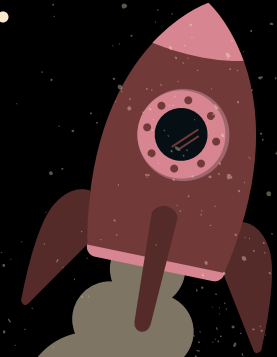


# The Peak of Harvest

a non-destructive  
identification method



Radu Mircea Giurgiu

University of Agricultural Sciences  
and Veterinary Medicine,  
Cluj-Napoca, Romania

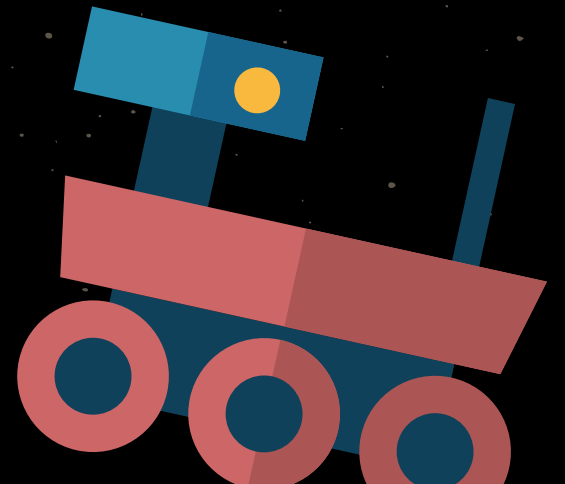


# Human Planetary Missions



## Priorities:

- oxygen
