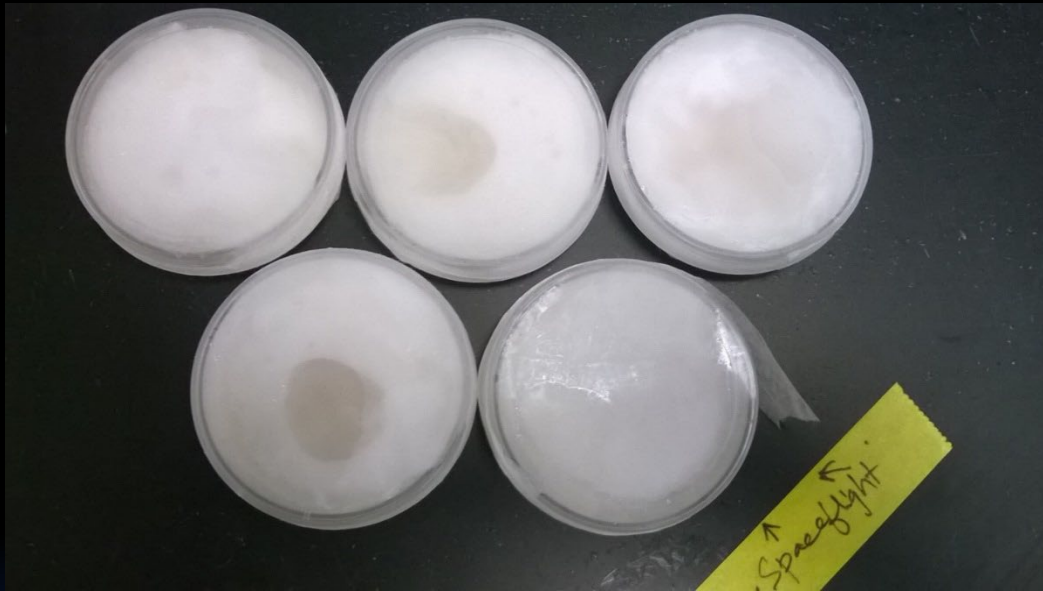


Seeds are plated..

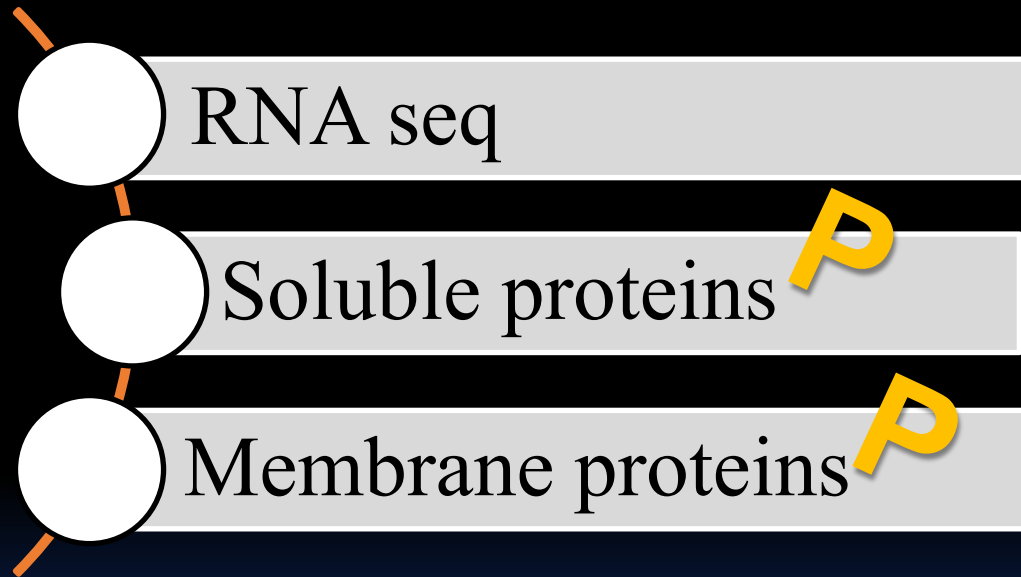
and loaded into
PDFUs!



