

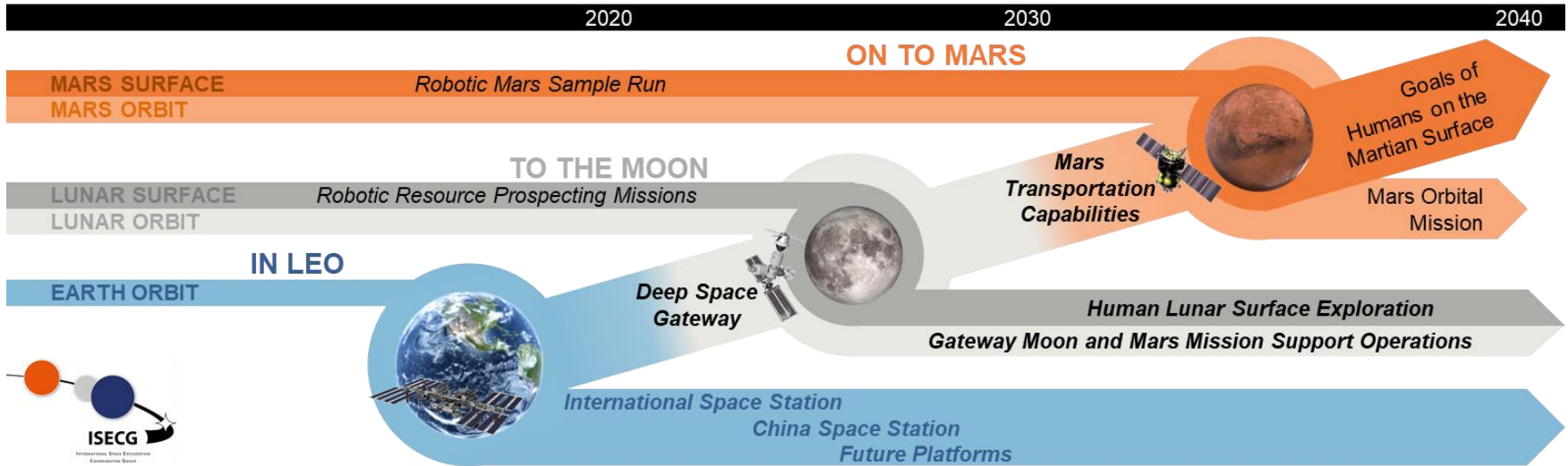
# The ReBUS project in the context of the ASI Life Science Roadmap for human space exploration

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[www.asi.it](http://www.asi.it)

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# The Global Exploration Roadmap



1

## Space Radiation

Invisible to the human eye, radiation increases cancer risk, damages the central nervous system, and can alter cognitive function, reduce motor function and prompt behavioral changes.

2

## Isolation and Confinement

Sleep loss, circadian desynchronization, and work overload may lead to performance reductions, adverse health outcomes, and compromised mission objectives.

3

## Distance from Earth

Planning and self-sufficiency are essential keys to a successful mission. Communication delays, the possibility of equipment failures and medical emergencies are some situations the astronauts must be capable of confronting.

4

## Gravity (or lack thereof)

Astronauts encounter a variance of gravity during missions. On Mars, astronauts would need to live and work in three-eighths of Earth's gravitational pull for up to two years.

