CURRENT AND FUTURE WAYS TO CLOSED LIFE SUPPORT SYSTEMS

2022 MELiSSA CONFERENCE

8-10 NOVEMBER
TOULOUSE
(FRANCE)

CREATING A CIRCULAR FUTURE

HANDBOOK

MELiSSA MICRO-ECOLOGICAL LIFE SUPPORT SYSTEM ALTERNATIVE

esa

cnes CENTRE NATIONAL D'ÉTUDES SPATIALES

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ABOUT THE EUROPEAN PROJECT OF CIRCULAR LIFE SUPPORT SYSTEMS

For almost 35 years, the European Space Agency (ESA) has been active in the field of regenerative life-support systems, through the MELiSSA (Micro-Ecological Life Support System Alternative) Project, the European circular life-support system project.

In space, astronaut survival requires very large quantities of oxygen, water and food, which are too expensive and cumbersome to transport. For future long-duration manned missions, especially to the Moon and Mars (and all the stages between Earth and Mars), it is currently unfeasible to rely solely on resupply from Earth.

The MELiSSA Project, initiated in 1987 after a preliminary flight onboard the Chinese "Long March" rocket, therefore studies the recycling all the waste from a space mission to meet the vital needs of astronauts. The challenge is to develop an artificial ecosystem (which supports astronauts on board during long space journeys) that can reproduce the main functions of the Earth, in a reduced mass and volume, but with extreme safety.

Transforming all waste, managing chemical and microbiological contaminants, using sunlight as a source of energy, and of course supplying oxygen, water and food to the astronauts during long space missions, are the challenges being studied by ESA and its partners.

Today, the MELiSSA Project is often cited as the most successful example of circular economy, resulting in numerous technology transfers from space to Earth (environment, agri-food, life sciences). Examples include the recycling of grey water on the Concordia Station in Antarctica or on the famous Roland Garros tennis tournament. We can also mention the anti-cholesterol patent and the creation of ezCOL, a spin-off from the MELiSSA program.

About 50 organizations (companies, universities, research centers, space industries, etc.) are involved in the project. 15 partners have signed a memorandum of understanding.

Today, the MELiSSA partners come from Belgium, Spain, France, Switzerland, Italy, the Netherlands and Canada. ▬

ABOUT THE MELiSSA FOUNDATION

The MELiSSA Foundation is a non-profit organization created in 2014 by the MELiSSA Consortium. The Foundation manages a fund dedicated to the support of MELiSSA PhD and post-doctoral students. Their research is focused on closed-loop life support technology, with the aim of enabling long-duration space missions, notably to the Moon and Mars.

The MELiSSA Foundation also hosts all communication and education aspects of the MELiSSA Project.

The Foundation's Board of Directors is composed of Dr Bérangère Farges (Program Director), Professor Dr Max Mergeay (Scientific Director) and Rob Suters LLM (Managing Director). The committee evaluating the doctoral applications is composed of representatives of the MELiSSA Community, ESA and independent scientists.

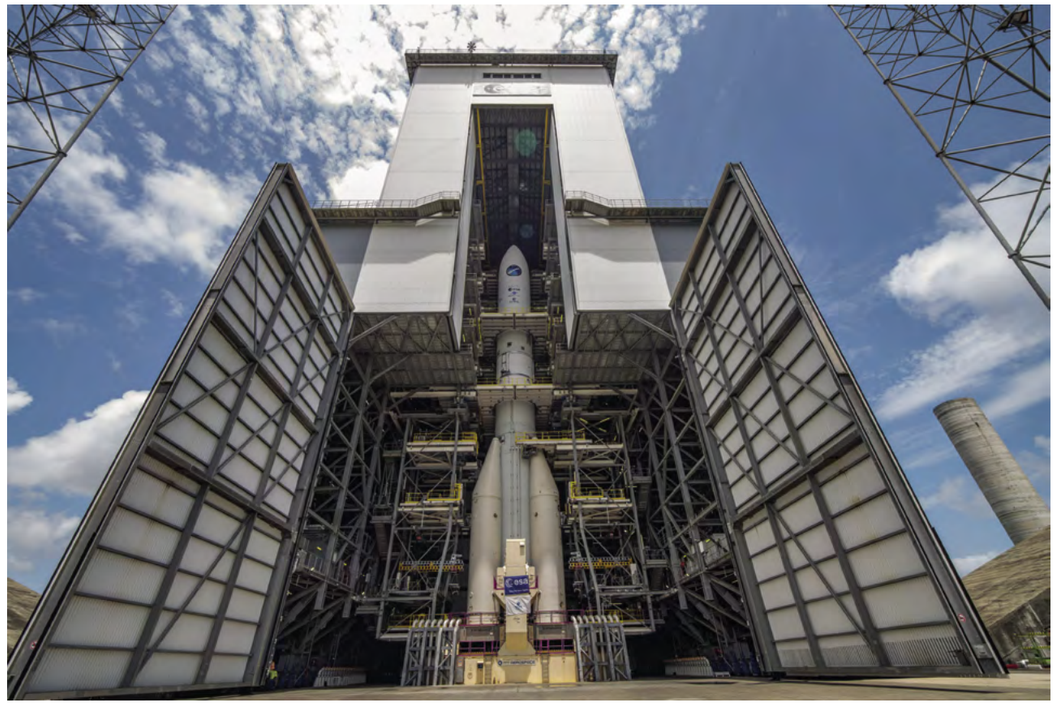
The MELiSSA Foundation also provides support services connected to MELiSSA communication, MELiSSA conferences and outreach activities. The Foundation furthermore plays an increasing role in the field of promoting terrestrial MELiSSA activities and acts as a contact point with industrial partners. ▬

ABOUT THE EUROPEAN SPACE AGENCY (ESA)

The European Space Agency (ESA) is Europe's gateway to space. Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world.

Exploring the Universe and sending satellites and humans into space in a secure and sustainable environment for all, are among the major challenges for developed nations in the 21st century. This is why over 20 European countries have been pooling resources for over 50 years, putting Europe at the forefront of space science, technology and applications. Today, Europe's citizens enjoy the benefits, from jobs and economic growth, to public services, efficient communications, and security.

ESA's wealth of experience and track record of success, in elaborating and implementing space programs for more than 50 years, have allowed it to continuously improve and adapt to its changing environment. In order to ensure the full integration of space into European society and economy, ESA regularly shares its experience with other European entities. ▬



8:30 REGISTRATIONS

ROOM 1
Chair: Christophe LASSEUR - ESA

9:30 **Torben HENRIKSEN** - ESA/D TEC Giorgio
José GAVIRA IZQUIERDO - ESA
9:40 **Giorgio MAGISTRATTI** - ESA HRE
9:50 **Sébastien BARDE** - CNES
10:00 **Stella TKATCHOVA** - EU Innovation
10:10 **Geraldine NAJA** - ESA/D CIP
10:30 **Didier SCHMITT** - ESA-HRE
11:00 **François FORGET** - IPSL
11:30 **Christophe LASSEUR** - ESA-TEC
12:10 **Frank RIEMAN** - ESA CIP

12:30 LUNCH

	ROOM 1	ROOM 2	ROOM 3
	Plants Characterisation 1/3	**Food Process 1/2**	**Urine & Nitrification 1/3**
	Chair: Lucie Poulet (UCA) **Co-chair:** Ray Wheeler (NASA)	**Chair:** Christel Paille (ESA) **Co-chair :** Joël Doré (INRAE)	**Chair:** Siegfried Vlaeminck (U Anvers) **Co-chair:** Nele Kirkerup (EAWAG)
13:30	Shortening the Breeding Cycle. **Bahar ACIKSOZ** - U SUSSEX	A navel multiproduct pathway towards algal food ingredients. **Antoinette KAZBAR** - U WAGENINGEN	Infiuence of organics removal and nitrification on pharmaceutical and artificial sweetener removal: the example of urine treatmet. **Aurea HEUSSER** - EAWAG
13:50	PaCMan Unit upgrade. New subsystems for a deeper investigation of the root zone. **Claudia QUADRI** - ENGINSOFT	Lettuce cultivation in a urine recycling scenario: Effects of different NH4:N03 ratios. **Mona SCHIEFLOE** - NTNU	Community shift of ammonia-oxidizing bacteria and washout of nitrite-oxidizing bacteria due to pH changes during urine nitrification. **Kai UDERT** - EAWAG
14:10	Fertilizer production for soilless plant cultivation in closed life support system -lessons learned from 4 years study. **Anna JURGA** - U WROCLAW	Vitamin B12, microalgae and the MELiSSA loop. **Ellen HARRISON** - U Cambridge.	Electrochemical stabilization and resource recovery from source-separated urine. **Popat SUDEEP** - U CLEMSON.
14:30	Characterization of three leafy vegetables in a sealed plant-growth chamber for closed life support systems. **Antonio PANNICO** - UNINA	Species selection of microgreens to be produced in space as functional food for astronaut consumption. **Luigi IZZO** - UNINA	Impact of the Composition of Organics on Urine Treatment. **Nele KIRKERUP** - EAWAG
14:50	Plants for Space - a new multidisciplinary centre focused on enabling long term-deep space habitation. **Mathew GILLIHAM** - U ADELAIDE	Green algae for sustainable edible proteins production. **Matteo BALLOTARRI** - U VERONA.	Will be three a multitude in the nitrifying compartment? First steps towards the characterization of a navel synthetic community by using fiow cytometry and atomie force microscopy. **Celia ALVAREZ** - U Ghent
15:10	Navel approach to enhance the potential of ground preparatory activities for improved plant growing experiments in microgravity. **Iliana ILLIEVA** - BAS	MEAT4SPACE - Cultured meat for human space exploration. **Pedro GARCIA** - ESA	The effects of ISS-like ionizing radiation on the proteome and metabolome of ureolytic and nitrifying bacteria. **Tom VERBEELEN** - U MONS

15:30 COFFEE BREAK

	ROOM 1	ROOM 2	ROOM 3
	Air & Grey Water	**Food Process 2/2**	**Urine & Nitrification 2/3**
	Chair: Enrique Peiro Cezon (U Mons) **Co-chair:** Gregory Navarro (CNES)	**Chair:** Alain Maillet (CNES) **Co-chair:** Felice Mastroleo (SCK)	**Chair:** Kai Udert (EAWAG) **Co-chair:** Marijn Timmer (U Anvers)
15:50	Grey water recycling from space to earth. **Pierre MAGNES** - FIRMUS	How abiotic factors change the requirements for plants cultivation in Space systems. **Chiara AMITRANO** - UNINA	Fresh urine treatment with bio-mineral phosphorus recovery and nitrification with biocatalysts. **Ana SOARES** - U CRANFIELD.
16:10	Indoor C02 Direct Air Capture (iC02-DAC): C02 As Renewable Carbon Source. **Luis Rafael LÓPEZ DE LEÓN** - U GIRONA	The significance of aquaponics in Controlled Ecological Life Support Systems. **Yoshiaki KITAYA** - U OSAKA	Urine and life support: Same nitrification-based MELiSSA solutions. **Siegfried VLAEMINCK** - U Antwerp
16:30	Anaerobic Membrane Bioreactors for Long Duration Sanitation: Current Technologies and Pharmaceutical Challenges. **John MARSHALL** - U TEXAS **Cancelled**	Ground-based demonstrator for the first space-ready lunar agricultural module. **Daniel SCHUBERT** - DLR	The alkalinity dilemma in nitrification. **Agata SIEDLECKA** - U WROCLAW
16:50	Electroactive bio-film development under controlled hydrodynamic in a Couette-Taylor electrochemical reactor. **Florent BOUCHON** - INRAE	Innovative Spirulina Nutraceuticals products for health prevention in long fiight and extraterrestrial habitat. **Olivier LEPINE** - ALGOSOURCE	Closing loop with biological nitrification for nutrients recovery and surfactants removal. **Kamil JANIACK** - U Wroclaw.
17:30	**Christer FUGLESANG** - ESA Astronaut		
18:20 **19:00**	JOURNEY TO "CITÉ DE L'ESPACE"		
20:00 **21:00**	VISIT «CITÉ DE L'ESPACE»		

	ROOM 1	ROOM 2	ROOM 3
8:00	**Joël DORÉ** - INRAE	**Emmanuel Frossard** - ETH	**Francesc GÒDIA** - UAB
	BioMaterial 1/2	**Plants Characterisation 2/3**	**System Studies 1/3**
	Chair: Advenit Makaya (ESA) **Co-chair:** Martin CERFF (BHL)	**Chair:** Emmanuel Frossard (ETHZ) **Co-chair:** Ann-Iren Jast (CIRIS)	**Chair:** Philippe Fiani (SHERPA) **Co-chair:** Lorenzo Buschieri (Enginsoft)
8:30	Passive limitation of surface contamination by perFluoroDecylTrichloroSilane coatings in the ISS during the MATISS experiments. **Laurence LEMELLE** - ENS Lyon	Evaluating Microgreens Crop Readiness for Space Production. **Lucie POULET** - UCA	Assessing the resilience of circular water systems: a simulation-based approach using the UWOT model. **Dimitrios BOUZIOTAS** - KWR
8:50	Assessing the integration of a bioreactor producing SCPs and PHAs from organic waste into global environmental systems. **Etienne PERRIN** - CNES	Crop production in space: the microbial helping hand. **Danny GEELEN** - U GHENT **Cancelled**	Circularity indicators and digitalisation for monitoring circular space and terrestrial systems. **Francois CLUZEL** - CENTRALSUPELEC
9:10	From Organic Waste to Ink for 3D Printing Within the MELiSSA Loop. **Martin CERFF** - BHL	SUPER FOOD FOR SPACE: from a complex biological system to a simplified plant model. **Leone ROMANO** - UNINA	Space Greenhouse Design: towards a systematic methodology. **Lucie POULET** - UCA
9:30	THE FUTURE OF FOOD PRODUCTION. **Giorgia PONTETTI** - EltHub	Lactuca sativa L. pla nts showed different capacities to cape with ionizing radiation when exposed to increasing doses of heavy ions. **Sara De FRANCESCO** - UNINA	Designing the MELiSSA Pilot Plant Integration. Gas loop closure between higher plant chamber and crew compartment: requirements specifications, simulations and hardware. **Carles CIURANS** - UAB
9:50	COFFEE BREAK		
	Plants Characterisation 3/3	**Space & Terrestrial Demonstrators 1/3**	**System Studies 2/3**
	Chair: Bahar Aciksoz (U Essex) **Co-chair:** Veronica De Micco (UNINA)	**Chair:** Chloé Audas (ESA) **Co-chair:** Alexis Paillet (CNES)	**Chair:** Gilles Dussap (UCA) **Co-chair:** Angela Vermeulen (TUD)
10:10	Integration of Human Urine Derivatives in Soilless Systems Fertilization to Grow Salad Crops. **Christophe EL NAKHEL** - UNINA	SEEDLING GROWTH: results from the largest ESA/NASA Arabidopsis experiment on the ISS looking into the molecular adaptation of plants to the Maan gravity and other l ife support system relevant scenarios. **Raul HERRANZ** - CSIC	A roadmap for future system studies VARSITY legacy. **Marco GATTI** - ENGINSOFT
10:30	Characterization of the performance of the Higher Plants Chamber in the MELiSSA Pilot Plant under batch and staggered mode of operation using L. sativa. **Carolina ARNAU** - UAB	PFPU: Microgravity Precursor Food Production Unit development statu. **Giorgio BOSCHERI** - THALES Alenia Space	Specification process of a simulation platform for the MELiSSA project. **Alexandre SOBAS** - CENTRALSUPELEC
10:50	Effect of the addition of human urine-based struvite on the growth of green bean on Mars and moon soil simulants. **Wieger WAMELINK** - U Wageningen.	Concept Study of a BLSS Module for LEO, Cislunar and Mars Transit stations. **Paolo CARATELLI** - U Abu Dhabi	Modelling physical processes in higher plants using leaf replicas for space applications. **Joanna KUZMA** - UCA
11:10	Amphibious plants present a gigantic shift in root microbial community across life cycles. **Jorge MANDUSSI** - U California	Adaptive vertical farm for fresh food production in life support systems. **Patrizia BAGNERINI**	Design of the MELiSSA loop control strategy. **Benjamin THIRON** - SHERPA
11:30	Light stimuli to guide roots of agriculturally-important plants in extra-terrestrial environments. **Luigi IZZO** - UNINA	Lessons learned for life support system payloads. **Blandine GORCE** - ESA	SpaceShip.FR and MELiSSA: Harmonized Roadmaps for Regenerative Life Support Systems. **Gregory NAVARRO** - CNES
11:50		Water Across the Plant Systems (WAPS): ground tests on hydration and air humidity to model plant growth for space experiments. **Giovanna ARONNE**- UNINA	
12:10	LUNCH		