What we got back



Data Sets and Metadata



Veggie on the International Space Station



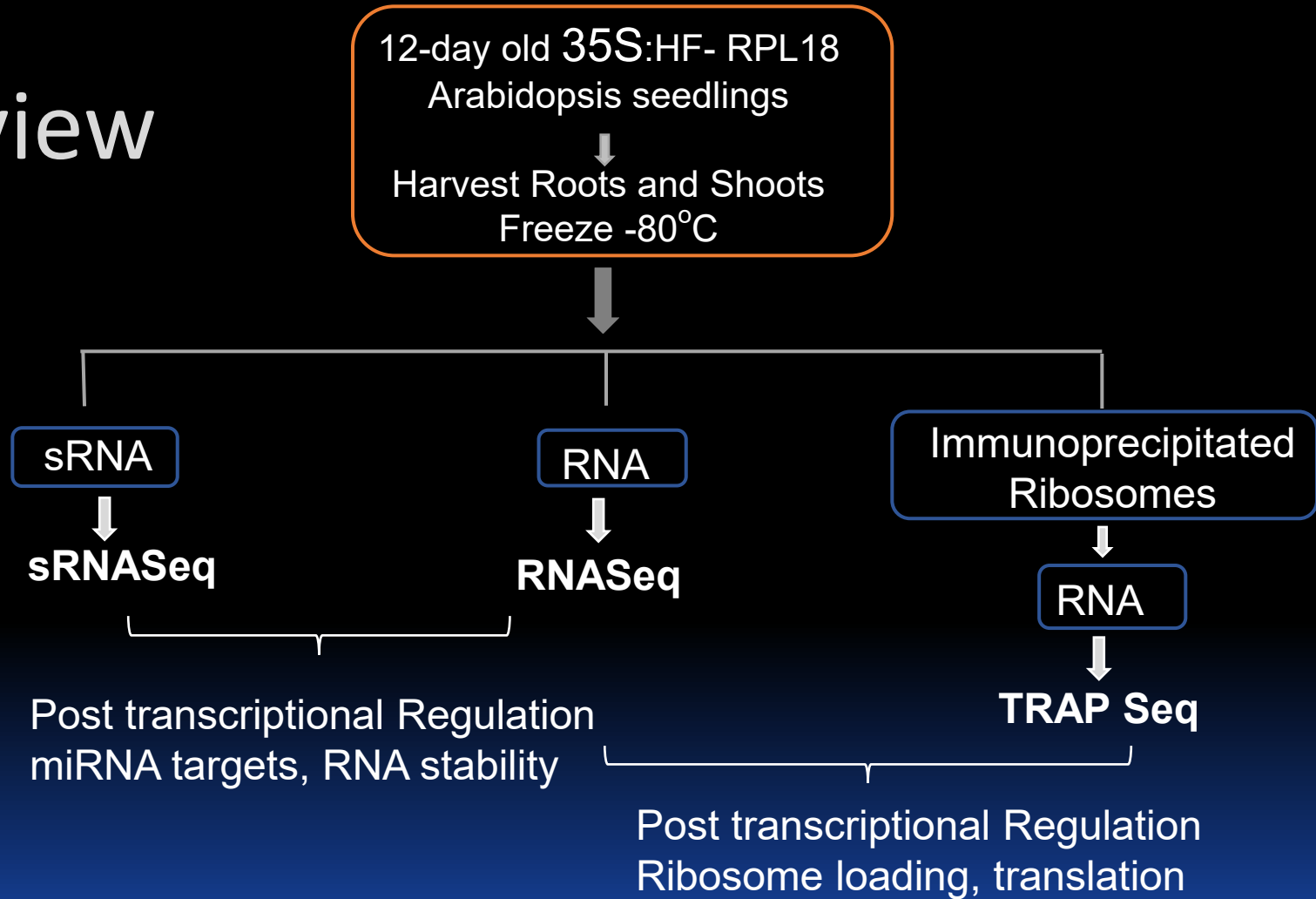
Used for both basic research and “crop” production.