- water
- food
- addressing hazards
- human-robot interaction



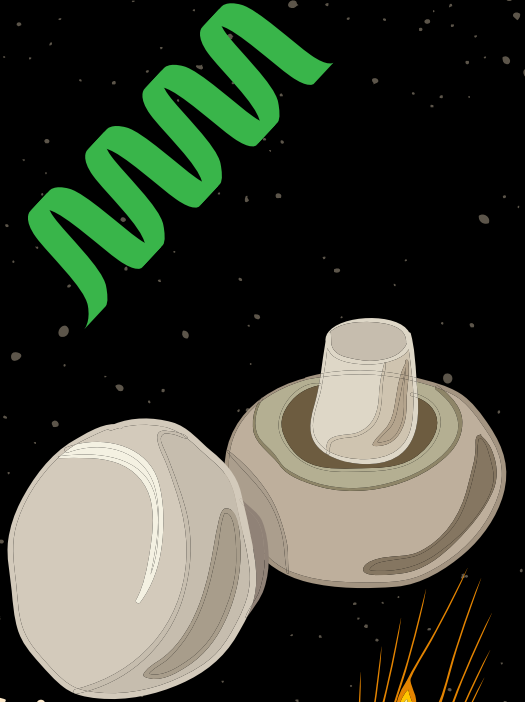
# Food supplies for astronauts



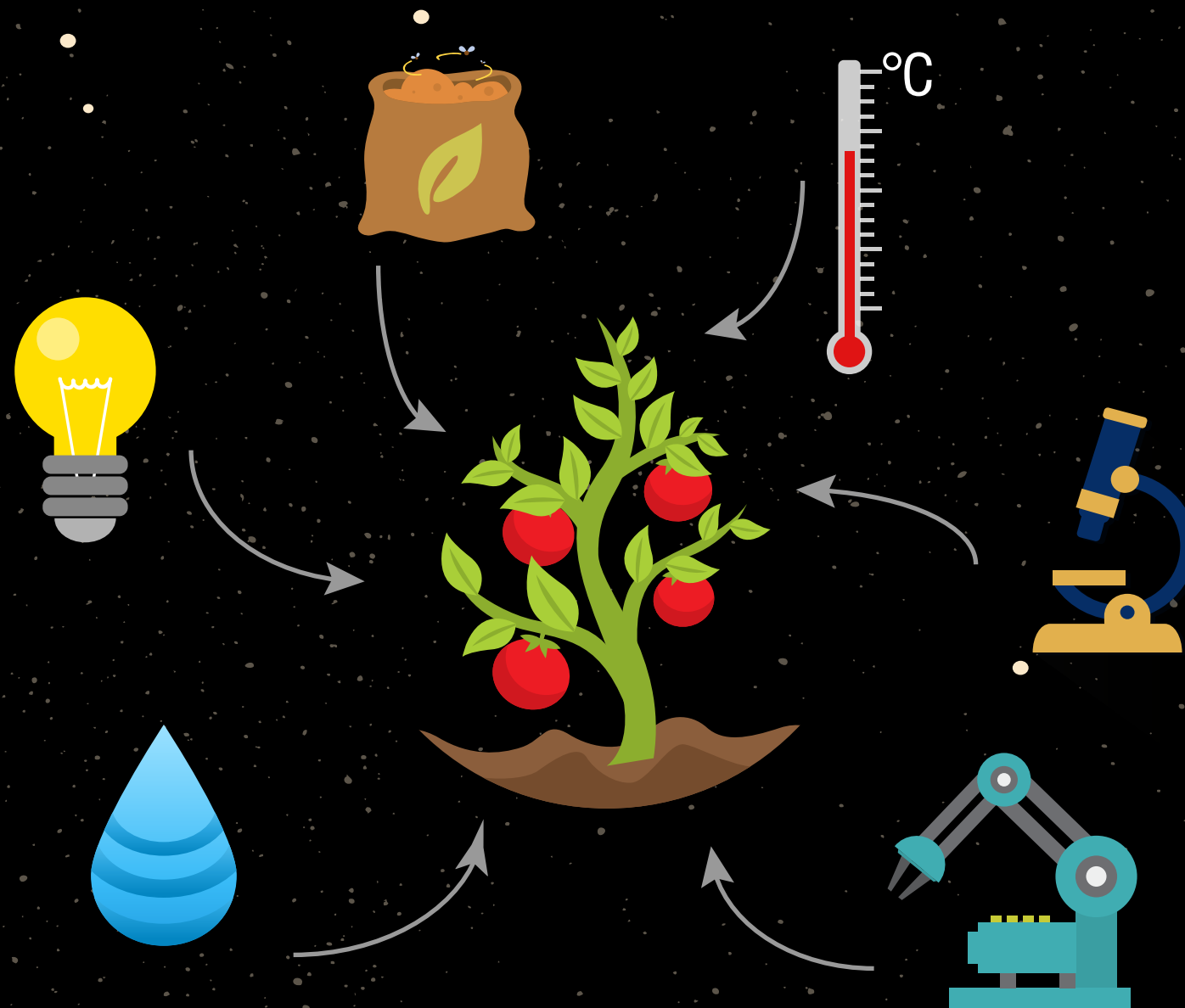
- dehydrated food
- package adaptations
- Spirulina
- Higher plants

Higher plant benefits:

Nutritional  
Freshness  
Oxygen suppliers  
Psychological

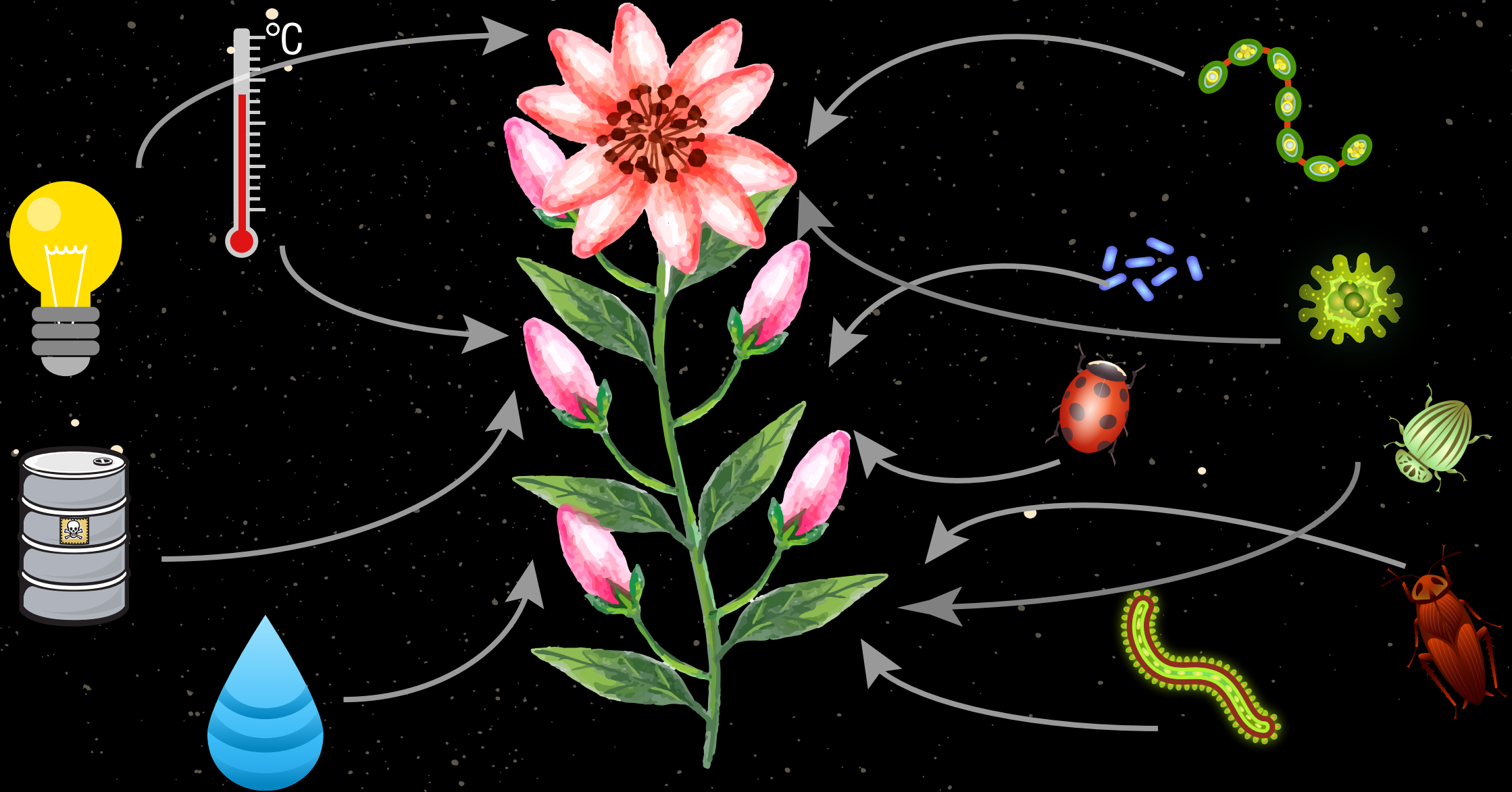


# Controlled Environment Agriculture

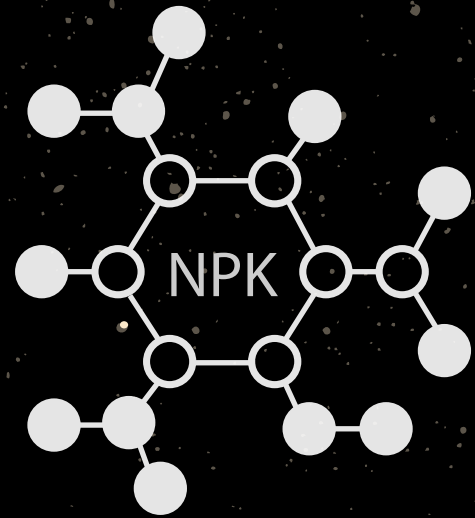




# Abiotic and biotic stress



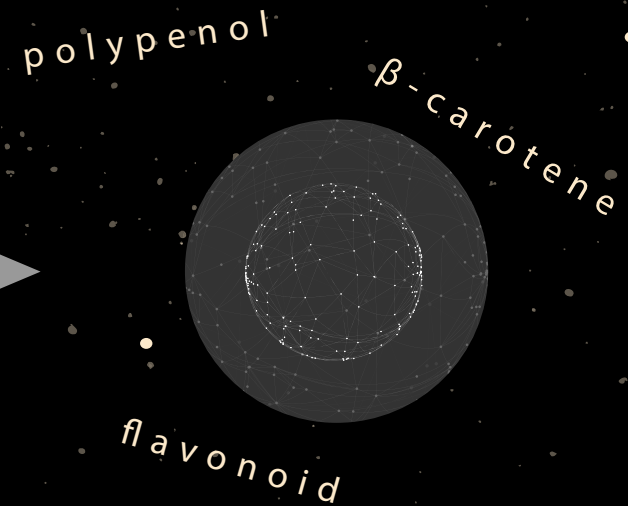
# Plant primary and secondary metabolism