	ROOM 1	ROOM 2	ROOM 3
	Audrey BERTHIER & Alexis PAILLET	**Ray WHEELER**	**Eric Landel**
13:10	MEDES	NASA	RTX
	Waste Treatment 1/2	**Space & Terrestrial Demonstrators 2/3**	**System Studies 3/3**
	Chair: Sandra Ortega (ESA) **Co-chair:** Alberte Regueira (U Ghent)	**Chair:** Cesare Lobascio (THALES Alenia Space) **Co-chair:** Carol Arnau (UAB)	**Chair:** Eric Landel (RTX) **Co-chair:** Chloé Audas (ESA)
13:40	Soluble wipes in deep space waste management. **Brian Mc CORMACK** - McCORMARK Innovation **Cancelled**	Running a photobioreactor in space for the production of oxygen and edible spirulina biomass. **Felice MASTROLEO** - SCK	Knowledge models of photobioreactors and their paths integral formulation. **Jeremi DAUCHET** - UCA
14:00	Bioenergetic modelling for predicting and steering VFA production in carbohydrates anaerobic fermentation. **Alberte REGUEIRA** - U Ghent	Design & operation of a bread board model of spirulina photobioreactor equipped with a harvesting system to support ISS On Board Demonstrator development. **Dominique CHAPUIS**- BEYOND GRAVITY	Conceptual design of an Environment Control and Life Support System for a Mars Transit Mission. **Blandine GORCE** - ESA
14:20	BioPack: a technology for waste inhibition and compaction for Life Support Systems. **Fabio LORENZINI** - KAYSER It	Spreading and sliding of condensed air humidity droplets over metallic substrates under non-isothermal conditions. **Ouriana OIKOMIDOU** - U Thessalonikis	Model structuration and review for MELiSSA knowledge and control. **Laurent POUGHON** - UCA
14:40	Characterization of a promising thermophilic chain elongating bacterium isolated from a MELiSSA waste compartment reactor, Thermocaproicibacter melissae gen. nov. sp. nov. for n-caproate production utilizing polymeric carbohydrates. **Tinh NGUYEN** - KUL	The Effect of ISS-like Ionizing Radiation and Microgravity on the Transcriptome of N-cycle Bacteria. **Tom VERBEELEN** - SCK	Analog mission to test life support systems for future manned missions. **Quentin ROYER** - ISAE
15:00	COFFEE BREAK		
	Waste Treatment 2/2	**Space & Terrestrial Demonstrators 3/3**	**Societal Impact 1/2**
	Chair: Ana Soares (U Cranfield) **Co-chair:** Korneel Rabaey (U Ghent)	**Chair:** Paolo Dainesi (Beyond Gravity) **Co-chair:** Dries Demey (Qinetiq)	**Chair:** Isabelle Damoisaux-Delnoy (IDDUP) **Co-chair:** Hennis Thieme (AstroPlant)
15:20	Lift off biogas industry : BIO-VALO, the pilot test platform for your projects. **Pierre FONTANILLE** - BioVALO	Advancement of the PFPU Root Module for the production of tuberous species in microgravity. **Luigi DURI** - UNINA	Open-source cellular agriculture and other one health citizen lead projects. **Garcia TORRENTS** - MARC
15:40	Plastic recycling in space using microorganisms: a potential tool to close the loop. **Rosa SANTOMARTINO**- U EDINBURGH	The SOLE project: a hydroponic greenhouse demonstrator for fresh food production in space. **Giorgia PONTETTI** - G&A Engineering	AstroPlant - an educational citizen science architecture for plant characterisation. **Thieme HENNIS** - ASTROPLANT
16:00	Evaluating the use of menstrual blood-derived cell therapy to support astronauts in longterm space missions. **Marion DUGUE** - TU DELFT	Autonomous complex biospheres in space : moral grounds, historical perspectives and a way forwards. **Louise FLEISCHER** - SPRING	Mars Camp - How to raise awareness of STEM through the topic of space. **Gaétan GRECO** - Euro Space Center
16:20	The membrane bioreactor (MBR): A hybrid technology for bioregenerative wastewater treatment and resource recovery in space. **Daniel YEH** - U South FLORIDA	Analog astronaut habitats and space simulation systems. **Kato CLAEYS** - KUL	The MELiSSA Project in the ESA_Lab@ Initiative: A Brainstorming Platform Promoting European STEM talents. **Maria Gabriella SARAH** - ESA
16:40	FREE TIME		
20:00	GROUP PICTURE		
20:30 22:30	GALA DINNER		

	ROOM 1	ROOM 2	ROOM 3
	REBUS 1/2	**Algae & Photobioreactor 1/2**	**Societal Impact 2/2**
	Chair: Marta Del Bianco (ASI) **Co-chair:** Stefania De Pascale (UNINA)	**Chair:** Jeremy Pruvost (GEPEA) **Co-chair:** Ellen Harrison (U Cambridge)	**Chair:** Christian TAMPONNET (ISPN)
8:00		The assessment of microalgae biochemistry new perspectives for their monitoring in photobioreactors. **Gonçalves OLIVIER** – GEPEA	Round Table **AstroPlants Users**
8:20		Extracellular conversion of CO2 into sugars and other functional food ingredients: SweetAir. **Iulian-Zoltan BOBOESCU** U WAGENINGEN	
8:40	The REBUS project in the context of the Italian Life Science Roadmap for human space exploration. **Marta DEL BIANCO** – ASI	Assessing the efficiency of cyanobacterium based BLSS on Mars **Cyprien VERSEUX** – ZARM	
9:00	Simulated microgravity affects pollen tube development: a crucial stage in the seed-to-seed cycle of space candidate crops. **Maurizio IOVANE** – UNINA	Optimizing phosphorus removal for municipal wastewater post-treatment with Chlorella vulgaris. **Aigars LAVRINOVIS** – RTU	History of CELSS in Europe. **Christophe LASSEUR** – ESA
9:20	The Potential of Lunar and Martian regolith simulants as plant growth media. **Antonio Giandonato CAPORALE** – UNINA	ALGOLIGHT to produce high value products in photobioreactor adaptable to the life support for human space exploration. **Charlène THOBIE** – ALGOLIGHT	The MELiSSA foundation and the selection of young scientists involved in research on life support in space: eight years of experience in the POMP project. **Max MERGEAY** – MELiSSA Foundation
9:40	The REBUS fungal collection for the space organic waste exploitation. **Solveig TOSI** – U PAVIA	Development of innovative processes for the industrial cultivation of high added-value plants in a vertical farming pilot system. **Nico BETTERLE** – U VERONA	
10:00	COFFEE BREAK		
	REBUS 2/2	**Algae & Photobioreactor 2/2**	**Terrestrial Applications 1/2**
	Chair: Marta Del Bianco (ASI) **Co-chair:** Stefania De Pascale (UNINA)	**Chair:** Pascal Jaouen (Pol Mer atlantique) **Co-chair:** Théodore Besson (ESTEE)	**Chair:** Aude de Clercq (ESA) **Co-chair:** Rob Suters (SEMiLLA)
10:20	Space organic waste degradation: a new approach to microgreens cultivation. **Silvia TABACCHIONI** – ENEA	Implementation of an automated process for a continuous Limnospira harvesting and the recycling of the culture medium for space applications. **Céline COENE** – QINETIQ	URIDIS, electricity-driven water technology for safe and sustainable toilets without chemical additives. **Korneel RABAEY** – U Ghent
10:40	Entomological degradation in bio-regenerative systems for space: Study on the bioconversion. **Maurizio CALVITTI** – ENEA	The impact of light, temperature and low-dose irradiation on the growth and composition of Limnospira indica, a component of the MELiSSA life support system for space exploration. **Jana FAHRION** – SCK	The greater Caux Seine Area : the land of energy transition & circular economy. **Pierre Van CAENEGEM** – CAUX SEINE
11:00	Chicory (Cichorium intybus L) for space-oriented production of prebiotic rich plant under controlled conditions for astronaut wellbeing. **Alberto BATTISTELLI** – CNR-IRET	Modeling and experimental campaign of a novel, compact, thin-tube photobioreactor for high volumetric productivity. **Jack HOENIGES** – GEPEA	Microalgae-based biofacade to develop sustainable buildings: system modeling with Modelica **Flora GIRARD** – GEPEA
11:20	Chocory roots as antidote to spaceflight induced chronic stress: a translational study in the framework of the ReBUS project. **Francesca ZORATTO** – ISS	Duckweed Production for Space Life Support. **Christine ESCOBAR** – SPACE LAB	Integrated Water Cycle Demonstration Pilot Project Using MELiSSA Space Technology. **Ernesto LOPEZ BAEZA** – U VALENCIA

11:40	Morpho-physiological and nutritional responses of Brassica microgreens to heavy ions: an outlook on ionizing radiation from the REBUS project. **Veronica De MICCO** - UNINA	Algal dormancy and revivability in space. **Yash PARDASANI** - SAMS UHT	The NEWgenerator Resource Recovery Case studies for global sanitation in India and South Africa, and implications for space colonies. **Yeh DANIEL** – U FLORIDA
12:00	ReBUS-Cyanobacteria: The use of the desiccation-, radiation-tolerant cyanobacterium Chroococcidiopsis sp. CCMEE 029 for in situ resource utilization on the Moon and Mars. **Daniella BILLI** - U ROME	Arthrospira – Biomas Recovery. **Rastilav KRAMP -** Bio X	
12:20	LUNCH		
	ROOM 1	**ROOM 2**	**ROOM 3**
	BioMaterial 2/2	**Urine & Nitrification 3/3**	**Terrestrial Applications 2/2**
	Chair: Adevnit Makaya (ESA) **Co-chair:** Sandra Ortega (ESA)	**Chair:** Baptiste Leroy (U Mons) **Co-chair:** Aurea Heusser (EAWAG)	**Chair:** Stephan Speidel (ESA) **Co-chair:** Pierre Van Caenegem (CAUX SEINE)
13:30	Assessing the Recycling Potential of Cupriavidus necator for Space Travel: Production of SCPs and PHAs from Organic Waste. **Pierre JORIS** – TBI	Nitrogen gas production and extraction from urine to compensate for gas leakage during long-term Space missions: Proof of concept for an energy-efficient microgravity-compatible bioreactor. **Marijn TIMMER** – U ANTWERP	PhotoBioreactor Space R&D at MEG Science. **Mattia TOFFANETTI**
13:50	3D printing in low-gravity (3DmedLowG project): Challenges in development of hardware and food compatible printing ink. **Gasan OSOKNIK** – Univerza v Ljubijani	Nitrogen gas and water recovery using the Nitrogenisor bioreactor for crewed Mars mission: A feasibility study based on stochastic mission scenarios. **Tim Van WINCKEL** – U ANTWERP	Q&A about MELiSSA terrestrial applications **Aude De CLERCQ** – ESA **Stephan SPEIDEL** – ESA
14:10	Kombucha-derived biomaterials for life in space. **Agata KOBODZIEJCZYK** – AGH UST	Toward nitrogen recovery from unnitrified urine using Limnospira indica. **Baptiste LEROY** – U MONS	Opportunities for MELiSSA-derived downstream services within ESA's Space Solutions. **Arnaud RUNGE** – ESA
14:30		Hydrolysis and nitrification of synthetic urine in continuous packed-bed bench-scale bioreactors. **Carolina ARNAU** – UAB	Advancing Opportunities for Ag-Tech in the Space Environment: Mutation Breeding Programs, Closed-Loop Developments, and Exploring Future Opportunities. **Connor KISELCHUK** – StarLab Oasis
14:50	COFFEE BREAK		
15:20	**Pr LIU Hong** – Lunar Palace		
15:40	PANELS. Necessary ECLSS demonstrators before the departure to Mars. **Cesare Lobascio** – Thales **Dries Demey** – RedWire **Francesc Gòdia** – UAB-MPP **Alexis PAILLET** – CNES **Peter Weiss** – Spartan Space **Chairman :** Giorgio Magistrati – ESA		
16:20 **16:40**	Conclusion **Robert Lindner** – ESA		

Torben HENRIKSEN

SPEAKER

Director of Technology, Engineering and Quality (D/TEC), and Head of ESTEC

José GAVIRA IZQUIERDO

SPEAKER

Head of the Mechanical Department in the European Space Agency

Jose Gavira is the Head of the Mechanical Department in the European Space Agency, managing a team of 300 engineers, with the responsibility to oversee the technical developments in ESA missions and projects, as well as the procurement of new Technologies in a large number of disciplines, with a total portfolio close to 500Meuros

He has over 37 years' experience in Space field, starting as Mechanical Engineer in the Spanish Space industry in 1985, and moving to the Technical Directorate of ESA in 1990. Additionally he hold a Master degree in Space Systems Engineering and an MBA.

During his career at ESA he was working in several Directorates, closely overseeing and coordinating Technology Research and Developments of Payloads and instruments for projects in Science, Earth Observation and the Human and Robotic Exploration Programs.

The Department he manages provides projects support, engineering knowhow, analysis tools, and laboratories facilities, and in those functions. Within his tasks he has been deeply involved in preparing the programmatic plans for MELiSSA activities during the last three Ministerail cycles.