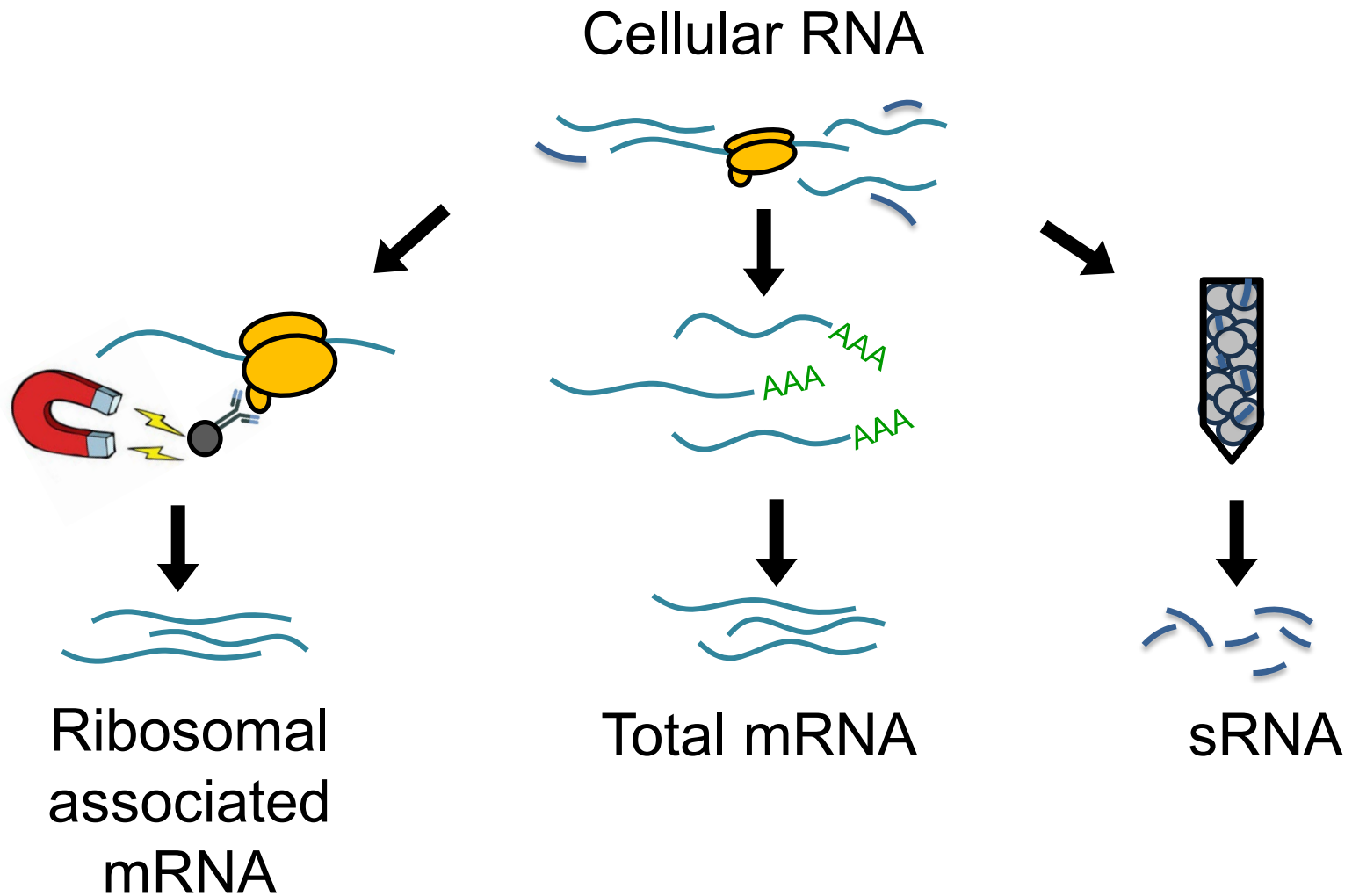
The hand of Scott Tingle

APEx -07

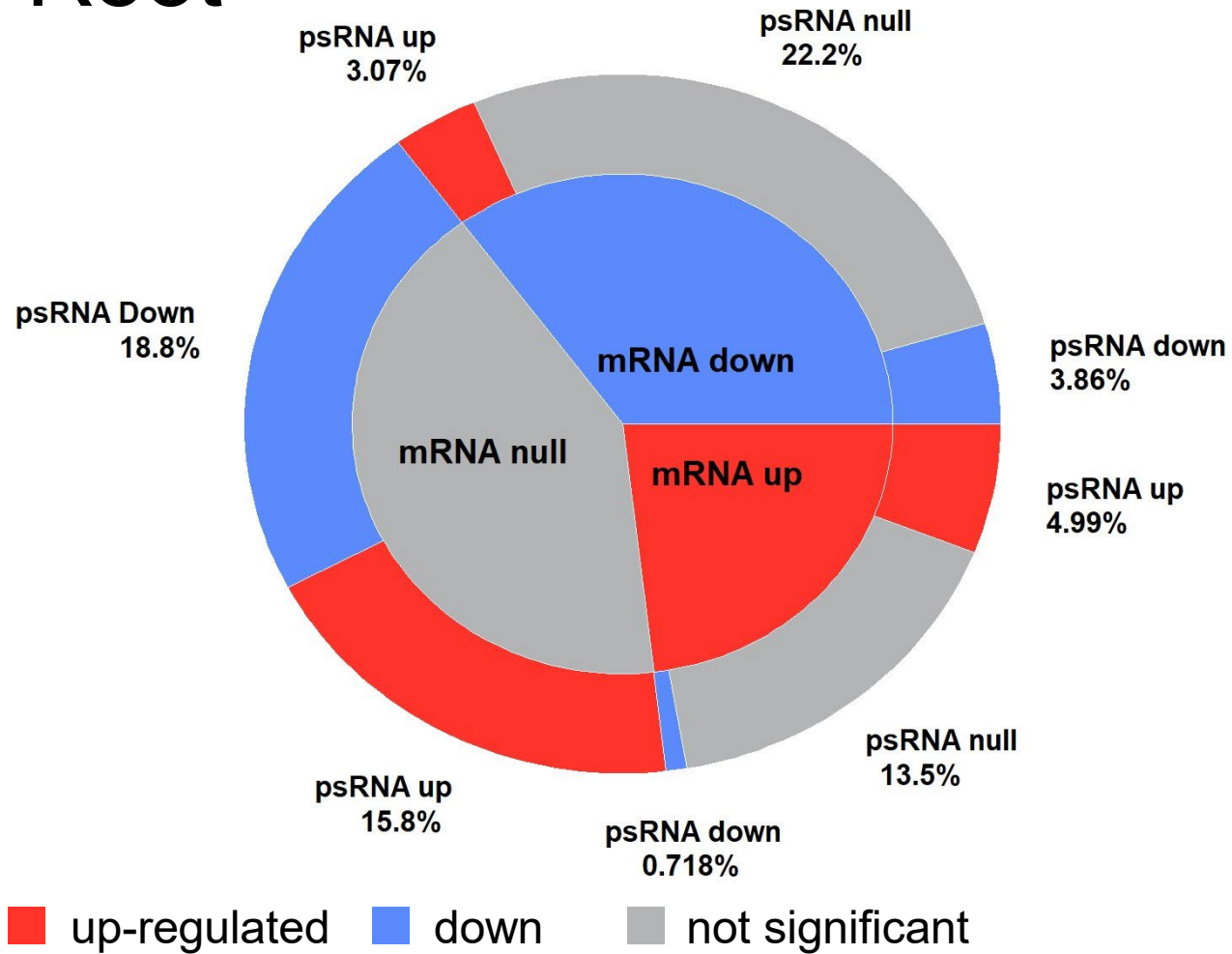
Overview



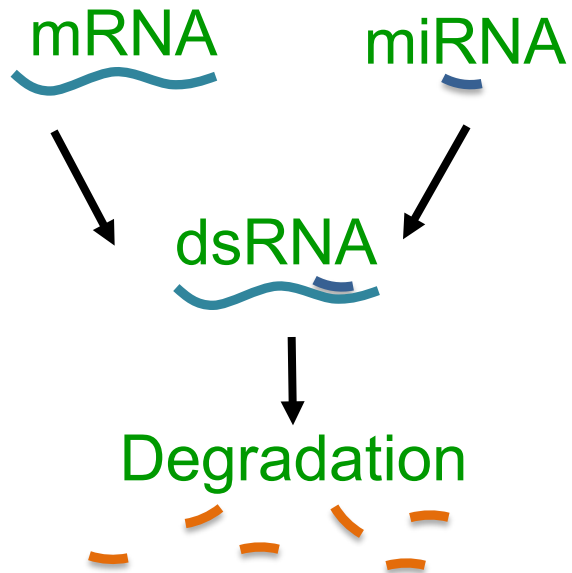
3 RNA Populations



Root



miRNA Regulation



Ath-miR397