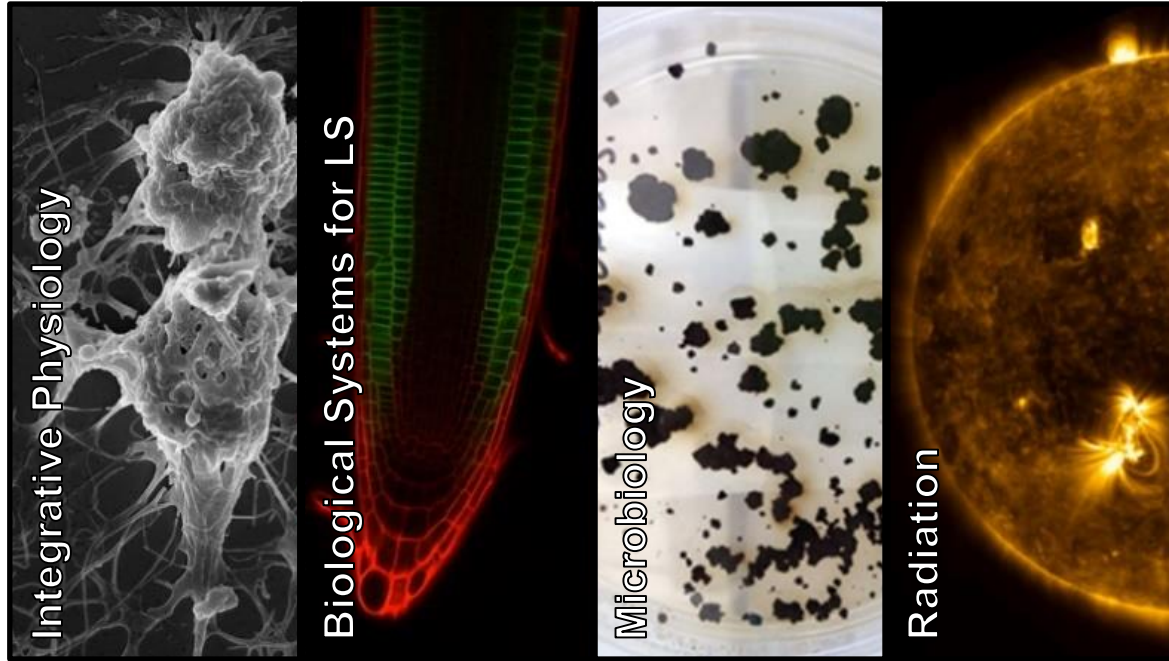
5

## Hostile/Closed Environments

The ecosystem inside a vehicle plays a big role in everyday astronaut life. Important habitability factors include temperature, pressure, lighting, noise, and quantity of space. It's essential that astronauts stay healthy and happy in such an environment.



# ASI Space Life Science Working Group





# ASI Space Life Science Working Group

<p><b>Integrative Physiology</b></p> <p>F. Babiloni T. Bandiera G. Biolo E. Caiani P. Campolongo M. Candela M. Capri M. Cerri G. Ciofani A. Corsini M. Crescenzi L. De Biase M. De Vittorio F. Ferlazzo <b>F. Ferranti</b> B. Grassi <b>M. Narici</b> M. Maccarrone P. Magni E. Martinelli C. Miniussi M. Monici N. Montano G. Ricci L. Visai</p>	<p><b>Biological Systems for LS</b></p> <p>P. Adamo G. Aronne R. M. Balestrini <b>A. Battistelli</b> V. Brambilla L. Bruno P. Costantino A. Desiderio <b>M. Del Bianco</b> L. Lanfranco C. Lobascio M. Maffei M. Morgante G. Renella S. Tosi</p>	<p><b>Microbiology</b></p> <p>D. Billi B. Cavalazzi D. Cavalieri B. Cobucci Ponzano D. Giovannelli <b>C. Pacelli</b> <b>S. Onofri</b> C. Pasquarella R. Santomartino N. Segata S. Richter</p>	<p><b>Radiation</b></p> <p>G. Cenci V. De Micco B. Fraboni C. La Tessa <b>L. Narici</b> A. Ottolenghi V. Patera M. Pugliese G. Rea A. M. Rizzo M. A. Tabocchini L. Tagliaferri W. Tinganelli <b>V. Vagelli</b></p>
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25 participants  
15 Institutions

14 participants  
11 institutions

11 participants  
11 institutions

13 participants  
11 institutions

V. Cotronei, M. Del Bianco, F. Ferranti, C. Pacelli, S. Piccirillo, S. Mari, V. Vagelli

# Working group objectives

**ASI objective: Enhance the national contribution and competitiveness towards enabling human deep space exploration for future Space exploration missions in collaboration with international partners and agencies.**

National and international experts from the scientific stakeholders (universities, research centers, industry) under coordination of ASI Science and Research Directorate have collaborated to:

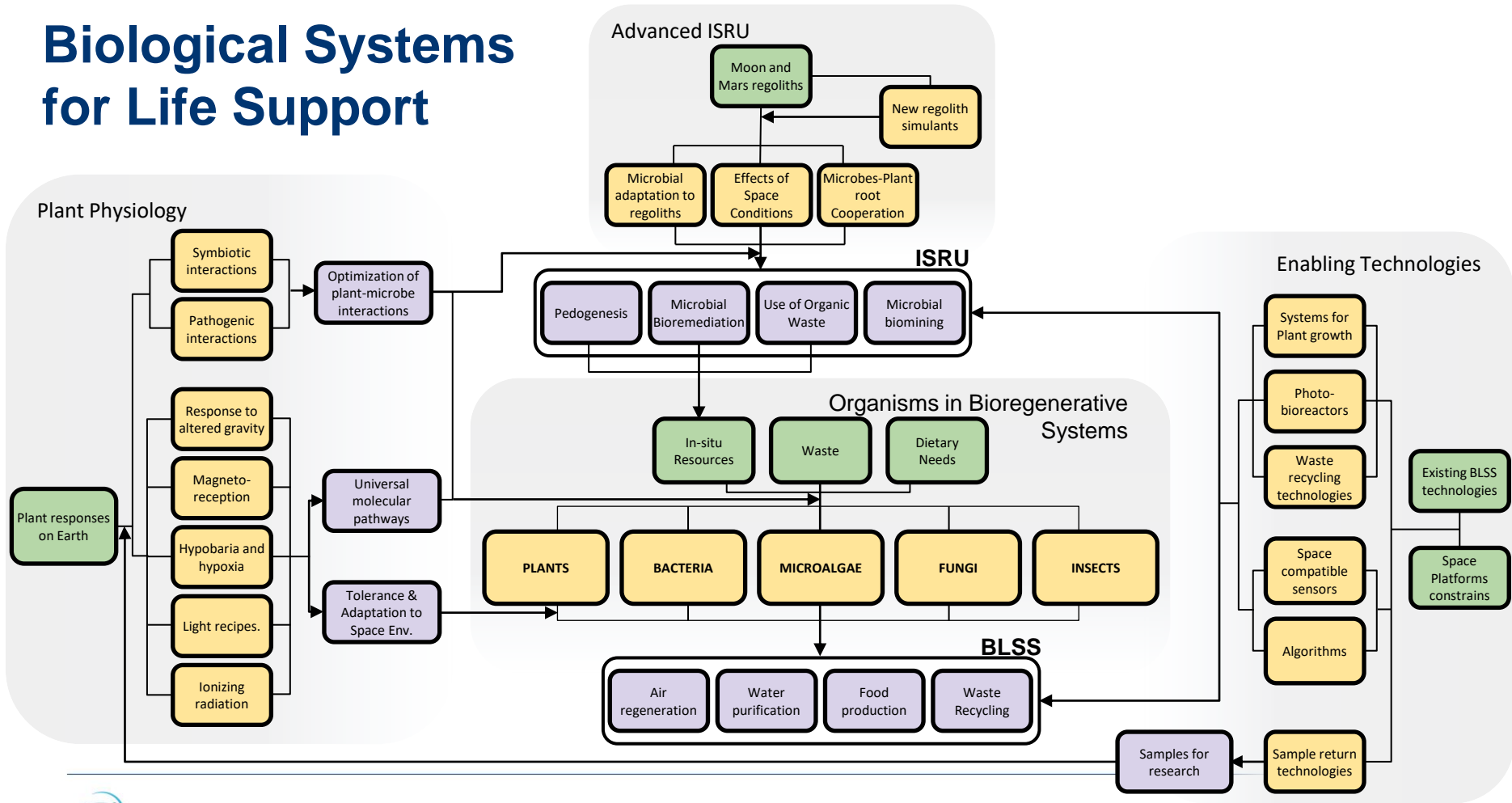
- Survey a critical **overview** of the state of the art and the currently unresolved issues to enable human deep Space exploration missions
- National and international **infrastructure mapping** and **networking**
- Identification of priority **objectives**

**Results to be acknowledged by ASI by implementing a Medium/Long term course of action for Space Life Sciences towards an efficient implementation, in synergy to other space agencies and stakeholders**

Works started in Fall 2021 and first results presented to the Italian community at ASI workshop in May 2022