Giorgio MAGISTRATTI

SPEAKER

1991-1998
Joined Laben (a Finmeccanica Company, Vimodrone Italy, now TAS-I) as Hardware Designer. Involved in the design of analogue and digital design of frontend and readout systems for Nuclear Physics. Member of the Hardware design and engineering team of a parallel supercomputer family (APE100 Project, INFN Roma)

June 1998 -2009
Joined Carlo Gavazzi Space Spa (CGS now OHB-I) as avionics system engineer. Hexapod Avionics responsible (Hexapod is a platform for scientific experiment now installed on the International Space Station). CGS responsible for system engineering of the DHPU (Data Handling & Power Unit) : a electronic unit to be used on the ISS External Payload (EuTEF, CPD,ASIM) that consists of a power section and a digital section based on VME bus.
Avionics System engineer for the production and integration of the DPUs/ICU units to be installed on the Herchel satellite: 3 EMs, 1 EQM and 3 PFMs have been assembled, tested and delivered to the Heschel Project.

CGS Program Manager and System Engineer of the High Performance COTS based Computer for Payload Systems project (Hi-P Cots) as subcontractor of EADS Sas under an ESA contract: a R&D activity that has as a goal the study, the modelisation (at architecture and building block level) and the validation of architecture for Payload Computers based on COTS components.

2009-2019
Joined the European Space Agency. Head of On-board Computers and Data Handling Section in the D/TEC Data System Division (TEC-ED). The Section's domain of responsibility covers control and data handling computers, low-level software, data transfer interfaces, command and control protocols and buses, solid state mass memories, authentication/encryption modules and general underlying microelectronics devices, such as microcontrollers and interface components.

2019-now
Joined ESA Humand and Robotic Exploration Directorate as Leader of the ExPeRT team (Exploration Preparation and Reseact Technology team) in charge of mission definition nd technology development for Exploration.

Sébastien BARDE

SPEAKER

Centre National d'Etudes Spatiales (CNES)
Associate Director for Exploration and Human Spaceflight

Sébastien Barde has been involved in human spaceflight for most of his career. He was project manager of the DECLIC experiment developed in cooperation with NASA, that is dedicated to the study of critical liquids and crystallization. Onboard the ISS since 2009, DECLIC has provided the scientific teams with major results allowing them to issue many publications.

He was later head of the CADMOS center which is in charge of all the French experiments in microgravity performed on board the MIR space station, then the ISS, and also in the Zero-G airplane. In this position, in 2016 – 2017, he was project manager of the French part of the Proxima mission, the first six-month mission of ESA's astronaut Thomas Pesquet's on the International Space Station.
In early 2017, he was appointed CNES' Associate Director for Exploration and Human Spaceflight.

Stella TKATCHOVA

KEY SPEAKER

EIC Programme Manager
EISMEA - European Innovation Council And SMEs Executive Agency

Stella Tkatchova is the Programme Manager (PM) for space systems at the European Innovation Council (EIC). As a Programme Manager, Tkatchova brings critical insights and technology/market specific knowledge and supports SME's and start-ups to achieve breakthrough innovation.
Previously she worked as a project manager and commercialization manager in the European space industry, managing a number of projects in the telecommunications (e.g. ESA ARTES INDIGO public private partnership, GOVSATCOM, O3B) and Earth observation (e.g. Copernicus Sentinel 1 and Sentinel 3) domains. As a commercialization manager, she co-founded a company and helped several SMEs and start-ups grow in the Newspace industry. Earlier in her career, she worked at ESA's European Space and Technology Centre (ESTEC) on the EU Galileo and the International Space Station (ISS) programmes. She holds a PhD by the Faculty of Aerospace Engineering of TU-Delft, The Netherlands.
She has written numerous articles, books, produced webinars and podcasts on problems related to the commercialization of space technology, the Newspace economy, space debris mitigation, on-orbit servicing, active debris removal and cis-lunar exploration. Tkatchova is the founder and former editor-in-chief of the International Journal of Space Technology Management & Innovation (IJSTMI).

Presentation summary
In her presentation Stella Tkatchova will show the findings of the call for contributions to the call Challenges for Circular Economy & Sustainable Living in Space and Earth.
The European Innovation Council (EIC) and the European Space Agency (ESA) jointly selected and consolidated the results in a White Paper, based on the input of selected experts from the space and terrestrial R&I ecosystem.
EIC and ESA jointly identified four outstanding challenges regarding circular economy and sustainable living on Earth and in Space and identified the following common synergies:
• Circular System Design Methodology (A)
• Circular Waste Management (B)
• Circular Urine Management (C)
• Circular Food Management (D)
The EIC and ESA received more than 74 proposals and performed a selection of 31 proposals based on the criterion of completeness, innovation potential and excellence of the contributions. ESA and the EIC invited the authors of the selected contributions to a joint workshop, which took place on the 13th of May 2022. The authors presented their innovative ideas and concepts and delivered their input to the White Paper on the respective challenge they focused on. The final conclusions of this joint effort will provide a summary of the strategic synergies for the circular economy and sustainable living on Earth and Space.

The content of the presentations was provided by the Key speakers and Speakers

GERALDINE NAJA

KEY SPEAKER

Director of Commercialisation, Industry and Procurement
ESA - European Space Agency

Geraldine Naja is Director of Commercialisation, Industry and Procurement at the European Space Agency (ESA). A French national, Geraldine holds over 30 years of experience, expertise and knowledge within the European space sector, in programmatic, managerial and strategy development positions.
She is responsible for elaborating and implementing ESA's industrial and procurement policies, conducting negotiations with industry, and managing procurement for all the Agency's activities and programmes. Furthermore, Geraldine is responsible for enabling and boosting European space commercialisation ambitions through innovative tools and partnerships.
Geraldine holds an MSc in Engineering and Propulsion and an MSc in Political Sciences, from the French École Polytechnique and the École Nationale Supérieure de Techniques Avancées (ENSTA), and the Institut d'Etudes Politiques de Paris (Sciences Po) respectively. Within various universities and institutes, Geraldine carries out teaching assignments about space policy, with the aim of inspiring future generations.

Presentation summary

Creating new commercial opportunities for the MELiSSA project.

In more than 30 years of research in the field of alternative life support systems in space, the MELiSSA project has acquired extensive know-how and competencies and built a wide network and close collaboration between its partners and the community. The technologies, processes and methodologies developed are now more than ever in line with the growing challenges for long-term human presence in space, as well as with our terrestrial sustainability and resource management challenges. Whether waste treatment, water recycling, food production, photobioreactors, or modelling and monitoring solutions, we see a market for closed resource loops and a large window of opportunity for MELiSSA stakeholders that should not be missed. Through ESA's Agenda 2025, in particular the creation of the Commercialisation Department and the 'Space for a green future' accelerator, ESA now has additional tools to create new commercial opportunities for MELiSSA research. In its role as facilitator and enabler, ESA will work with the MELiSSA project to explore new market opportunities for providing sustainable solutions for both space and Earth.

DIDIER SCHMITT

KEY SPEAKER

Strategy and Coordination Group Leader for Human and Robotic Exploration
ESA - European Space Agency

Didier Schmitt is head of the strategy and coordination group for human and robotic exploration at the European Space Agency. From 2009 to 2018 he was stationed in Brussels, successively in the European Commission Space Policy Unit, as adviser to the President of the EC on science technology foresight, and at the EU diplomatic service dealing with space and security. Previously he was head of Life Sciences for human spaceflight at ESA-ESTEC and beforehand Associate Professor at the Toulouse medical school and at the International Space University. His educational background is PhD in biosciences and certified medical doctor (including mountain emergency medical care and aerospace medicine). His academic work brought him to various places like Cape Canaveral for scientific experiments on Shuttle-Spacelab programme and to Star City near Moscow for experiments on the Mir space station. In 2016/17 he was part of an Antarctic inland logistics expedition. As a populariser, he Authored several books and was an active opinion writer in the top French press. In 2013 he also authored "All you need is Space", a comic booklet by the EU, distributed at 1 million copies in 25 languages. More recently he started a fiction science comic series (Red Safari) and is chief editor of a magazine-book series on space and exploration (Mook Mars).

Presentation summary

ESA's Terrae Novae exploration programme is leading Europe's human journey into the Solar system using robots as precursors and scouts. Exploring space is about travelling farther and coming back with new experiences and knowledge to help us on Earth. Humankind will benefit from the new discoveries, ambitions, science, inspiration, and challenges.
Looking further ahead the Terrae Novae 2030+ strategy roadmap is an ambitious exploration vision for Europe. Its objectives are threefold: to create new opportunities in low Earth Orbit for a sustained European presence after the International Space Station, to enable the first European to explore the Moon's surface by 2030 as a step towards sustainable lunar exploration in the 2030's, and to prepare the horizon goal of Europe being part of the first human mission to Mars.

FRANÇOIS FORGET

KEY SPEAKER

Senior Consultant Scientist
Institut Pierre Simon Laplace (IPSL/LMD)

François Forget is a planetary scientist at CNRS in Paris (LMD, Institut Pierre Simon Laplace) and has previously worked several years at NASA and CNES. He is a specialist of the robotic exploration of the solar system (and in particular, Mars) and is involved in various activities regarding the future human explorations. He is a member of the science teams of several space missions including Mars Express, Trace Gas Orbiter and Rosalind Franklin (ESA), Mars Reconnaissance Orbiter and Insight (NASA), Hope (toward Mars, UAE), New Horizons (Pluto, NASA) and DA VINCI (Venus, NASA). With his team, he has developed numerical models to simulate the environment in the atmospheres of the solar system. These models are now used to design all planetary space missions going to these environments and analyze their results. He has also been serving as an adviser for science and exploration at CNES, ESA and NASA.

Presentation summary

Exploration of the red planet and its resources

After the Moon, Mars is the long-term objectives of space agencies for human exploration. Meanwhile, in the past 25 years Mars has been explored and studied without interruption by many spacecrafts from various countries. They have shown that the red planet is a small, desert planet with a thin CO2 atmosphere, an active meteorology and a rich past that has left spectacular geological signatures on the surface.
The atmosphere may sometime be problematic for human exploration (storms). Nevertheless the CO2 atmosphere is a well-known resource to extract carbon (to make methane as a fuel) and oxygen (to breathe or make an oxidizing fuel). A key resource on Mars is water. I will review our knowledge of the different water reservoir available and their accessibility, and discuss various topic regarding its future exploration by humans.

The content of the presentations was provided by the Key speakers and Speakers

CHRISTOPHE LASSEUR

KEY SPEAKER

Head of MELiSSA Project - European Space Agency

PhD in bioengineering from University of Compiegne (France), Christophe Lasseur join first MATRA space Branch (today Airbus), where he worked on the control of higher plant chamber. Later on he became the project manager of the echograph Anthrorack which flew with success on US Shuttle D2 mission. In 1990, he joined ESA for a research fellow position devoted to the precursor of the MELiSSA pilot plant. In 1992, he became MELiSSA project manager, and in 1998 the coordinator of ESA R&D in the life support domain. From 2000 to 2010, he chaired the International Life Support working Group, which involved NASA, JAXA, CSA, RSA, and ESA. He currently acts as well as European representative to the ISS Medical board for microbiology, and is adviser for several European Union activities. Since 2012 he chair the Life Support Sessions (F4) of COSPAR. He regularly teaches in several European engineering schools (e.g. KTH, EPFL, Agro-Paris). In March 2017, He received a Doctor Honoris Causa from Antwerp University (Belgium).

Presentation summary

Overview of MELiSSA project

Seeded in 1987 with a precursor flight experiment on board the Chinese rocket longue Marche and initiated by Airbus in March 1989, the European project of regenerative life support, follows a very progressive approach. Today, after almost 30 years of activities, the project gather a very large community from scientists to engineers, from universities to spin-off companies, from industry to space companies, from students to European civil servants. This large community distributed over 15 European countries is pursuing two main objectives: - Space life support system and - Terrestrial circular economy.

It is correct to state that the key challenge of MELiSSA is: how to select, to assemble and to demonstrate processes and technologies to reach the highest degree of closure within the ALISSE criteria set : Mass, Energy, Efficiency, Safety, Reliability and Crew Time.

Mainly due to these final objectives, the overall project is structured in a very progressive approach.

Within Phase 1, Basic R&D, the processes and technologies are characterized, first at stoichiometry's level, energy and safety, then static and dynamics models are elaborated for an integration in the overall system. After this intensive characterization, within phase 2 called: Preliminary Flight experiments, the critical space issues are identified and propose for flight experiment. From this already solid information the selected processes and technologies are integrated and demonstrated over a long period and with living consumers. The core of this activity is performed at the MELiSSA Pilot plant in Spain. In parallel, of these 3 phases run as well the Phase 4 : Technology transfer, where already 6 spin-off company have been created. Initiated to transfer space technology to Earth, this phase is becoming more and more a platform of collaboration for join R&D efforts. Phase 5, which has taken a reasonable amplitude over the last years: Education and Communication is led by the MELiSSA foundation and support Students and STEM activities. In this presentation we present the organization of the project, the key achievements and the perspective.

ELENA GRASHCHENKOVA

SPEAKER

European Space Agency

Mrs. Grashchenkova is a Contracts Officer at the European Space Agency. She graduated in European and International Business Law from Leiden University, and she holds an LL.M. in Russian law. Mrs. Grashchenkova is a graduate of the ISP20 Program at the International Space University.

Mrs. Grashchenkova joined ESA in 2013 and since then she has been providing procurement support to the Technology, Engineering and Quality Directorate and the Human and Robotic Exploration Directorate. She has been in charge of contract management for different projects in human spaceflight, ISS exploitation activities, and space exploration programmes, including the Lunar Gateway and HERACLES mission. From 2022, she is in charge of big space projects in telecommunications. She has worked closely with the European Astronaut Centre, the German Aerospace Center (DLR) and the French Space Agency (CNES). For many years, she has served as a Contracts Officer for the MELiSSA project.

Before joining ESA, Mrs. Grashchenkova worked as a Legal Counsel in a law firm in Rotterdam providing legal advice in international trade and transport. She has spent much of her career specialising in contract and civil law, procurement and international arbitration.

BAHAR ACIKSOZ

SPEAKER

University of Essex

I graduated from Sabanci University, Turkey with a PhD on plant nutrition and physiology. After my studies I started working as a post-doctoral fellow at ETH Zürich in the Group of Plant Nutrition. In my first post-doc project at ETH Zürich, I worked at the MELISSA Food characterization phase 2- Cultivar selection project at the European Space Agency (ESA). In my second post-doc project at ETH Zürich, I continued working for ESA under the framework of the MELISSA Foundation. I later enrolled at a private Swiss company, Earth Space Technical Ecosystem Enterprises SA (ESTEE SA), as a food production project manager where my task was to maximize food crop production in a vertical unit of aeroponics and hydroponics, equipped with remotely controllable LED illumination. Then I worked as a moss farm manager at Green City Solutions GmbH in Berlin, Germany. Currently I am a Cofund Marie Curie fellow from the European Union`s Horizon 2020, Co-Circulation2 programme working at the University of Essex. The aim of the project is to develop a speed breeding system to accelerate crops of soybean, barley and wheat generation up to 6 cycles per year by using LED lighting systems.