LFC = -4.3

Targets lignan and beta tubulin

Ath-miR167c

LFC = 2.9

Targets arf family

Ath-miR319 a and b

LFC = 1

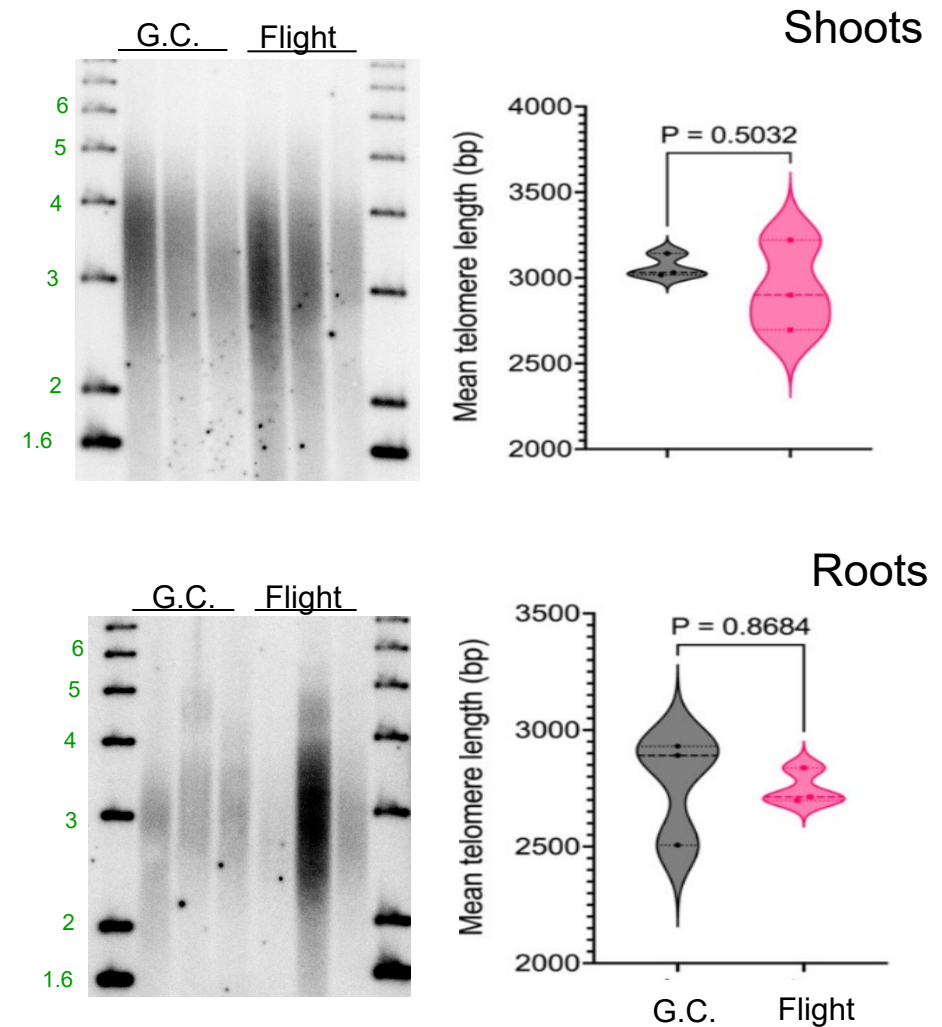
Targets myb family

Ath-miR159b

LFC = 1

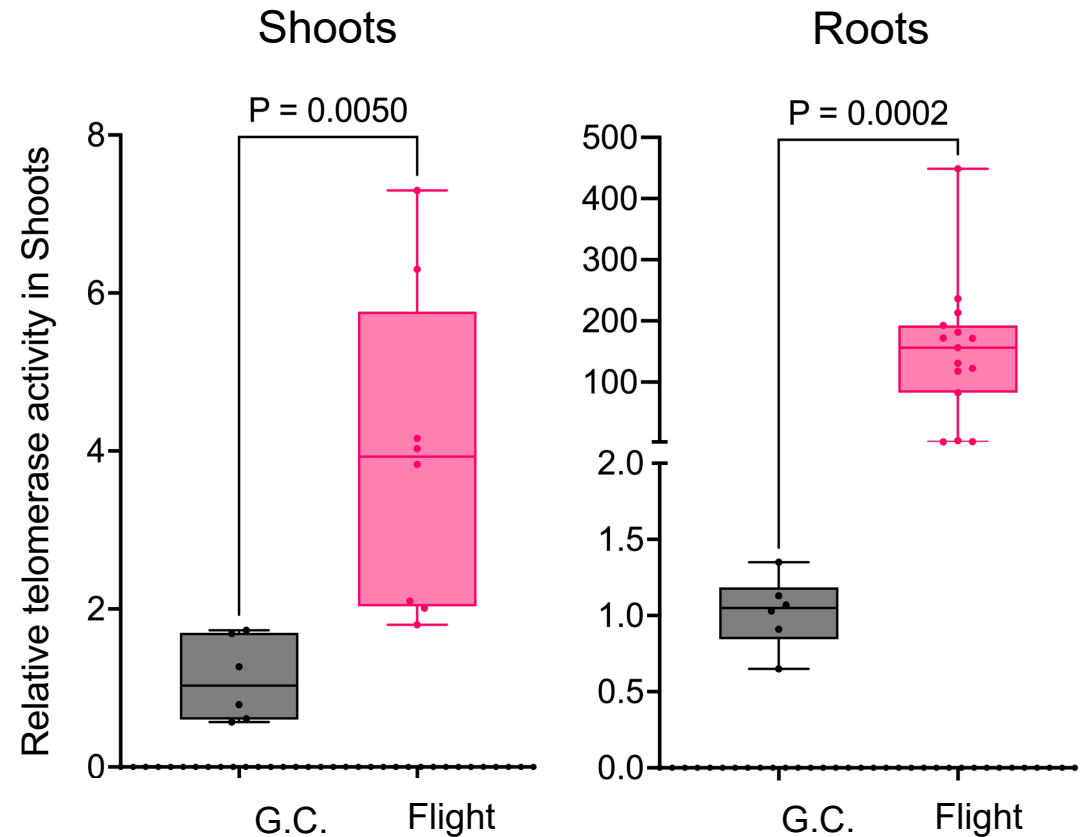