<https://www.asi.it/event/roadmap-for-space-life-sciences-workshop-nazionale/>

# Biological Systems for Life Support



# The ReBUS project - In-situ REsource Bio-Utilization for life support in Space



Consortium of 9 institutions

- lead by the University of Naples Federico II
- 6 research institutions
- 3 industries

Total of 19 interconnected Work Packages

Duration 3.5 years (end April 2023)

ASI team: 6 people





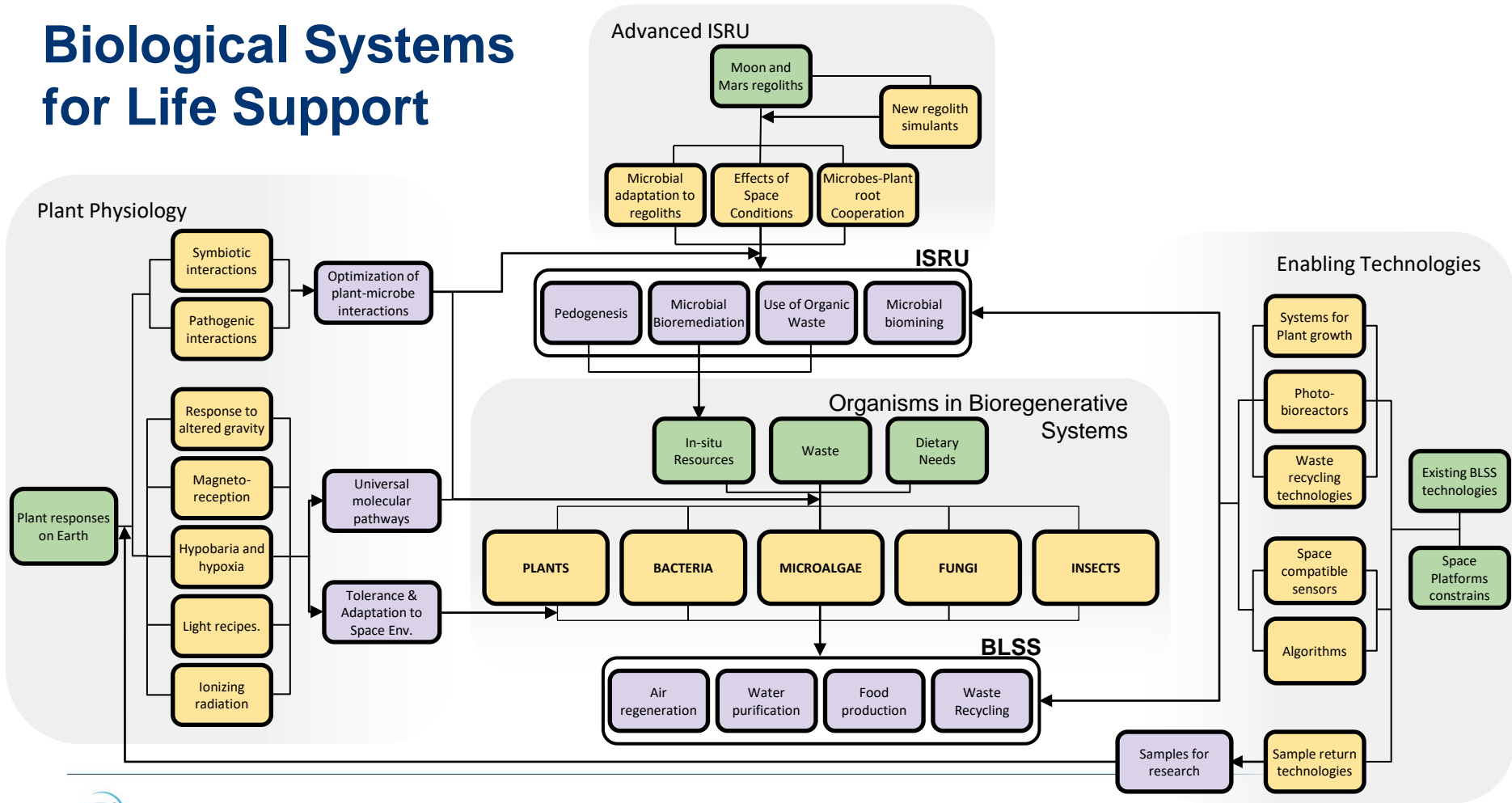
# The ReBUS objectives - In-situ REsource Bio-Utilization for life support in Space