AUREA HEUSSER

SPEAKER

PhD student, ETH Zurich, Department of environmental engineering

Aurea Heusser is a PhD student at ETH Zurich in the department of environmental engineering, where she also did her Bachelor and Master Degree. Her research takes place at Eawag, the Swiss Federal Institute of Aquatic Science and Technology, in the department of process engineering under the supervision of Prof. Dr. Kai M. Udert. She is working on the treatment of separately collected urine to produce a fertilizer. Her research focuses on the efficiency and robustness of the whole treatment chain, from storage to fertilizer, including degradation of organics, nitrification and the adsorption of pharmaceuticals. She aims for an optimization of the treatment process by better understanding the individual steps and testing new reactor types and configurations.

CLAUDIA QUADRI

SPEAKER

Senior Application Engineer EnginSoft S.p.A

Graduated at Politecnico di Milano in Chemical Engineering, Claudia Quadri currently works at EnginSoft as Senior Application Engineer. She deals with engineering consulting activities for product and process design and innovation utilizing CFD simulation tools and collaborates with costumers from a broad range of industrial fields. She gained experience in several applications, such as HVAC, process industry (LNG plants, scrubbers, reformers), multiphase flows, chemical applications (mixing process, reactors, reactive flows), heat transfer and combustion simulations aimed at evaluating pollutant emissions.

She has participated in international research projects in the Bio-regenerative systems and Aerospace sectors. In particular, she collaborated with ESA and the MELiSSA program for the improvement and upgrade of the MPP compartment IV_b, and she led the design, engineering and testing of the PaCMan PCU (Plant Characterization Unit), a hydroponic research facility with closed atmospheric and liquid compartments for plant characterization.

The content of the presentations was provided by the Key speakers and Speakers

Mona SCHIEFLOE

SPEAKER

Researcher / PhD Candidate CIRiS - Centre for Interdisciplinary Research in Space, NTNU Social Research ltd

Mona Schiefloe holds a MSc in Biology and is currently a PhD candidate in Biotechnology/Biology. She has worked as a Researcher at CIRiS since 2010. The research activities emphasize plant production in closed systems for both spaceflight Life Support and Earth applications. Of special interest is environmental factors affecting plant growth and development in recycling hydroponic systems, with a special focus on salt stress and effects of nutrient solution composition. The research includes monitoring and control of nutrient solution components, resource recycling between biological systems, technologies for plant monitoring and plant analyses and process control of the plant growth facilities. Projects span from cooperation with local farmers in their greenhouses to development of life support systems for human spaceflight and execution of plant experiments on the International Space Station. Schiefloe has several years of practical experience from integration and operation of spaceflight projects and is a certified console operator for ESA and NASA for the International Space Station program.

Kai Udert

SPEAKER

Prof. Dr. sc. techn.

Kai Udert has a background in environmental engineering. In 2003, he received his PhD from the Swiss Federal Institute of Technology Zurich (ETHZ). After a postdoctoral affiliation with the Massachusetts Institute of Technology (MIT), he joined the Swiss Federal Institute of Aquatic Science and Technology (Eawag) in 2006. Since then, he has been leading the research group on decentralized wastewater treatment and source separation at Eawag. In 2017, Kai Udert got an appointment as adjunct professor at ETH Zurich. Since 2016, he has been involved in the MELiSSA project. His main research focus lies on nutrient recovery from urine. Besides working as a researcher, he is a lecturer at ETH Zurich for process engineering in water and wastewater treatment. He is member of the management committees of the IWA specialist groups on Resource-Oriented Sanitation and Small Water and Wastewater Treatment Systems. Furthermore, he has been working with the Swiss (SNV) and German (DIN) standardization bodies on the development of guidelines for on-site sanitation systems. In addition to his academic work, he is also involved in the two start-up companies Vuna GmbH and VunaNexus AG.

Anna JURGA

SPEAKER

PhD Student, Wroclaw University of Science and Technology

Anna Jurga is a final-year PhD student at the Faculty of Environmental Engineering at Wrocław University of Science and Technology. Her doctoral thesis concerns the production of liquid fertilisers from urine and grey water for soilless cultivation at a future space base. She was involved in a number of projects related to the life support system in a space application, as well as research projects on circular economy in wastewater treatment. Her main field of interest is closing the loop between sanitary sector and agriculture in both space and terrestrial systems, and also new, highly efficient agricultural systems. She is involved in the commercial projects implementing modern vertical farming for plant cultivation.

Popat SUDEEP

SPEAKER

Associate Professor Environmental Engineering and Earth Sciences
Clemson University

Dr. Sudeep Popat is an Associate Professor in the Department of Environmental Engineering and Earth Sciences at Clemson University. He has a Ph.D. in Chemical and Environmental Engineering from the University of California, Riverside, and conducted postdoctoral research at Arizona State University, prior to coming to Clemson. His research group focuses on wastewater treatment technologies, particularly on anaerobic digestion to recover energy and electrochemical technologies to recover nutrients. Ongoing projects include anaerobic co-digestion of wastewater sludge with fats, oils, and grease, wherein the focus is on the understanding of the conversion of long-chain fatty acids under anaerobic conditions. The lab also works on using electrochemical peroxide production and its applications in wastewater treatment. One area of focus is the stabilization of source-separated urine to enable the recovery of nitrogen and phosphorus.

Antonio PANNICO

SPEAKER

Department of Agricultural Sciences,
University of Naples Federico II, Portici, Italy

Antonio Pannico obtained a Master degree in Horticultural Science at the Department of Agricultural Science of the University of Naples Federico II (Italy) in 2008. From 2010 to 2014, he accomplished his Ph.D. in Science and Technology of Agri-food Production. Since 2014, he has been collaborating with the Space farming research group of the Department of Agricultural Sciences within the MELiSSA program on different topics: development of a root module for growing tuberous species in microgravity (PFPU project); upgrading and testing of Compartment IVb at the ESA MELiSSA Pilot Plant in the Universitat Autònoma de Barcelona; characterization of plants for Bioregenerative Life Support Systems in Space (BLSSs) in the ESA Plant Characterization Unit at the Laboratory of Crop Research for Space (PaCMan project). He is currently a Senior researcher at the University of Naples Federico II, Italy.

Luigi Gennaro IZZO

SPEAKER

Department of Agricultural Sciences, University of Naples Federico II

Luigi Gennaro Izzo is a Researcher in Environmental and Applied Botany at the Department of Agricultural Sciences, UNINA. He received the master's degree in Biological Sciences in 2015 and the PhD in Agricultural and Food Sciences in 2019, conducting research on plant lighting in the framework of the MELiSSA project aimed at improving plant-based bioregenerative life-support systems. He contributed to several projects funded by ASI and ESA carrying out research activities at foreign research centers including the NASA Kennedy Space Center (USA), the ESA European Space Research and Technology Center (NL), the Environmental Horticulture Department, University of Florida (USA) and the Institute of Plant Physiology and Genetics, Bulgarian Academy of Sciences. Current research activities mainly focus on: 1) plant responses to light quality, 2) plant tropisms and plant reproduction in altered gravity conditions. To date he authored n. 25 peer-reviewed publications in international scientific journals and is Editor of Frontiers in Plant Science, BMC Plant Biology, Frontiers in Astronomy and Space Sciences, Plants and PeerJ.

Nele KIRKERUP

SPEAKER

Process Engineering

Nele Kirkerup is member of the POMP III program focussing on the fate of organic compounds during biological treatment of urine. She has always been interested in space technologies, wanting to study aerospace engineering before joining the environmental engineering department at ETH Zurich. During the master program her interest in circularity and the versatile application and definition of sustainability grew. She wrote her bachelor thesis on particle pollution around airports and her master thesis on urine nitrification in biofilm systems, which fostered her interests in lab work, resource recovery and circularity. During her studies, Nele actively engaged in different student associations, building soft skills such as team management and communication, which she is eager to implement in her scientific research. By entering the POMP III program Nele combined her interests acquired during the years at ETH with her childhood dream of working in space technologies.

Mathew GILLIHAM

SPEAKER

Director, Waite Research Institute - University of Adelaide, Australia

Matthew is Director of the Waite Research Institute, the University of Adelaide's flagship for agriculture, food and wine innovation. As Director he is stimulating and supporting research initiatives across the spectrum of agricultural research (from policy and economics, to animal, soil, crop and food sciences). As Professor of Crop Molecular Physiology, he has a track record of notable discoveries in plant nutrition, stress signalling, and salt and drought tolerance, with many of these discoveries deployed into improved crops for agriculture. In recent years he has turned his attention to optimising plants for extra-terrestrial and controlled environments, which is required to enable long-term space habitation, and to improve sustainability outcomes on Earth. He is leading a large multi-national collaboration between academia, government, and industry to build international capability in Plants4Space. Matthew is a current Clarivate Highly Cited Scientist, and he and his group have received honours, awards and funding which include SA Tall Poppy Awards, ARC Future Fellowships, Training Centres, and Centres of Excellence. Matthew is also convenor for the Adapting to abiotic stress and climate change special interest group of the Society for Experimental Biology, UK, and recent member of the South Australian Premier's Science and Innovation Council.

Matteo BALLOTARRI

SPEAKER

Associate Professor in Plant Physiology University of Verona, Department of Biotecnologie

Prof. Matteo Ballottari obtained in his PhD in Industrial and Environmental Biotechnology at the University of Verona in 2008. Since 2011 Matteo Ballottari was appointed as Assistant Professor, and then since 2014 Associate Professor, in Plant Physiology at the Department of Biotechnology of the University of Verona. He is member of the several national and international scientific society, among which the International Socieity of Photosynthesis Research and the Young Academy of Europe. Matteo Ballottari is involved in national and European projects financed by public and private funds about the exploitation of photosynthetic organisms to produce food, feed and high value products. Prof. Ballottari group (SOLE-LAB) studies plant metabolism in microalgae and higher plants, focusing on how it might be improved to produce biomass and high value products through an interdisciplinary approach ranging from omics to biophysics, biochemistry, and genetic engineering.

Joao Pedro GARCIA

SPEAKER

European Space Agency

João Garcia obtained a masters's degree in Biomedical Engineering from the University of Porto (Portugal) in 2015. In 2020, he completed a PhD in Regenerative Medicine at the University Medical Center Utrecht (The Netherlands), during which he focused on the development of regenerative strategies for cartilage diseases. Since early on in his PhD, Joao developed an interest in cellular agriculture and cultured meat technologies. As of January 2022, he joined the European Space Agency as a Research Fellow, where he is currently evaluating the potential of cultured meat as food source in future long-term space exploration missions. Among other tasks, João is identifying the main obstacles and constrains to implement cultured meat in space, as well as pinpointing opportunities to integrate these technologies with other life support or food production systems. João is additionally interested in studying the behaviour of cells used in cultured meat when exposed to space environment conditions.

Thanh Huy NGUYEN

SPEAKER

Ph.D candidate Laboratory of Proteomics and Microbiology, Faculty of Sciences University of Mons Belgium

During the time studying and working at Can Tho University (Vietnam), I mainly focused on plant biotechnolgy, particularly applying plant tissue culture for the breeding of different ornamental and medicinal plants, and using molecular tools for the screening of different characteristics (e.g. fragrance, salt tolerance, alkaline tolerance) of rice cultivars. Later, when I did my Master thesis at Vrije Universiteit Brussel (VUB) (Belgium), I worked on Sulfolobus acidocaldarius, a thermoacidophilic archaeon, with the aim to engineer a thermo-stable red fluorescent protein that can be use as a multi-purpose tool for research in this extremophile. On 2020, I came back to Belgium for my PhD at the University of Mons (UMons). I am now a member of URINIS research group. The URINIS project aims at providing a proof of principle that urine nitrification, a key process in the MELiSSA life support system, using a consortium of three functional groups of bacteria, i.e. (i) ureolytic heterotrophs for the hydrolysis of urea to ammonia (also my focus from the side of Umons), (ii) ammonia oxidizing bacteria for the oxidation of ammonia to nitrite (nitritation), and (iii) nitrite oxidizing bacteria for the oxidation of nitrite to nitrate (nitratation), is possible under Space conditions in the ISS.
Education:
2008-2013: B.Sc in Biotechnology, Can Tho University, Vietnam
2016-2018: M.Sc in Molecular Biology (IPMB), Vrije Universiteit Brussel, Belgium
2020-present: Ph.D candidate - Doctorat Sciences Bioloques, Université de Mons, Belgium.

Pierre MAGNES

SPEAKER

PhD in Biology (Ecotoxicology), Paul Sabatier University, Toulouse

After working in cogeneration and biomass plants, Pierre MAGNES founded FIRMUS France in 2011, with the technical help of Jean-Christophe LASSERRE, technical manager. FIRMUS France made it possible to maintain relationships between the ESA and the French Polar Institute (IPEV), around the grey water recycling system installation on the Concordia Research Station. In 2017, to better promote and develop the FIRMUS France know-how in grey water recycling, he founded the FGWRS (Firmus Grey Water Recycling System) company based in Monaco. Relationships with the ESA and the IPEV will continue through a two-year program supported by the Prince Albert 2 of Monaco Foundation, aiming to improve the process in place and focus on other aspects of water treatment; yellow and black water. Justin SARGENTI (justin@fgwrs.mc) is in charge of this program and she will travel to Antarctica from december 2022 to January 2023 to test the pilot she is developing.

The content of the presentations was provided by the Key speakers and Speakers

Chiara AMITRANO

SPEAKER

Dr. Chiara Amitrano, University of Naples Federico II, Department of Agricultural Sciences.

Born in Naples (Italy) in 1992, biology graduated with a Thesis on Space ecology, Ph.D. in Sustainable Agricultural, Forestry Systems and Food Security. Currently she works at the Department of Agricultural Sciences of the University of Naples on the project "microgreens x microgravity", in collaboration with the Italian Space Agency. In the last years, she has been involved in many research projects, covering these areas of expertise:

- Plant morpho-anatomical and photosynthetic adaptations to natural and polluted environments.
- Controlled environment crop production
- Studying and modelling the effects of environmental parameters' modulation (VPD, water delivery, drought and salt stress, light intensity).
- Plants in Space Ecosystems and extreme environments, with emphasis on the effects of ionizing radiation (radio-sensitivity and radio-resistance strategies).
- Resource use efficiency in plants and Vineyards through a multidisciplinary approach tracing functional traits in the continuum soil-plant-atmosphere.