inorganic  
compounds

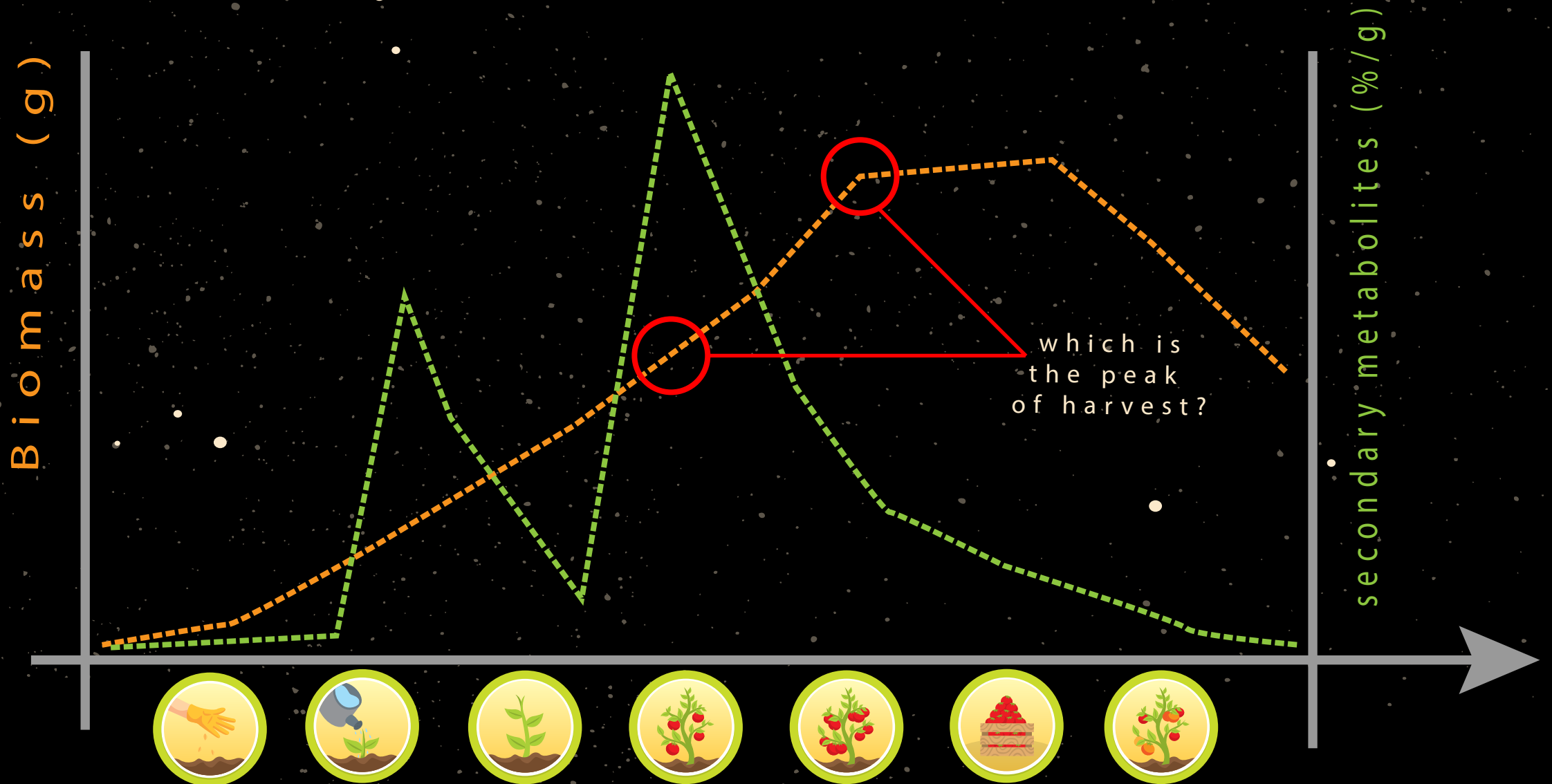


primary  
metabolites



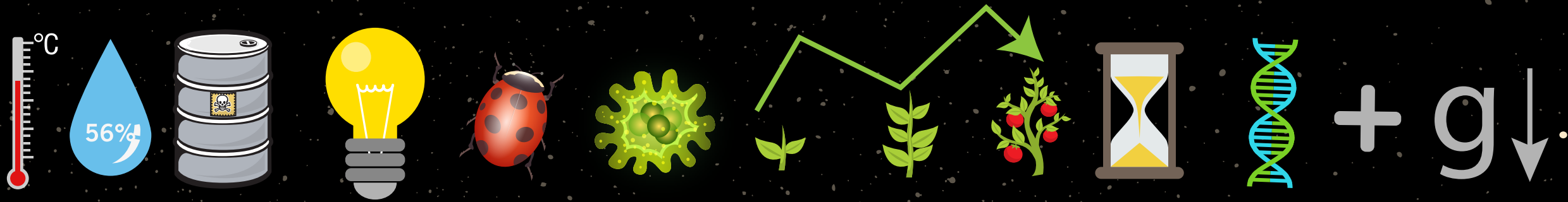
secondary  
metabolites

# Quantity and Quality of Vegetables



# Factors influencing secondary metabolites; methods of identification

..



NMR (nuclear magnetic resonance spectroscopy)

CC (column chromatography)

TLC (thin layer chromatography)

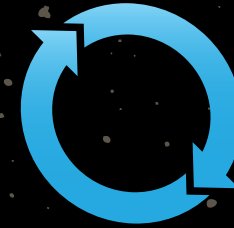
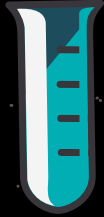
GC/MS (gas chromatography and mass spectroscopy)

HPLC (high performance liquid chromatography)

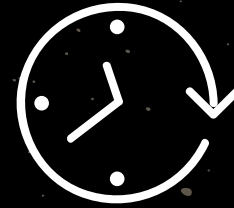
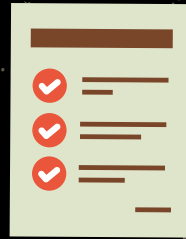
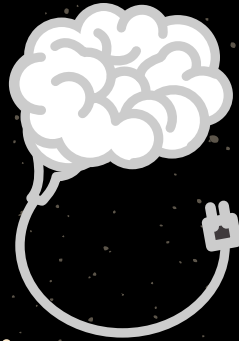