Targets myb and tcp

- Unlike humans, plant telomeres remained the same length during a 2- week spaceflight experiment.



Barbero Barcenilla et al. (2023) **Nature Comm.**

- Unlike humans, plant telomeres remained the same length during a 2 week spaceflight experiment.
- Telomerase showed a 150x increase in activity.
- What is telomerase doing?



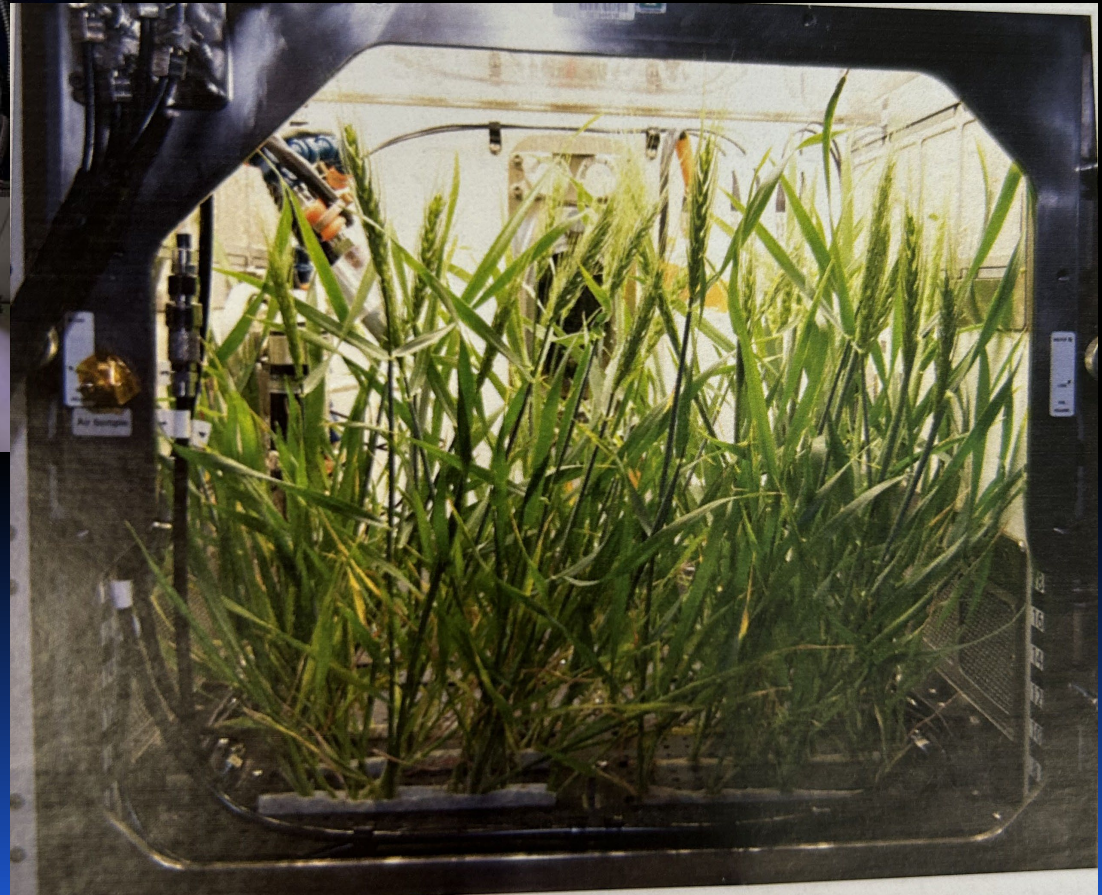
Barbero Barcenilla et al. (2023) *Nature Comm.*