Ana SOARES

SPEAKER

Cranfield University, UK

She is a professor in Biotechnology Engineer and IWA Fellow working at Cranfield University in the UK. Her work focuses in municipal as well as industrial wastewater, proposing innovative and economically feasible solutions to produce high quality effluents and product recovery. Her scientific findings have resulted in leading-edge processes and technological innovations that contribute, worldwide, to sustainable solutions for effluent treatment. These contributions are underpinning the implementation of circular economy solutions, reduction in greenhouse gas emissions, and enhanced effluent quality. She is particularly successful in bridging the gap between science and application, working in close collaboration with industrial and institutional stakeholders. She is the Editor in Chief for the Water and Environment Journal, Associate Editor for Water Research and active in many national and international committees.

Luis Rafael LÓPEZ DE LEÓN

SPEAKER

PhD in Environmental Science and Technology.
Specialty in Environmental Engineering

Luis R. López de León (El Salvador, 87) Chemical Engineer from the Autonomous University of Barcelona (UAB, 2011). He performed his master thesis and PhD thesis in the research GENOCOV under the supervision of Dr. David Gabriel, of the Department of Chemica Engineering at UAB. His doctoral thesis (May,2016), focused on the development of control strategies in biotrickling filters for the removal of hydrogen sulfide from biogas streams. During his PhD studies he performed a 6- month research stay at Ghent University under the supervision of Prof. E. Volcke and later from April 2017 to May 2020 he worked as a postdoctoral researcher at Duke University (USA). Since February 2022 and until January 2024, Dr. López will lead the MSCA funded project titled: "The MICRO-BIO process" at the LEQUIA/Universitat de Girona. The MICRO-BIO process aims to capture CO2 from indoor air and transform it into carbon-neutral commodity chemicals by means of microbial electrosynthesis technologies. Research interests: Development of CO2 capture technologies to improve indoor air quality and Design of microbioreactors to enhance mass transfer and reaction rate of biological processes.

Siegfried VLAEMINCK

SPEAKER

Professor, University of Antwerp

Since 2015, Siegfried E. Vlaeminck is professor at the University of Antwerp, where he heads the research team Microbial Cleantech and Environmental Systems Analyses for Water, Nutrients, Food and CO2, in the Sustainable Energy, Air and Water Technology Research Group, and serves as vicechair to the Bioscience Engineering Department. He obtained his MSc (2005) and PhD (2009) degrees in Bioscience Engineering, option Environmental Technology, at Ghent University, under the supervision of prof. Willy Verstraete. The mission of his Antwerp-based research team is to develop sustainable microbial biotechnology for water cycling, food production and climate change mitigation. As an ultimate case of circular economy, the team also focuses on regenerative life support systems for human spaceflights, in the MELiSSA programme, with a particular interest in nitrification-based processes. Prof. Vlaeminck contributed to 130+ papers indexed by Web of Science, which are cited 4500+ times. The Vlaeminck lab is well connected, amongst others to the Centre for Advanced Process Technology for Urban Resource Recovery (CAPTURE). The team's activities can also be followed on LinkedIn and Twitter.

Daniel SCHUBERT

SPEAKER

Dr.-Ing. Daniel Schubert studied at the Technical University of Berlin and has an engineering diploma in industrial engineering with an emphasis on aerospace and production techniques. In 2011, he initiated the EDEN group at the DLR Institute of Space Systems for technology investigations on Bioregenerative Life Support Systems and since served as the team leader of this group. His research expertise is set on habitat interface analysis and plant accommodation and dynamic plant production planning. Throughout many projects for ESA, EU, Bundesministerium für Bildung und Forschung (BMBF), Wirtschaftsförderung Bremen (WfB), Dr. Schubert proved his management- and team leading skills. Outstanding is the EDEN ISS project. He led this project with 15 international partners, including the organization of the deployment mission of the greenhouse system at the Antarctic research station Neumayer III in 2017/18.

Florent BOUCHON

SPEAKER

PhD student at INRAE, Antony, France.

I studied biotechnology in AgroParisTech in order to work with microorganisms. I find them amazingly powerful, capable to adapt everywhere in the world and able to catalyze all the reactions. However they are full of mysteries that I wanted to investigate. That is why I am working on bioelectrochemical systems applied to wastewater treatment in the frame of the ANR project BIOTUBA in my PhD. Before to implement it in wastewater treatment plant, one of the main limitations of the device (a bio electrochemical snorkel) is the aging of the biofilm which decreases its performances overtime. Hydrodynamic was identified to potentially be used as a control tool. I am currently working on this strategy, using shear stress to refresh aged biofilm activity and efficiency using a new reactor developed by myself. On the other hand, I am really interested in one of the main challenging part of the 21st century: Space exploration. In this objective, microorganisms could lead to increase yields, give answers to well-known problematics and adapt faster than other organisms. This is why it could be a great honor to help developing new biotechnologies applied to space in this MELiSSA project.

The content of the presentations was provided by the Key speakers and Speakers

Olivier LEPINE

SPEAKER

Chief Scientific & Technical Officer, Member of the board

Olivier Lépine is one of the founders and the Chief Scientific and Technical Officer of Algosource, a group of companies dedicated to microalgae. Since 1993 AlgoSource has embarked on the development of Spirulina and Phycocyanin based products. The first company to commercially produce Spirulina in Europe, AlgoSource has developed original microalgae-based products with the aim of bringing efficient nutraceuticals to both industries and final consumers. Those products are tested in clinical studies against placebo.The company also provides integrated consultancy services for microalgae projects from competitive production technologies up-to biomass biorefining and product marketing. Olivier has a master's degree in physics and chemistry and a master degree from the National School of Petroleum in France. He has served in the energy industry for 7 years abroad before joining the microalgae sector.

Christer FUGLESANG

KEY SPEAKER

Prof. Christer Fuglesang, KTH Royal Institute of Technology

Christer Fuglesang is a Swedish physicist and an ESA astronaut. He was first launched aboard the STS-116 Space Shuttle mission on December 10, 2006, at 01:47 GMT, making him the first Swedish citizen in space. Married with three children, he became a Fellow at Cern after obtaining a PhD in experimental particle physics from Stockholm University in 1987. Fuglesang got selected to join the European Astronaut Corps in 1992. He has participated in two Space Shuttle missions to the International Space Station and performed five spacewalks. He is the first person outside of the United States or Russian space programs to participate in more than three spacewalks.

Currently, Fuglesang is Professor at KTH Royal Institute of Technology in Stockholm and Director of KTH Space Center. His research is related to particles in space: radiation on ultra-high energy cosmic rays and recently studying the possibility of putting sunshades in space to help control global temperature. He teaches the course Human Spaceflight. Fuglesang is also a Space Advisor for Saab, working as a consultant since 2017.
Fuglesang is member of the Royal Swedish Academies of Science, Engineering Science and War Sciences. Hi is chairman of the Boards for the Swedish National Museum of Science and Technology and the Göran Gustafsson Foundation for Research in Natural Sciences and Medicine. He has written several books for children.

Joël DORÉ

KEY SPEAKER

Research Director
INRAE - Institut National De La Recherche Agronomique

Joël is Research Director at INRAE Micalis Institute "Food and Gut Microbiology for Human Health" (www.micalis.fr) and Scientific Director of MetaGenoPolis (www.mgps.eu), offering unique expertise in quantitative and functional metagenomics. Gut microbial ecologist by training, Joel pioneered intestinal metagenomics towards food-microbe-host interactions as well as diagnostic applications. With > 38 years of academic research and > 250 publications (H Index 69), Joël aims to provide a better understanding of man-microbes symbiosis towards personalized preventive nutrition and precision medicine. Joel is laureate of the ERC-Advanced Homo. symbiosus and coordinator of EU program https://humanmicrobiomeaction.eu/. He is co-founder and scientific advisor of www.maat-pharma.com, a startup company dedicated to provide safe and standardized microbiotherapy solutions for the reconstruction of host-microbes symbiosis in the context of cancer therapy. He is also cofounder of https://novobiome.eu/ and https://gmt.bio/. Member of the BoD of GMfH, he supports the www.gutmicrobiotaforhealth.com scientific web-platform.

Presentation summary

Humans are microbial, ecosystems, symbioses. The relationship that humans have with their microbiomes is an essential element in maintaining health and well-being. Recent changes in lifestyles may have fostered an alteration of this symbiosis, which is frequently associated with chronic disorders and diseases that have been increasing unchecked for several generations. We will highlight the innovations expected from the emerging knowledge on the host-microbes symbiosis, for diagnosis, preventive nutrition and a medicine of the 'microbial human'. As microbiome science also impacts a number of sustainable development goals of the Planetary boundaries Initiative, we will also explore how microbiome science could help provide sustainability tools and strategies aligned with the life support systems sought by MELiSSA.

Emmanuel FROSSARD

KEY SPEAKER

Full Professor of Plant Nutrition
Institute Of Agricultural Sciences At The ETH Zurich

Emmanuel Frossard studied Agriculture and Food Sciences at the Institut National Polytechnique de Lorraine in Nancy, France (ENSAIA-INPL). After completing his doctorate at the ENSAIA-INPL in 1985, he spent two years as a postdoc fellow in the Department of Soil Science at the University of Saskatchewan, Canada. From 1985 to 1994 he was a lecturer in the Group for Crop Production at the ENSAIA-INPL before becoming Associate Professor of Plant Nutrition at the ETH Zurich in 1994 and full Professor in 2000. He has been from January to June 2013 visiting scientist in the group of BioGeoChemistry of Prof. PM Vitousek, Stanford University, USA and from February to July 2020 visiting scientist at CIRAD in the unit recycling and risks on La Réunion. From 2013 to 2018 Emmanuel Frossard has been president of the steering committee of the Swiss National Research Program on the use of soil as a resource. Emmanuel Frossard's group addresses in research and teaching the challenge of how to improve nutrient efficiency in productive agricultural systems to preserve and enhance the natural resource base and contribute to food security.

Presentation summary

We review here what should be considered so that higher plants grown in the MELiSSA loop could receive and use all nutrients they need in available forms and appropriate concentrations to allow optimal growth. We show that to reach that goal we will need full input and output element mass balances for each step implemented in the MELiSSA loop. These balances will have to be calculated for nutrients as well as toxic elements. It will be also necessary to analyze the forms of elements and, if necessary, to implement processes to transform nutrients into plant available forms. We will need to quantify the impact of various nutritional regimes on CO2 uptake, O2, water, and biomass production. Among the new methods to be developed, the most urgent one would be to remove sodium (Na) from urine as soon as it is collected, without removing any plant nutrients. Finally, it will also be important to develop ion-sensitive electrodes that can be used in the long term to monitor the concentration of each element of interest in the nutrient solution, and a method to treat data collected by these electrodes in real-time so that plants can always be fed with the nutrients they need..

The content of the presentations was provided by the Key speakers and Speakers

Francesc GÒDIA

KEY SPEAKER

Full Professor in Chemical Engineering
UAB - Universitat Autònoma De Barcelona

Full Professor of Chemical Engineering at Universitat Autònoma de Barcelona (UAB) since 1993. Teaching activities in Biotechnology and Chemical Engineering. Coordinator of the Biotechnology Doctoral Program at UAB. His research activity is focussed on Regenerative Life Support Systems in Space and Animal Cell Technology for the production of biopharmaceuticals, recombinant vaccines and vectors for gene therapy. Overall Manager of the MELiSSA Pilot Plant a joint facility of UAB and ESA (European Space Agency), for the demonstration and integration of Life Support technologies. Author of more than 125 papers in JCR journals, 5 patents, 9 book chapters and advisor of 37 completed PhD thesis. Member of the Scientific and Organizing Committee of several International Congresses. Coordinator of the ESACT International Courses on Animal Cell Technology and Cell-based Viral Vaccines. Vice-President of the European Federation of Biotechnology. Member of the Executive Board of the European Society of Animal Cell Technology.

Presentation summary

The MELiSSA loop is conceived as a loop with several compartments, each one performing a specific function, providing all together the basic functions in life support: food production, atmosphere regeneration, water recovery and wastes treatment. The MELiSSA Pilot Plant is a facility designed for the terrestrial demonstration of this concept, hosting laboratory rats as a crew mimicking the respiration of humans. The work program at the Pilot Plant is currently focused on the integration of its compartments in long-term continuous and controlled operation, in consecutive steps, involving liquid, solid and gas phases, targeting to the completion of the proposed loop. The integration of three compartments: Compartment 3 (nitrifying packed-bed bioreactor based on the co-culture of immobilized Nitrosomonas europaea and Nitrobacter winogradskyi), Compartment 4a (an air-lift photobioreactor for the culture of the edible cyanobacteria Limnospira indica with concomitant oxygen production) and Compartment 5 (an animal isolator with rats as mock-up crew), has completed a long-term experimental campaign, exploring the effect of several variables in the operation of the three compartments, with special emphasis in the complex gas management dynamics between the three compartments and its control in continuous operation. The system showed high robustness and reliability over long operation periods and the coordinated performance of oxygen producing and oxygen consuming compartments has been achieved under transitory and steady-state conditions. The next integration steps in preparation in the MELiSSA Pilot Plant will include the higher plant chamber, that is now completely characterized. Finally, the future perspectives of the MELiSSA Pilot Plant evolution to a Human Rated Facility will be discussed.

Laurence LEMELLE

SPEAKER

Directrice de Recherche CNRS at LGL-TPE
(Ecole Normale Supérieure de Lyon, CNRS)

Laurence Lemelle is a Directrice de Recherche CNRS at LGL-TPE (Ecole Normale Supérieure de Lyon, CNRS), where she studies biogeology. Her research focuses on the microbial cell/mineral interactions and assemblages using non-destructive visible and X-ray elemental and molecular imaging techniques. In the 2000s, she pioneered a new program to detect past and present microbial cells in rocks using synchrotron micro-XRF and work on XRF analyses of the cometary and interstellar grains of the NASA Stardust Sample Return Mission. Today, she is a key developer of the trace metal quantification by XRF recorded on the new generation X-ray nanoprobes dedicated to elemental and molecular imaging. The aim is the exploration of biological patterns and biomarkers with unprecedented sensitivity in the oldest microbial traces at the origin of life. In 2008, in joint work with C. Place, biophysicists of the Laboratoire de Physique (ENS de Lyon), she initiated an experimental study based on visible microscopy. The aim was to better understand the primo interaction of microorganisms with solid surfaces that determines upstream the colonisation of mineralogical and biological environments. Today, this work is focused on how to limit surface biocontamination in future manned missions of long duration, based on the design of the MATISS sample return experiment on the ISS.

Lucie POULET

SPEAKER

Institut Pascal, Université Clermont Auvergne.