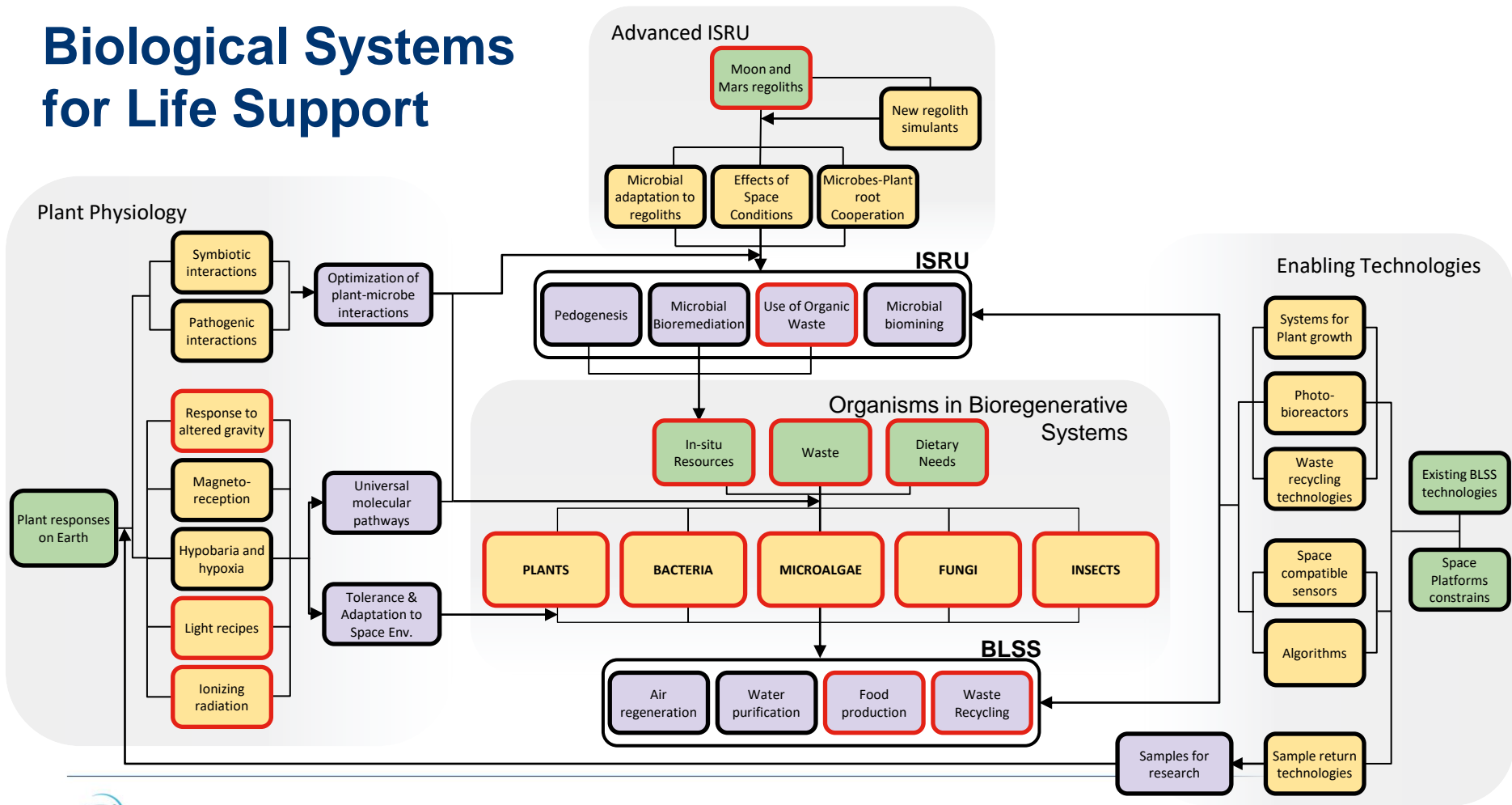
Study of a Bioregenerative Life Support System with the integration of different organisms (higher plants, fungi, bacteria, cyanobacteria, insects)