Advanced Plant Habitat



Mark Vande Hei

Used for both basic research and
“crop” production.

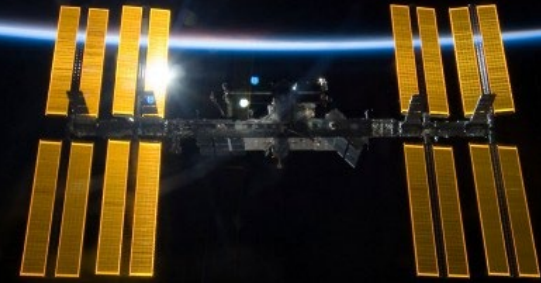


BLiSS

What we need to move forward

1. Shift from models and pick and eat to crops
2. Regolith vs hydroponics vs ?
3. Light quality/ daylength vs energy consumption
4. Gas exchange
5. Water/nutrients
6. Cohorts of multi-discipline scientists

Acknowledgements



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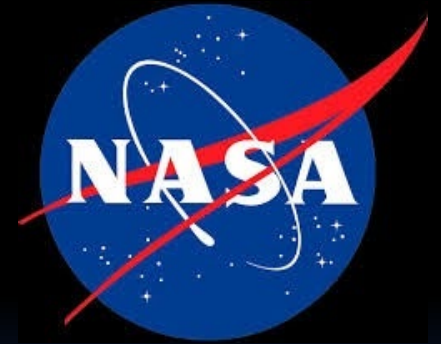
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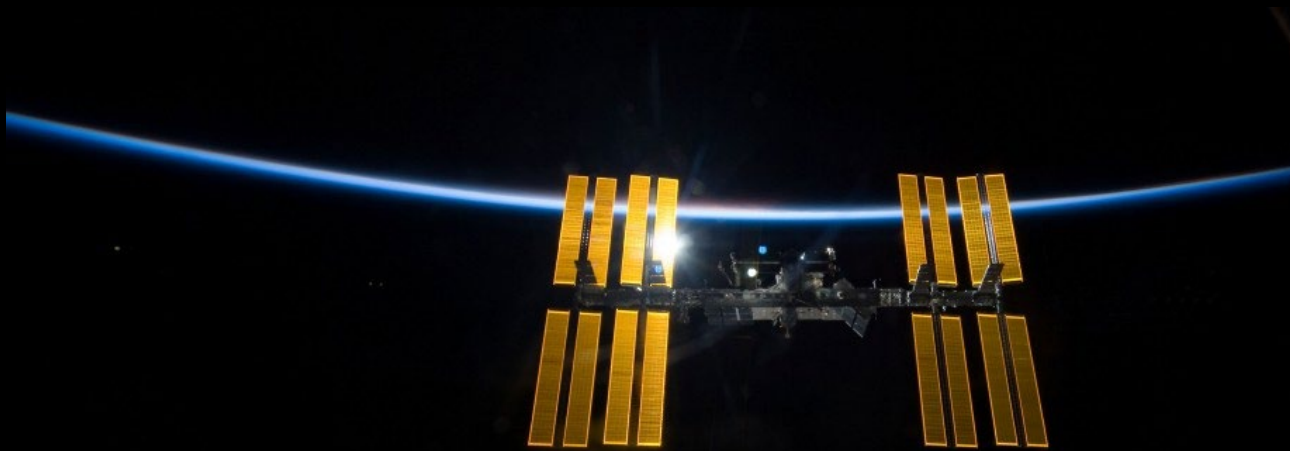
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"Remember the seed in the Styrofoam cup: the roots go down and the plant goes up and nobody really knows how or why"

- Robert Fulgham, All I really Need to Know I Learned in Kindergarten