Lucie Poulet is currently a European Marie Sklodowska-Curie research fellow at Institut Pascal (Université Clermont Auvergne, France), where she obtained her doctorate in chemical process engineering. Her research focuses on the study of mass and energy transfer in reduced gravity environments, for modeling applications of advanced life-support systems. The long-term application of this research is the design of efficient and sustainable space greenhouse modules, using modeling tools. She has previously worked for 3 years in the Space Crop Production group at NASA Kennedy Space Center (Florida), studying the interactions between ventilation and photosynthesis in reduced gravity environments, through modeling and experimentations, as well as the development of harvesting hardware for microgreens in microgravity. She discovered the MELiSSA project thanks to an internship at the European Space Agency in the MELiSSA team, 12 years ago. Her enthusiasm for space exploration and her various research projects led her to participate in 4 Mars analog missions – including the 4-month NASA-funded HI-SEAS mission – and 7 parabolic flights to test experiments she had participated in designing.

Dimitrios BOUZIOTAS

SPEAKER

Dimitrios Bouziotas holds an R&D modeling role in the fields of Urban Water Systems & Hydroinformatics, working as part of the Resilience Management & Governance team in KWR Water Research Institute in the Netherlands.
His scientific background lies in hydraulic engineering (MEng NTUA/MSc TU Delft), with experience in both applied research (KWR, NTUA/Greece, Deltares/the Netherlands, GIZ/Vietnam, JRC/Italy) and water engineering consultancy (Hydroexigiantiki/Greece).
The focal points of his work are water systems modelling, optimisation and quantitative risk analysis. He also has an interest in research related to hydroinformatics, including data-driven models and hydroclimatic stochastics.
Dimitrios is currently working, among others, in Dutch and EU-Horizon 2020 projects where water cycle modeling at regional and city scales is employed.

Etienne PERRIN

SPEAKER

Student & intern at CNES

Design and mechanical engineer specializing in aerospace fascinated by space exploration and complex systems. Born and raised in Paris, I continued to study there when I started my higher education at ESTACA and then at EPF, engineering schools that allowed me to develop my mechanical, systems engineering and aerospace education. Along my school years, I enjoyed having multiple work experiences allowing an exploration of multiple industries. I enjoyed working as a mechanical design engineer in the naval industry, designing and manufacturing large structures and as a mechanical design engineer in energy research by DLR, in Cologne, developing new solar reactors aiming at the synthesis of green hydrogen and synthetic fuels. Building and imagining systems has always been a passion and aerospace a subject of curiosity for me. To this passion that I have always had for aerospace, as far back as I can remember, has been added with time an awareness of the importance of the challenges that mankind must face to ensure its heritage and its future. Regarding that, I am today working at CNES in Spaceship FR, an R&D infrastructure working on low TRL technologies for Moon and Mars exploration.

François CLUZEL

SPEAKER

Assistant Professor, Université Paris-Saclay, Centrale Supélec, Laboratoire Génie Industriel

François Cluzel is an assistant professor and head of the Design Engineering research group at Laboratoire Genie Industriel (Industrial Engineering Research Department) at CentraleSupélec, member of Université Paris-Saclay. He holds a PhD in industrial engineering from Ecole Centrale Paris (2012) and an engineering degree in mechanics from Supméca Paris (2008). His research and teaching activities deal with innovation engineering and circular economy. He is a member of the Design Society, and of the French network of eco-design researchers EcoSD. He is an active member of the ESA_Lab@ CentraleSupélec launched in 2020.

Martin CERFF

SPEAKER

Dr. Martin Cerff, Blue Horizon SarL, Luxembourg

Martin joined Luxembourg-based start-up company Blue Horizon in 2020 after a postdoc at the Forschungszentrum Jülich where he studied metabolic fluxes of bacteria. He holds a PhD in Bioprocess Engineering from Karlsruhe Institute of Technology (KIT). The interface between (Micro-)Biology and Technology fascinates him: he's been enjoying to pick tomatoes from the same plants in his wintergarden for almost three years now – with contributions from home-fermented fertilizer and automated irrigation. At Blue Horizon, he is developing solutions for Biological Life Support Systems for space exploration and terrestrial applications. He will talk about "From Organic Waste to Ink for 3D Printing Within the MELiSSA Loop".

Leone Ermes ROMANO

SPEAKER

PhD student, University of Napoli Federico II

Leone is a passionate Astrobotanist and is currently studying to finish his PhD in Food Science at the University of Napoli Federico II. His work mainly focuses on studying the effects of different gravity levels on plants' growth and nutrient content. His PhD research project (Superfood for Space) has been co-funded by ESA in the OSIP financial program. Superfood for Space aims to cultivate Wolffia globosa in Space as a food source for astronauts. To reach this challenging objective, the project plans to develop cultivation protocols for the up-mentioned species, automate the cultivation process and design cultivation hardware that could grow Wolffia globosa successfully in Space. Leone has been involved in numerous Space related research projects of national and international interests. Among these, Rootrops aimed at studying the interaction of light and hypergravity on the development of roots, and the Multitrop experiment conducted on board of the ISS is worth mentioning.

Giorgia PONTETTI

SPEAKER

Giorgia Pontetti, electronic engineer and astronautical engineer, lover of nature and technology. Despite the rigid and formal studies as an engineer in the 90s, I have always had nature and agriculture in my life, because it is the only source capable of making me feel alive. The passion for agriculture has always accompanied me, handed down by my family of humble and peasant origins, as well as the passion for technology that is constantly changing, because dynamism is the best weapon to get to know and know each other better. I am CEO of a research center for microelectronics for space applications G & A Engineering, founder and CEO of Ferrari Farm a new generation farm with hydroponic cultivation in sterile, hermetic and computerized greenhouses and Chief Technical Officer of EltHub a company specialized in design and manufacturing of Special Equipment for aerospace, defence, automotive and hydroponic. I'm Vice president and secretary of "Space Exploration" commission at the Order of Engineers of the province of Rome, member of the board of Woman 4 Cyber Italia and journalist.

Sara De Francesco

SPEAKER

PhD student - Department of Agricultural Sciences University of Naples Federico II

She is at the first year of PhD Course in "Sustainable Agriculture and Forestry Systems and Food Security at the Department of Agricultural Sciences of the University of Naples "Federico II". Her research project, funded by the Italian Space Agency (ASI) as part of the MELiSSA PhDs (POMP) program, aims to understand the effect of different types/levels of ionizing radiation on plant value as bio-regenerator of resources in Bioregenerative Life Support Systems (BLSSs) and to investigate the mechanisms for radioresistance. She got the master's degree in Food Science & Technology at the Department of Agricultural Sciences of the University of Naples "Federico II" in 2019. During the academic years, she participated, as a student in the preparation of the Multitrop experiment of the Italian Space Agency (ASI), at the NASA laboratories, on the effects of microgravity on the orientation of root growth. After the graduation, she won two fellowships as part of ASI "In Situ Resource Bio-Utilizazion for life Support systems-REBUS" national research project on the study of the effects of Space radiation on plants development.

Carles CIURANS

SPEAKER

Assistant Professor, Université Paris-Saclay, Centrale Supélec, Laboratoire Génie Industriel

Carles Ciurans (carles.ciurans@uab.cat) earned his B.Sc. degree in biotechnology from the Universitat Autònoma de Barcelona (UAB), Barcelona, Spain, in 2013 and his M.Sc. degree in biochemical engineering in 2017 from the University of Birmingham, United Kingdom. He is currently a Ph.D. candidate, both at the Université Clermont Auvergne, 6300 Clermont-Ferrand, France, and the Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain. He has industrial experience in the bioprocess industry mainly in the field of industrial production of organic acids. His academic research interests are oriented towards the modeling, control, and optimization of bioprocesses, with a focus on the design of life support system strategies.

Christophe EL NAKHEL

SPEAKER

Postdoctoral researcher at the University of Naples Federico II, Department of Agricutural Sciences, 80055 Portici, Italy.

Christophe El-Nakhel obtained a B.S. in Earth & Life Sciences from the Lebanese University, Faculty of Sciences II in 2012 and a diploma of Agricultural Engineering from the Lebanese University, Faculty of Agricultural Engineering and Veterinary Sciences in 2013; Accomplishing his graduation project at the University of Tuscia, Italy. From 2015 till 2019, he accomplished his Ph.D degree with honors in Agricultural and Food Sciences at the University of Naples, Department of Agricultural Sciences, under the POMP project financed by the European Space Agency and supported by MELiSSA foundation; Working on the management of the nutrient solution in hydroponics to produce higher quality lettuce plants for bioregenerative life support systems. In his Ph.D period, he was an exchange student for a year at the University of Ghent, Faculty of Biosciences Engineering, Belgium; Where he worked on the exploration of nitrogen and phosphate rich organic waste streams to replace chemical fertilization of hydroponically grown lettuce, and on the assessment of the rootassociated bacterial community. He is currently a postodoctoral researcher at the University of Naples Federico II, Italy.

Raúl Herranz

SPEAKER

PhD - PCNPmicrogravity Lab I3 researcher - Centro de Investigaciones Biológicas Margarita Salas (CSIC, Madrid SPAIN)

Awarded with a PhD in Biochemistry (molecular evolution, UAM, Spain/ Supervisor Prof. Marco, 2004) including his first spaceflight experiments as PhD student (Drosophila GENE/ AGEING experiments in the Spanish Soyuz Cervantes Mission, 2003), Raul Herranz worked as posDoc in several EU ground simulation labs, mainly at the European Space Agency (ESTEC, The Netherlands/ Supervisor Dr. van Loon, 2008) on LDC biological validation. Then, he joined the PCNPµG lab in Spain (CSIC, Spain/ Supervisor Dr. Medina) as transcriptomics expert, focused on the overall transcriptional effects of suboptimal spaceflight environments. He was the coordinator of several ESA and United Nations ground simulation projects, Co-I in the ESA/NASA largest Arabidopsis plant biology experiment at ISS (SEEDLING GROWTH) and invited as expert for United Nations, ESA and NASA (GENELAB) working groups. Today, he is the European coordinator of the ESA funded Space Omics Topical Team and International Standards for Space Omics Processing (ISSOP, https://issop.space/space-omics-topical-team/)

Marco GATTI

SPEAKER

Senior Project Engineer, EnginSoft

Born in 1988 in Bergamo (Italy), after a scientific high school diploma, I obtained a master's degree in Mechanical Engineering from the University of Bergamo and a Ph.D. in Energy Engineering, with specialization in Combustion, from Centrale Supélec (Université Paris-Saclay) and Technische Universität Darmstadt ("European Joint Doctorate" programme).

I work at EnginSoft since 2020 where I am a Senior Project Engineer working on many consultancy projects using 1D and 3D multiphysics simulation software. I am particularly involved in activities related to the ESA research program MELiSSA. Some examples of these activities are (i) hydrodynamic simulations of the photobioreactor compartment in the OSCAR project, (ii) design and engineering of a root sampling tool for the PCU in the PaCMan 2 project and (iii) system simulations of the MELiSSA loop in the VARSITY project.

Carolina ARNAU JIMENEZ

SPEAKER

I was born in Barcelona, Spain. I am currently working in the MELiSSA Pilot Plant as a Technical Coordinator. I am in charged of keep running the pilot compartments and contributing in their Integration to fulfil with the complete closure of gas, liquid and solid phases of all MELiSSA compartments. I finished my bachelor's in chemical engineering in 2005 in Universitat Autonoma de Barcelona. In 2011, I finished my PhD in the Biotechnology field. In my PhD, I developed an Optimized Production system for Heterologous proteins using yeast as a host in a continuous and fed-batch operation modes. After completing my PhD, I started a position as Junior Bioprocess Engineer in the MELiSSA Pilot Plant. I was mainly focussed on the Nitrifying Compartment. After some years involved in the project, I started working in other compartments as the photobioreactors compartments and continuously progressing in the integration of several phases of the compartments. In 2018, I started a new position in the MELISSA Pilot Plant as a Technical coordinator. From then on, we are progressing in the grown demonstration of the MELISSA loop, integrating all compartments (all phases) in other to fulfil 100% of a human oxygen needs and 40% of its diet for long term testing campaigns.

Giorgio BOSCHERI

SPEAKER

Regenerative Life Support Senior Engineer Thales Alenia Space Italia Giorgio Boscheri is a Space Engineer employed since 2008 at Thales Alenia Space Italia, a company specialized in integration of large space systems. Since then, he has been involved in the research and development of advanced life support systems for space exploration, with base in Turin. His fields of specialization and technical responsibility are bio-regenerative systems, with a focus on solutions that use higher plants to regenerate vital resources and produce food, as well as water treatment technologies. He has managed numerous national and international projects, most of which for the European Space Agency.

Alexandre SOBAS

SPEAKER

CentraleSupélec, Université Paris-Saclay
Current company : MBDA (Airbus Group)

Following a Master's degree in mechanical engineering at the University of Technology of Troyes (UTT) and two internships in the aerospace industry, Alexandre SOBAS will graduate in 2022 with a Master of Science in complex systems engineering at CentraleSupélec, Université Paris-Saclay. His Master's thesis, supervised by François Cluzel & Franck Marle (CentraleSupélec), focused on the specification process of a simulation platform for the MELiSSA project, in collaboration with Christophe Lasseur & Chloé Audas (ESA). After completing his final internship on Model Based Systems Engineering (MBSE) for Systems of Systems, Alexandre is currently working as a systems engineer at MBDA (Airbus Group).

Wieger WAMELINK

SPEAKER

Senior Ecologist - Wageningen Environmental Research

Dr. Wieger Wamelink works as ecologist at Wageningen University & Research (WUR) in the Netherlands. As senior researcher he works on the effects of nitrogen deposition and climate change on biodiversity, especially on plant species. He is also one of the caretakers of the nature gardens on the Wageningen campus and as campus ecologist responsible for the management of the green areas on the campus. In 2013 Wieger started Food For Mars and Moon (FFMM) with as goal to grow crops on Mars and the moon applying the regoliths and ice present at the moon and Mars. The research includes the effects of heavy metals present in the regoliths on the growth, effect of cosmic radiation on the plant growth, the application of human faeces as manure and the need to bring worms, bacteria and pollinators to create a sustainable closed agricultural ecosystem. The research recently expanded to grow mealworms on crops grown on Mars regolith simulant as an addition to astronaut's meals and to circulate plant waste. To boldly grow where no plant has grown before.

Paolo CARATELLI

SPEAKER

Ph.D, M.Arch. OAPPC (Italy) - Associate Professor of Architecture - College of Engineering, Department of Architecture and Design - Abu Dhabi University, Abu Dhabi – UAE

Paolo Caratelli is a Licensed Architect in Italy (OAPPC, Florence Chapter), and currently a full-time faculty as Associate Professor at Abu Dhabi University. He holds a M. Arch. cum Laude, and a Ph.D. in Architectural and Urban Design from the University of Florence, Italy. He collaborated on several projects as design manager, architect, and planner for private developers and public institutions as well. In 2008 he moved to UAE as Managing Director for a leading architecture firm, then joined Abu Dhabi University in 2011 as full-time faculty. Paolo is an active researcher on architectural and urban sustainability, and investigator about social and cultural changes in architectural design. He published in several international peer-reviewed journals and conference proceedings, serving also as Guest Editor and reviewer. His research activity is focused on design and technology integration into habitats in isolated confined extreme (ICE) environments as paradigm of self-sufficiency and environmental sustainability, and investigation of complex habitation systems as techno-theoretical resource for buildings in ordinary environments. A special focus is dedicated to the psycho-physiological effects of confinement on occupants in ICE habitats and possible remedies through architectural design and spatial organization, integration of Bio-regenerative Life Support Systems (BLSS) into ICE habitats including movable disaster relief facilities, desert and polar regions, underwater facilities, and habitats in low and micro-gravity environments in space, and technologies' spin-offs into ordinary buildings. Paolo is an Associate Member of the American Institute of Aeronautics and Astronautics, Board Member of AIAA-SATC (Space Architecture Technical Committee), and Scientific Committee Member of SPSD (Spatial Planning and Sustainable Development).