1. food production (microgreens);
2. minimizing the use of exogenous resources;
3. maximizing:
  - the use of in situ resources (Lunar and Martian soils, water, gas in atmosphere);
  - the recycling of the organic matter produced in the system itself (crop residues, crew physiological waste).
4. assess the effects of prebiotics on psychophysiological performance (mice)

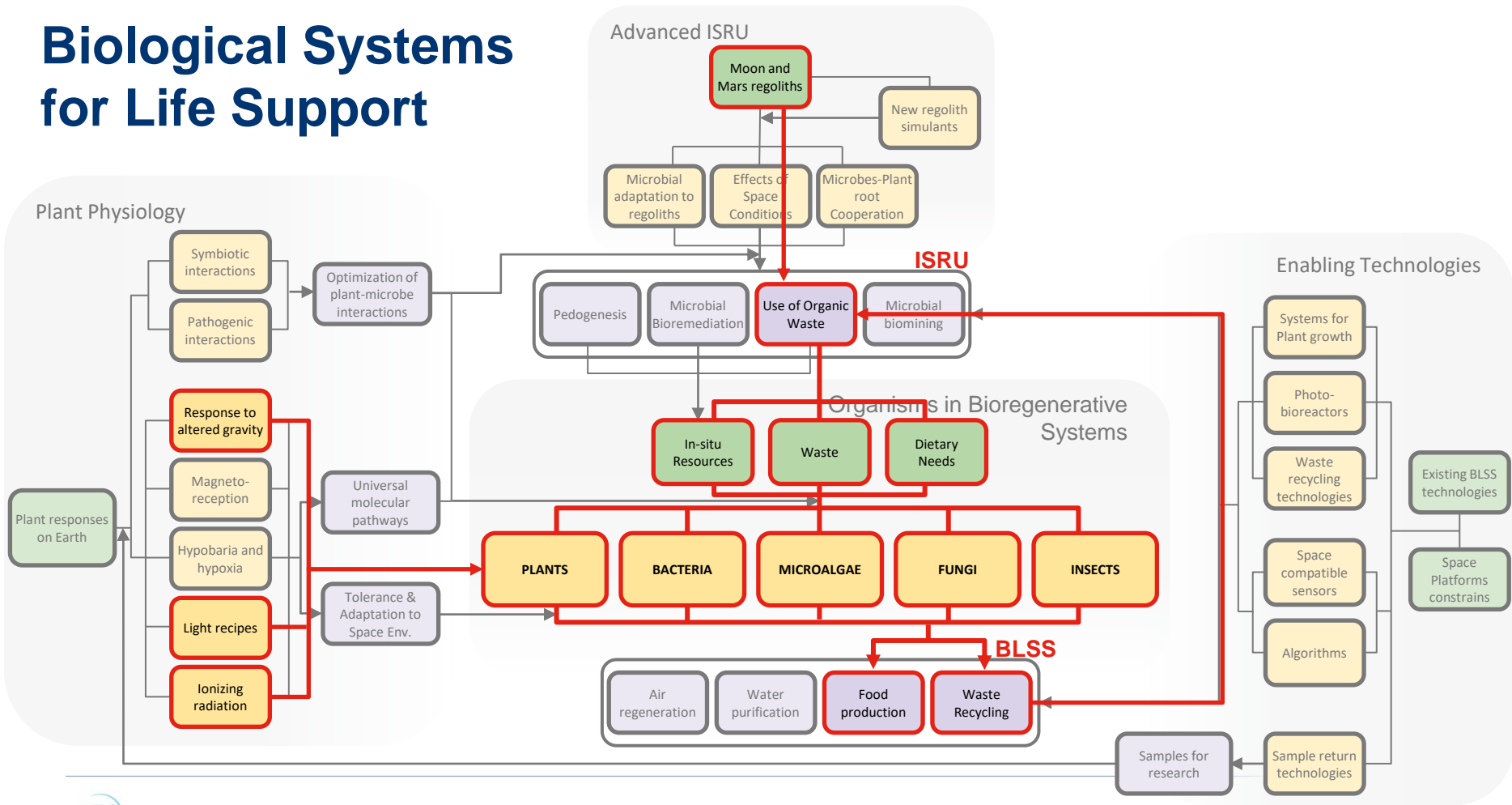
# Biological Systems for Life Support



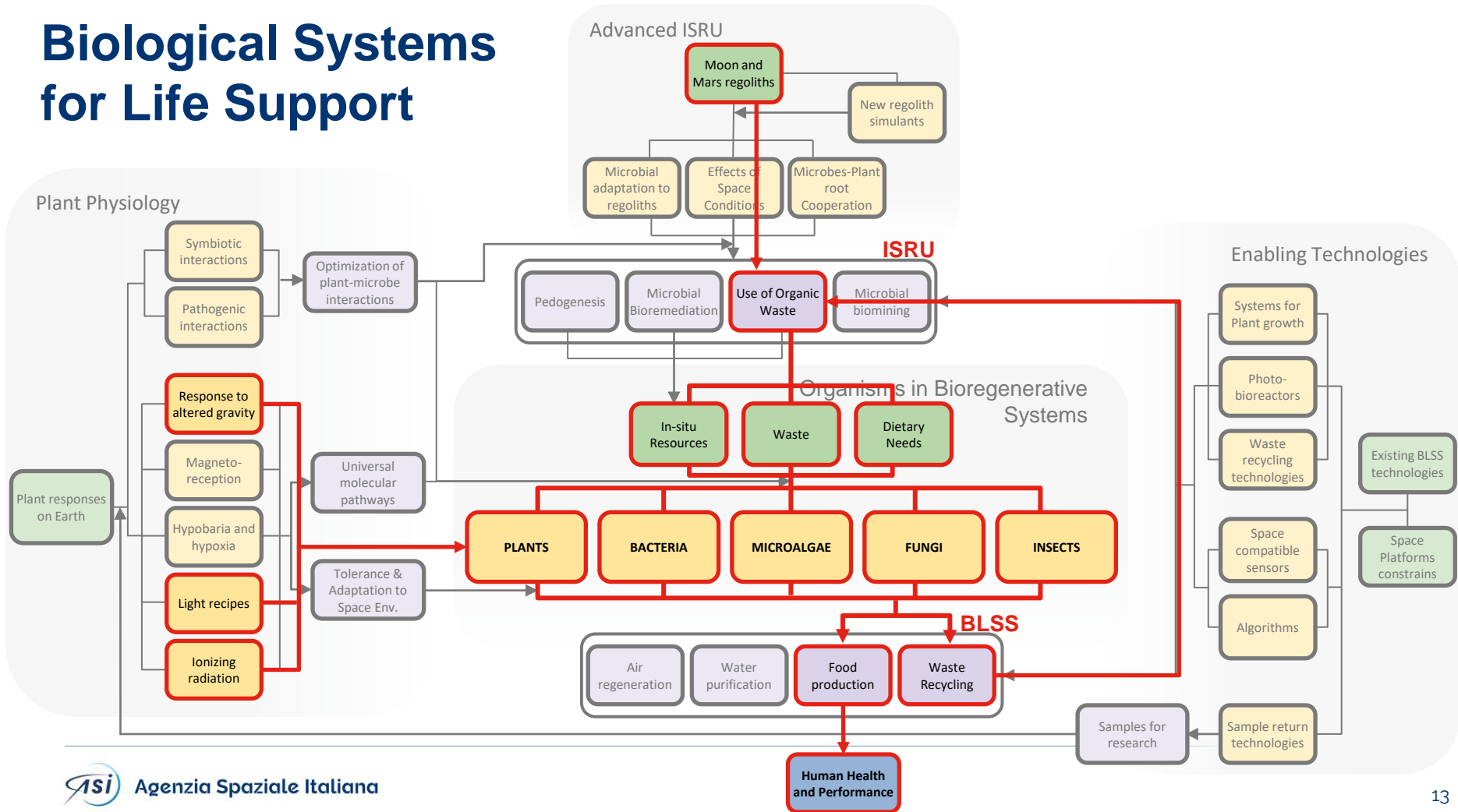
# Biological Systems for Life Support



# Biological Systems for Life Support



# Biological Systems for Life Support







# Thank you for your attention

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