UPLC (ultra high performance liquid chromatography)

# Non-destructive identification methods

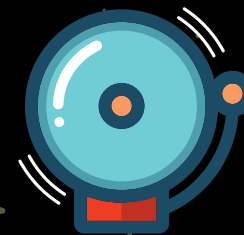
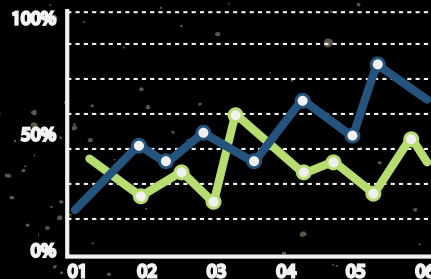
## i) Repetitive sampling



## ii) Computational modelling (BigData)

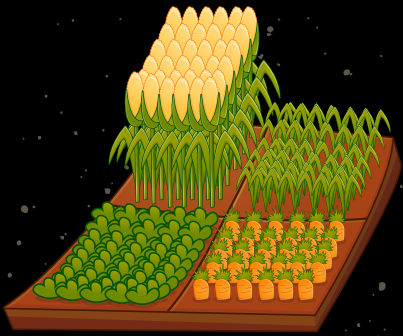


## iii) Real time, in-situ analysis



# Repetitive sampling

needs:



grow chamber



laboratory



know-how

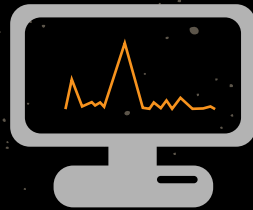
method:



sample



preparation



chromatography  
graph

drawbacks:

- time consuming
- specialist needed
- losing biomass
- not able to identify optimal moment of harvest



# Computational modelling

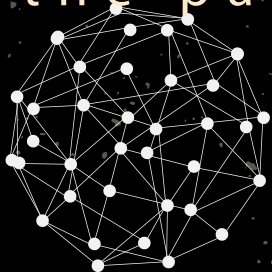
needs:



Big data

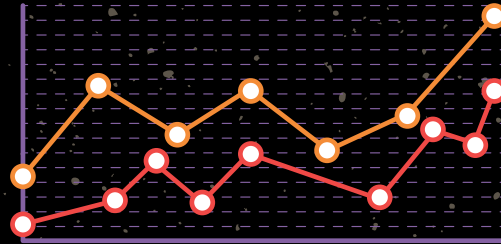


Set the parameters



Model

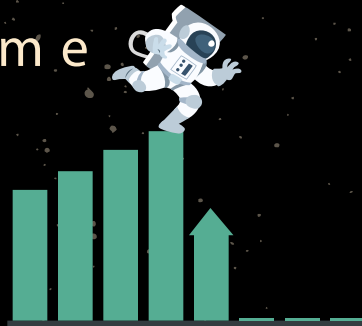
method:



use Model



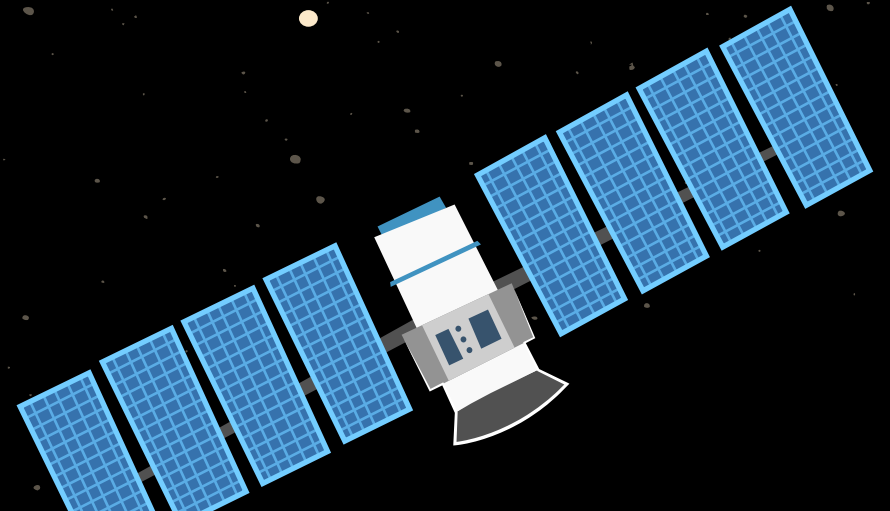
predict harvest  
time



harvest

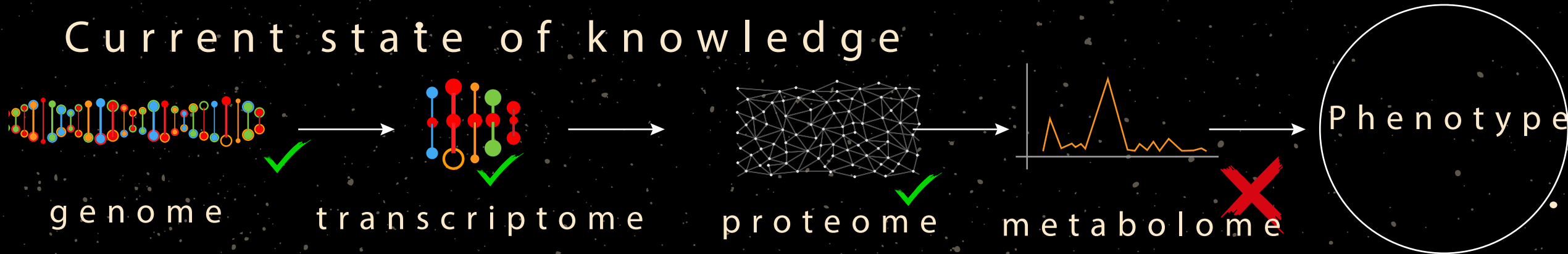
drawbacks:

- data availability
- limit crop variety
- technological control
- not flexible to unplanned phenomena