Joanna KUZMA

SPEAKER

Université Clermont Auvergne (UCA), Centre National d'Etudes Spatiales (CNES)

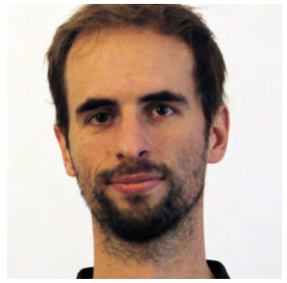
Graduated in chemical engineering at Wroclaw University of Technology. Currently PhD student at Université Clermont Auvergne in the POMP3 program sponsored by MELiSSA Foundation and CNES. Before starting the PhD Joanna was Young Graduate Trainee at ESA in MELiSSA Project. During her studies, she was involved in several space-related projects with a direct interest in life support systems and plant cultivation. The main area of her interest is modeling heat and mass exchange between plants and the environment.

Jorge A. MANDUSSÍ

SPEAKER

Montiel-Molina PhD - Amphibious-plants microbiome presents a shift in diversity across their life cycle

Born and raised in Mexico City, Montiel-Molina completed a Bachelor's degree in Biology at the Metropolitan Autonomous University in Xochimilco, Mexico (the place of origin for the famous salamander Axolotl, Ambystoma mexicana). He gained knowledge in areas such as fungal biology and taxonomy, aquaculture, wildlife ecology, among other topics not of his expertise, but related with his research interest. He obtained a Master's degree in Life Sciences at The Center for Scientific Research and Higher Education of Ensenada, defending a thesis on plant distribution of rare and endemic flora restricted to ephemeral wetlands–vernal pools, in Baja California, Mexico. After some time in conservation activism with the California Native Plant Society (USA) and, other local groups in Mexico, he decided to travel to the USA to study ephemeral wetlands at the University of California, Merced. Montiel-Molina obtained his Ph.D. in Environmental Systems in 2021, studying microbial ecology in vernal pools at the Mediterranean region of the North American continent, encompassing California USA, and Baja California Mexico. He is a pioneer in studying the microbiome of soil, water, and plants uniquely adapted to these extreme ecosystems. Currently, he serves as a faculty lecturer at the University of California Merced, teaching topics on environmental microbiology.



Benjamin THIRON

SPEAKER

Modelling and Control Engineer - SHERPA Engineering

Benjamin Thiron is a Control Engineer at SHERPA Engineering in Paris since 2020. After a master thesis on the design of a global control system for the MELiSSA Life Support System at SHERPA Engineering, he joins the company as a control engineer. He works on flow and energy management systems and is involved in the MELiSSA projects in which the company participates. Recently, he has been involved in the VARSITY project and in the development of a control strategy for the MELiSSA life support system.

Blandine GORCE

SPEAKER

Young Graduate Trainee, European Space Agency

Currently a Young Graduate Trainee at the European Space Agency, I design and size life support systems for future Martian missions. I currently leverage lessons learned for life support systems payloads' operations and future regenerative life support.
In December, I will graduate with an MSc. in Engineering from Supaero in Toulouse, France, with a major in Earth Observation, and a minor in Conception and Operation of Spacecrafts. After a short stint in a biotech startup, I have concentrated on nurturing my passion for space systems: first as a research intern on the study of coronal mass ejection at the Institut de Recherche en Astrophysique et Planetologie (IRAP), and subsequently within the Micro-Ecological Life Support System Alternative (MELiSSA) team at the European Space Agency (ESA) with crewed spaceflights as my primary focus. As a graduate student, I participated in the development of a concept system to recycle water through plant transpiration, and shortly after I was lucky to be a part of, as the crew's health and safety officer, an analog mission at the Mars Desert Research Station in Utah. I hope to continue to contribute to the field of life support systems and broaden my knowledge of crewed spaceflight.

The content of the presentations was provided by the Key speakers and Speakers

Gregory NAVARRO

SPEAKER

Spaceship FR Engineer
Responsible for the development of Moon and Mars habitats

Graduated of Polytech'Orléans in Embedded Computer Systems Engineering in 2002, Gregory Navarro first worked in the development of embedded software for aerospace, military and automotive systems. He joined CNES in 2008 and worked for 6 years on critical software for scientific payloads as a Quality Engineer for several scientific missions. In 2014, he took over responsibility for the quality operations team, in support of the control centers and the teams of the CNES command/control center and antenna network. He was also part of the operations team that carried out the launch of four GALILEO satellites in 2017. In 2018, he joined CADMOS as deputy project manager for the coordination of the development, operation and maintenance of the technology and life support payloads operated in the Columbus module by the astronauts of the International Space Station (ISS). Then he was responsible for the development of various experiments for the ISS, in particular the student experiments and the Blob for Thomas Pesquet's ALPHA mission. Since September 2021, he has been responsible for the development of the lunar and Martian habitat for the SPACESHIP France project at CNES in Toulouse.

Giovanna ARONNE

SPEAKER

Department of Agricultural Sciences, University of Naples Federico II

After the Laurea degree in Agricultural Sciences at the University of Naples (IT), she obtained a PhD in Plant Science at the University of Aberdeen (UK). Her academic career started as university researcher in General Botany and is now full professor of Environmental and Applied Botany at the University of Naples Federico II.
One of her main research interests is to investigate on morpho-functional adaptations of plant species to changing environmental conditions. Part of her research is still devoted to long term conservation of rare and threatened species in sight of climate changes. However, over the last twenty years, most of her studies aim at investigating the effects of space factors, mainly microgravity, on plant growth and reproduction.
In the scenario of human missions to Moon and Mars, the European and Italian Space Agencies have involved her in projects aimed to study the effect of microgravity on root tropisms, water transpiration, seedling growth, pollen functionality.
She has been principal investigator and coordinator of numerous research projects including those performed on the International Space Station in collaboration with NASA, ESA, and ASI.

Audrey BERTHIER

KEY SPEAKER

Executive Director
MEDES - Institute For Space Medicine And Physiology

Audrey Berthier is the Executive Director of MEDES, the Institute for Space Physiology and Medicine. She is a biomedical engineer, graduated from the Engineering School Telecom Physique Strasbourg. She has been working for MEDES since 2001 and has managed or participated to various projects in the field of space medicine, digital health and epidemiological surveillance. In 2019, she became COO of MEDES and became the Executive Director of MEDES in 2020.

Presentation summary
CNES – Spaceship FR
ESA and CNES have developed an initiative to study relevant concepts for future exploration missions, the Spaceship initiative. This Spaceship project is a collaboration between three entities, the Spaceship FR (CNES, Toulouse), the Spaceship EAC (ESA, Cologne) and the Spaceship ECSAT (ESA, Harwell). The Spaceship teams also have networks of collaborators across Europe, enabling them to support and initiate R&D to reach operational concepts, with an emphasis on practical demonstrations and on an organization with a high degree of autonomy. The Spaceship FR works on several key areas including activities for optimized life support systems.

MEDES – Institute for Space Physiology and Medicine
MEDES is a hybrid organization between space and health, which was founded in 1989 by CNES and the Toulouse University Hospitals, its two main members. Its activities are focused on space physiology and medicine, clinical research and innovations between space and health. In the field of clinical research, MEDES is operating a clinical research facility, the Space Clinic, integrated within the Toulouse University Hospitals and used both for space and non-space research.

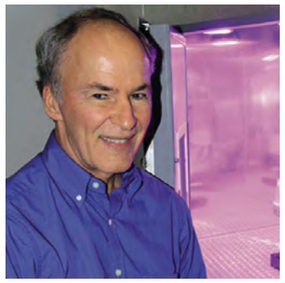
Alexis PAILLET

SPEAKER

Spaceship FR Project manager and in charge of the technologies for exploration at the Centre National d'Etudes Spatiales based in Toulouse.

Alexis joined the French space agency in 2005 to work in the development, assembly and testing of space instruments intended in particular for the exploration of the planet Mars (ChemCam on board the Curiosity rover and the main seismometer of the Martian lander Insight). Since 2019, Alexis take the lead of the Spaceship FR project, which aims to prepare human and robotic space exploration, by validating French technologies on Earth, deploying them on test bases in order to begin exploration of the Moon and to export the model to the planet Mars. This project is a laboratory of ideas and demonstration of technologies at the service of a future lunar base, which is being prepared under the impetus of the American Artemis program.

The content of the presentations was provided by the Key speakers and Speakers



Raymond WHEELER

KEY SPEAKER

Plant Physiologist and lead for Advanced Life Support Research activities in the Exploration Research and Technology Program
NASA Kennedy Space Center

Ray Wheeler is a plant physiologist at Kennedy Space Center (KSC) where he has led the advanced life support and plant research groups. He received a BS from Penn State Univ., an MS and Ph.D. from Utah State Univ., and postdoctoral research at the Univ. of Wisconsin. Ray started at KSC in 1988 where his research focused on plant gas exchange, CO2 responses, hydroponics, and plant lighting. Ray has also been involved with KSC's waste processing, trace contaminant control, water biocide, and microbial monitoring research. Ray was a member of the Intl. Advanced Life Support Working Group and has held courtesy appointments at 9 universities. He is the author or co-author of 280 scientific research papers and currently serves as chief scientist for NASA's Kennedy Space Center. Ray received NASA's Exceptional Scientific Achievement Medal, NASA Exceptional Service Medal, the USDA B.Y. Morrison Distinguished Lecturer, the ASGSR Founder's Award, the AIAA Jeffries Award for Aerospace Medicine and Life Science Research and served as Vice Chair for the Life Sciences Commission of COSPAR.

Presentation summary

NASA's interests in bioregenerative life support started in the 1960s with studies of Chlorella algae and hydrogen metabolizing bacteria. Higher plant and waste recycling research expanded with the start of the CELSS Program ca. 1980, when university investigators began studying crops in controlled environments. These findings were used to conduct larger scale tests in NASA's Biomass Production Chamber (BPC). BPC studies tracked crop gas exchange rates, validated hydroponic techniques, recycled nutrients from processed wastes, and demonstrated a volume efficient, vertical farming approach. Related studies began in the 1990s to test LEDs for growing plants. Both vertical farming and LED lighting have expanded around the world now. Currently plants are grown on the ISS in small chambers to provide fresh foods for the astronauts. Although these don't provide much overall life support, they are an important step toward sustainable living in space. But success will require a worldwide effort that will ultimately help humans live both on Earth and in space.

Eric LANDEL

KEY SPEAKER

Senior Consultant
ELC

Eric Landel is awarded a diploma by the Ecole Central of Nantes then supports a thesis of naval hydrodynamics. He worked as Engineer of Principia R&D (scientific Engineering company), then Technical director. During this period, he performs numerous works for original modeling in acoustics, hydrodynamics and fluid mechanics… From 2000, he joined the NVH department of Renault where he was responsive of acoustic performance of Renault vehicle. He developped new methodologies for NVH. From 10 years, he was Expert Leader for numerical modeling and simulation in Renault : CAE, system modeling and support for decision making. He was responsive of the R&AE plan for new methods and tools. Now he is consultant and expert for numerical modeling and simulation.

Presentation summary

New stakes for numerical modeling and simulation of Cyber-physical systems

Performances of products and services become always higher and more sophisticated to meet the desires of their users. This becomes possible mainly by the growing contribution of electronics. So, products are made of physical parts with multiphysics phenomena, controllers and communication. The counterpart is a significant increase in their complexity which make their development and validation always more difficult and expensive. Classically, numerical modeling and simulation remain a strong lever to support these stakes, but with specific issues: architectural management, model management, model transfers, model identification, traceability, etc. On these questions, methods, tools and processes are emerging and their implementations make it possible to accelerate the availability of simulation results in the different contexts of the projects. At IRT SystemX, a research project AMC (Agility and Margin of Design) has recently delivered a demonstrator of a complete chain of tools to support the process of modeling a complex system.

Brian James MCCORMACK

SPEAKER

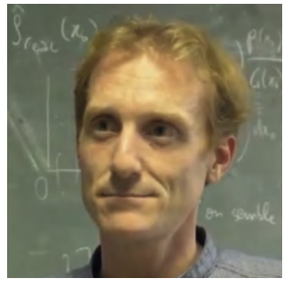
Managing Director, Founder and Inventor, McCormack Innovation

Born and raised in the Kingdom of Fife in Scotland, Brian epitomises the hard-working Scottish ethos. He left school at 15 and worked between coal mines (initially working above ground at the Francis Colliery aged 15 then going underground at the Seafield colliery aged 16 and coalface aged 18). His career progressed working on the development of sewage tunnels for about 10 years. With entrepreneurialism running hard through him, Brian later ran and then sold a taxi business. His inspiration for McCormack Innovation and the creation of a dissolving material was developed out of necessity. When he first received his bowel screening test kit in the post he could immediately see that a proper stool collection method should be incorporated. He then went about developing what now is the safe and more convenient way in which to collect stool samples. It soon became apparent that a major application of this product would be in hospitals, clinics and through pharmacies for home use as well. Moreover 3500 units were immediately purchased by a medical diagnostics company in Sweden who could see the benefits of the product – being flushable down the toilet. Brian went on to development an environmentally friendly dissolving wipe – the world's first soluble wet wipe for medical and personal care with coveted Fine to Flush certification.

Felice MASTROLEO

SPEAKER

Felice MASTROLEO has a background in biology and water treatment from the University of Liège (Belgium). After a short stay in the food industry, he completed a PhD research on the compartment 2 of the MELiSSA project at SCK CEN and the University of Mons (Belgium). More specifically, he studied the effect of space related culture conditions (ionizing radiation, simulated microgravity and space flight) on the bacterium Rhodospirillum rubrum at the transcriptomic and proteomic level. He is now a senior scientist at SCK CEN leading MELiSSA related projects linked to compartment 2 (carbon transformation), compartment 3 (nitrifiers) as well as compartment 4a (Spirulina). He is involved in the Pool of MELiSSA PhD (POMP) program with the University College Cork (Ireland), the University of Napoli (Italy) and the University of Cambridge (UK). A major part of his current research relates to valorization of scientific knowledge for preclinical as well agricultural/humanitarian purposes. The former includes the use of spirulina as potential radioprotective agent against radiotherapy-associated intestinal mucositis and dysbiosis. Agricultural/humanitarian projects refer to the cryopreservation of Spirulina as well as the start-up and the follow-up of Spirulina projects using low-tech and circular economy approaches, in Global South countries including Democratic Republic of Congo.