# Real time, in-situ analysis

## Current state of knowledge

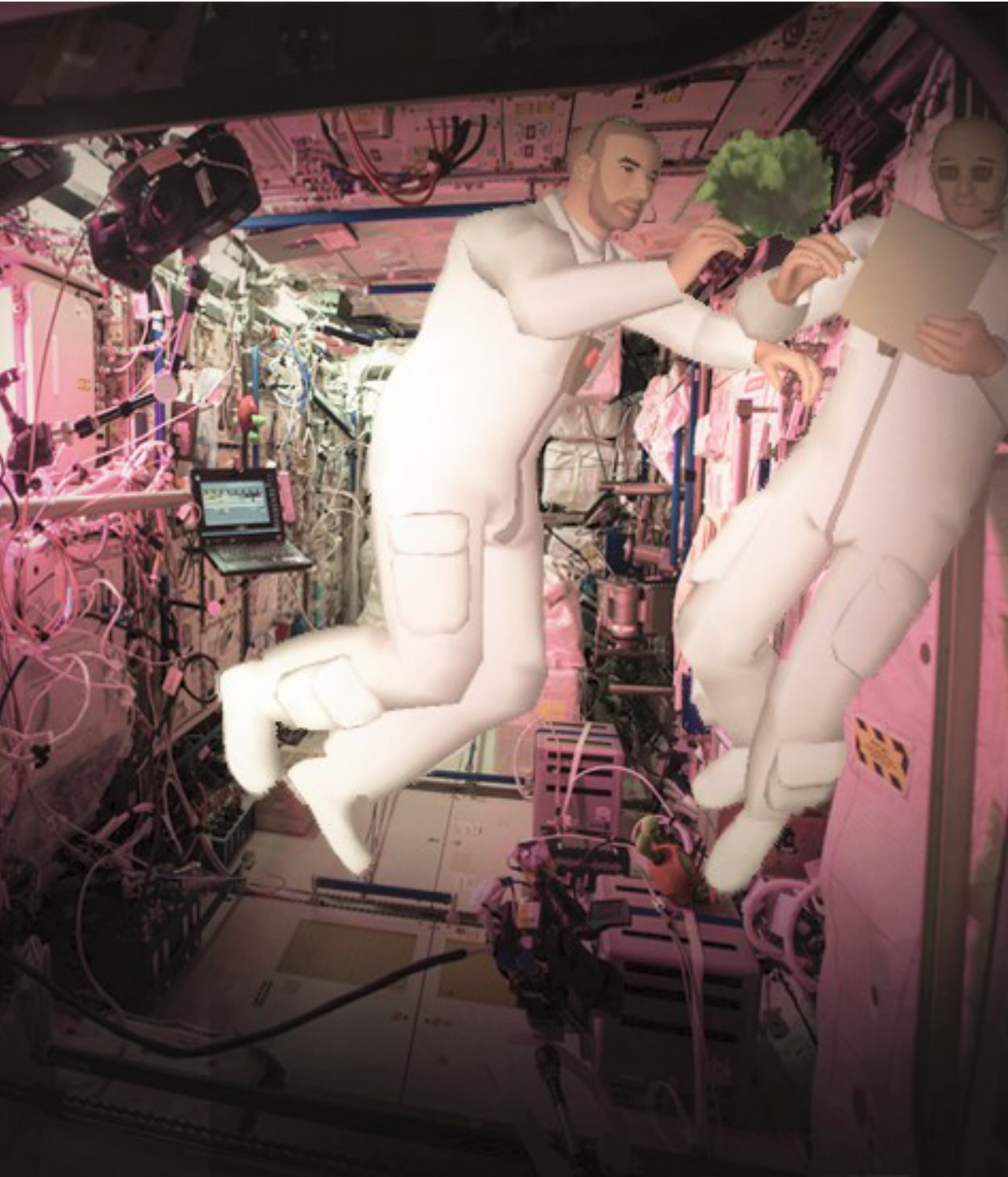


## Trends in plant science:

- indirect assessment through sensors (Woo et al, 2008)  
eg water status through chlorophyll fluorometry, ultrasound
- phytomonitoring multi-spectral readings (Pflantz, 2014)
- IR (infrared spectroscopy) + chemometrics (Cozzulino, 2015)  
(multivariate analysis)



# Terrestrial Spinoff



Radu Mircea Giurgiu  
radu.giurgiu@outlook.com