Jeremi DAUCHET

SPEAKER

Jeremi Dauchet is a physicist who received his PhD in chemical engineering in 2012. He is expert in transport physics and radiative transfer in particular (including electromagnetic theory applied to the determination of radiative properties), with special emphasis on the Monte Carlo method. Associate professor at Institut Pascal (France), his research is applied to photoreactive processes engineering. His work on photobioreactor predictive modeling are developed in close collaboration with Jean-François Cornet at Institut Pascal, with contributions to MELiSSA program.

The content of the presentations was provided by the Key speakers and Speakers

Dominique CHAPUIS

SPEAKER

Beyond Gravity Slip Rings SA

Dominique Chapuis graduated from Ecole Polytechnique Fédérale de Lausanne in Switzerland where he obtained a Master of Science Degree in Microengineering and a pHD degree on the subject of Haptic interfaces compatible with Magnetic Resonance Imagery.
In 2009 as post-doc at the REhabilitation Engineering Laboratory in ETH Zurich, he designed robotic tools to investigate recovery mechanism following neurological injury. Since 2011, he joined Beyond Gravity Slip Rings SA (formerly known as RUAG Space Nyon) working on slip rings and angular sensors for Satellite Solar Array Drive mechanisms and other space application.
In 2014 in the same company, he had the opportunity to step into the development of bioreactor for space application and he was involved in the design of a sounding rocket payload, yeast bioreactors. Dr. Chapuis is currently system engineer on the Biorat-1 project.

Fabio LORENZINI

SPEAKER

Kayser Italia S.r.l.

Fabio Lorenzini, born in Livorno (Italy) in 1982, received his Master Degree in Chemical Engineering at the University of Pisa in 2007. In 2011 he joined Kayser Italia S.r.l., an Italian aerospace system engineering company where he currently works as Project Manager. He took part in the design, production, integration and testing of space avionics systems and experiment hardware for space life science and space physical science investigations. He contributed to the development of several payloads installed and tested inside the ISS (including hardware to support biological experiments performed in the ESA KUBIK facility and electronic modules). He was also responsible for the system thermal design of payloads located outside the ISS and on satellites.

Laurent POUGHON

SPEAKER

Laurent POUGHON is Assistant Professor in Biochemical Engineering, Informatics and Bioinformatics at Polytech Clermont (France) and researcher at Institut Pascal (UCA-INP Clermont – CNRS) – Team « Process Engineering, Applied thermodynamics and Biosystems » (GePEB-IP team). His research activities are in the fields of metabolic engineering, bioprocess engineering and modelling, artificial ecosystem (MELiSSA) modelling. He has a track record experience in the design and the mathematical modelling of the MELiSSA ecosystem since 1994. He has developed the dynamic model for the third compartment of the MELiSSA loop (Nitrifying compartment) and has also worked on the dynamic models for the growth of higher plants, photoBioreactors and anaerobic reactors. He has established the first complete loop mass balance models of the MELiSSA loop. His skills have been applied to several biological domains such as cyanobacteria (membrane photo-bioreactors), water treatment and recycling in aquaculture and biorefinery, within various national and European projects.

Tinh NGUYEN

SPEAKER

Ph.D student - KU Leuven

Tinh Van Nguyen is a fourth year PhD student at Division of Soil and Water Management, KU Leuven, Belgium. He holds a master's degree in Interuniversity Programme in Molecular Biology (IPMB), is jointly organized by KU Leuven, Vrije Universiteit Brussel, and Universiteit Antwerpen. He is interested in Molecular biology and Environmental microbiology. Currently, his doctoral research investigates the metabolic interactions within the microbial community of the MELiSSA waste degradation compartment C1. He experienced with bacterial isolation and taxonomy, anaerobic bacteria, genome sequencing, genomics, 16S amplicon sequencing, co-occurence network analysis.

Quentin ROYER

SPEAKER

Student in Aerospace Engineering at ISAE-SUPAERO and Crew Engineer for MDRS 275 mission

As a long-time space enthusiast, I am now a motivated and passionate student in aerospace engineering at ISAE-SUPAERO. I am part of several projects aiming to develop space technology, and the MDRS mission is one of them. Next year, I will perform an analog mission in the MDRS station along with six other students from my school : for 4 weeks, we will simulate life on Mars in a closed environnement, with limited resources. During this mission, we will perform experiments on human factors, test space-related equipment and live as astronauts. One of our main goals will be to monitor our use of resources, as well as our amount of waste (CO_2, used water, etc…) we generate. However, we also want to be able to recycle this waste, by experimenting with technologies that are being developed to support astronauts during real missions.

Pierre FONTANILLE

SPEAKER

Dr Pierre FONTANILLE is Professor at Clermont Auvergne university since 2002. He teaches microbiology and biochemical engineering at Polytech Clermont-ferrand, an Engineering school. His research is realized at Institut Pascal (GePEB department), an interdisciplinary research laboratory working in the strategic fields of the Engineering and systems sciences depending on University of Clermont Auvergne and CNRS. He has 20 years of experience in the field of biomolecules production in bioreactor (in particular SCFAs, lipids and biogas). He worked more particularly on biogas production systems, anaerobic fermentation and methanation. He has co-authored more than 40 papers in peer-reviewed international journals or book chapters and 50 communication papers and talks in international congresses.
Since 2016 he is Director of the company BIO-VALO. This company is a technological platform in the field of Biomass valorization and Biogas Production which proposes to company or research laboratory to make test to certified new green tech innovations around anaerobic fermentation at a semi-industrial or industrial scale.

Luigi Giuseppe DURI

SPEAKER

Dr. Luigi Giuseppe DURI from the Department of Agriculture of the University of Naples Federico II (UNINA)

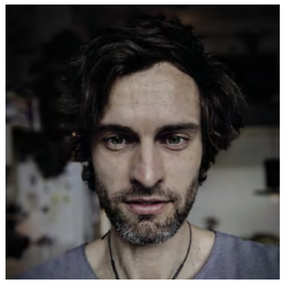
Luigi Giuseppe DURI obtained a Master degree in Agricultural Sciences and Technologies at the Department of Agriculture of the University of Naples Federico II (Italy) in 2011. From 2014 to 2018, he collaborated with different research teams of the Department of Agriculture on various topics. From 2018 to 2022, he accomplished his Ph.D. in Sustainable Agriculture and Forestry Systems and Food Security with a project "In-Situ Resource Utilization (ISRU) for life support in Space" focusing on the reuse of organic waste from a BLSS to improve Lunar and Martian "soils" to sustain plants growth. He is currently collaborating with the Space farming research team at the Department of Agriculture of the University of Naples Federico II, Italy.

Rosa SANTOMARTINO

SPEAKER

UK Centre for Astrobiology, University of Edinburgh

Rosa Santomartino is a postdoctoral research fellow at the UK Centre for Astrobiology, of which she recently became co-director. She is now establishing her own research group in Space Microbiology. Her major research interest lays in understanding how to harness the power of microorganisms for the development of sustainable biotechnologies for space exploration, and how these could help tackling environmental issues on Earth. She was recently awarded a Leverhulme Research Fellowship (2022-2025) and an University of Edinburgh Moray Endowment Fund (2022) for her own research project on plastic biodegrading microorganisms for sustainable space exploration. Previously, she performed two space microbiology experiments onboard the ISS, BioRock (2019) and BioAsteroid (2021), which provided the first demonstration of biomining on a space station. She was an invited scientific advisor for the Microbiology section of the Italian Space Agency (ASI) Space Life Sciences Roadmap in 2021-2022. She is also part of the 'Science for Sustainability Hub' at her institution, a recently formed group of scientific experts which use their research to tackle compelling environmental issues.



Thieme HENNIS

SPEAKER

Thieme Hennis's formal training is in complex systems engineering and in self-organisation in education (PhD in 2016) with a strong interest in circular and sustainable system design. With organisations like And The People and Border Sessions he works on topics such as inclusive and circular system design, sustainable housing, and food and agri innovation by organising processes in which relevant stakeholders meet and co-create new solutions that meet the demands of a changing society.

He initiated and co-leads the open source project and citizen science network called AstroPlant to engage young explorers with the quest to grow plants in space and generate data about plants so we can feed ourselves on this planet and beyond in the decades to come.
AstroPlant provides open source experimental equipment, protocols and technical support to get started, and a scalable IoT backbone to manage and visualise experimental data. It is a community initiative kickstarted by the European Space Agency and Border Sessions, and is supported by the MELiSSA consortium (working on closed loop life support systems) and other organisations.

Marion DUGUE

SPEAKER

Preliminary review of the use of menstrual-blood derived stem cells for stem cell therapy during crewed missions
Marion Dugué has a background in mathematics and physics and is currently pursuing a master's at TU Delft, Netherlands. She is an active member of the Space Exploration project group of the Space Generation Advisory council, both as researcher and coordinator. As the project manager of the latest analog astronaut mission CHILL-ICE which took place last August in an Icelandic lava tube, she is interested in regenerative life support systems in extreme environments, with a curiosity for female safety and comfort. Not having a background in biomedical science, her work presented in this discipline during the MeLISSA conference is mainly to gather feedback from experts.

Louise FLEISCHER

SPEAKER

President of The Spring Institute for Forests on the Moon

Louise graduated in 2017 from Ecole Polytechnique with a Diplome d'ingénieur and in 2018 from Stanford University with a Master of Sciences in Aeronautics and Astronautics. She then joined the San-Francisco-based unicorn Zipline International, where she worked for three years, first as a Systems Engineer then as a Program Manager. Her different missions included weather resilience, reliability management and operations scale up. Her role as a multi-disciplinary liaison brought her from the tropical heat of Ghana and Rwanda to the polar cold of North Dakota. In 2021, she decides to come back to her everlasting passion for space exploration and settles as a digital nomad in the depth of the french countryside. Following a time of reflection on the place of nature in humanity's ambitions in space, she founds with a team of alumnis from Polytechnique, Science Po and MIT, The Spring Institute for Forests on the Moon, a non-profit organisation dedicated to send closed selfsustaining ecosystems in space.

Gaétan GRECO

SPEAKER

Growing up in Belgium where I was born in 1988, my interest in the whole wide universe goes as far back as I can remember, so much that I took the habit to tell that I learned how to read in astronomy books, which must be partially true. Other than the mandatory knowledge acquisition process undergone at school, I also experienced growing up socially and mentally through scouting and martial art.
In my teenage years, a local grouping of astronomy enthusiasts allowed me to volunteer for outreach activities, as I became a keen observer of the sky. Following the easily predicted path by enrolling in physics as I entered university, I changed course rather quickly, to reorient it towards journalism and extracurricular didactics.
The institution I was hired in, the Euro Space Center, manages to combine in a single place many topics and practices I longed to find and explore in a workplace. Once a museum, it is now best described as a discovery park full of interactivity, and every day there brings the joy of spreading positive ideas about space among happy children having fun with friends and family members.

The content of the presentations was provided by the Key speakers and Speakers

Daniel YEH

SPEAKER

Ph.D., P.E., BCEE, LEED AP BD+C - Professor, Dept. of Civil & Environmental Engineering - College of Engineering, University of South Florida

Dr. Daniel Yeh is a professor in the Department of Civil and Environmental Engineering at the University of South Florida (Tampa, Florida, USA) and the PI of the Membrane Biotechnology Lab (membiolab.com). He is also a Visiting Professor at NASA Kennedy Space Center. Dr. Yeh's research and teaching interests are in water & wastewater engineering, waste resource recovery, global water & sanitation, water/energy/food nexus, anaerobic and algal membrane bioreactors, and bioregenerative life support systems for space travel. Of particular interest are automated, off-grid, small-scale water recycling and waste resource recovery systems. Dr. Yeh holds degrees from the University of Michigan (BS Natural Resources, BSE Civil Engineering and MSE Environmental Engineering) and Georgia Institute of Technology (PhD Environmental Engineering), and conducted postdoctoral research at Stanford University. Dr. Yeh is a professional engineer, an AAEES boardcertified environmental engineer, and a LEED Accredited Professional. He is also a Senior Member of the National Academy of Inventors and a two-time recipient of the Excellence in Innovation Award at USF.

Kato CLAEYS

SPEAKER

Iir. arch. (KULeuven young graduate)

Kato Claeys is an architectural engineer and obtained her B.S. in architectural engineering from the University of Ghent and a M.S. in architectural engineering from the University of Brussels. Recently, Kato graduated from the master of space studies from the KU Leuven. Following this study, she wrote her thesis on moon habitations. During her participation in the one-week analogue astronaut mission EMMPOL 10 (Poland), she performed the role of Vice-Commander.

Maria Gabriella SARAH

SPEAKER

Maria-Gabriella Sarah has a MSc in electrical engineering and has been working in American Consultancies before joining ESA in 2002. After a start in the Science Directorate, as operations engineer, she held the position of Agency Risk Coordinator (CRO) implementing at Corporate level in the Strategic Department the Agency Risk Management framework ESA is using today, creating and chairing networks of Risk Management practitioners, with and outside ESA.
She is now in charge of Partnerships with non-space organizations, to foster the use of space technologies and applications on Earth. In that context she has supported the setting up of the Sustainable development Goals catalogue ESA has put in place to gather all space projects helping achieve the 17 United Nations Sustainable Development Goals.

The content of the presentations was provided by the Key speakers and Speakers

Olivier GONÇALVES

SPEAKER

Full Professor at Nantes University

Olivier GONÇALVES is in charge of the research group Bioprocesses Applied to Microalgae (BAM) (40 people) in the GEPEA UMR CNRS 6144 laboratory. He was/is the principal investigator of several research programs (National or International) concerning the valorization of microalgae building blocks molecules, or focused on the industrial valorization of the microalgae biomass (from the sourcing and the biochemical characterization of original species to their industrial utilization at TRL level up to 6). He is co-author of ca. 50 scientific papers including 3 book chapters, 3 patents, coeditor of 1 book, and ca. 100 scientific communications (h-index 22, 977 citations). He has been/is the advisor or co-advisor for 15 PhD students.

Iulian-Zoltan BOBOESCU

SPEAKER

After completing his PhD at the Politechnica University Timisoara, Romania, and the Biological Research Center Szeged, in Hungary, working on novel microbial – microalgal biohydrogen production approaches, Dr. Boboescu was offered a Mitacs Accelerate fellowship at the Sherbrooke University in QC Canada. Here, he developed and scaled-up novel second and third generation biorefinery technologies together with some of the biggest North American companies active in the fields of biofuels, biocommodities and specialty chemicals. Dr. Boboescu joined the Bioprocess Engineering (BPE) group of Wageningen University and Research, The Netherlands, after securing a Marie Skłodowska-Curie Fellowship to develop a novel acoustic biorefinery approach. Presently, Dr. Boboescu is leading the Biorefinery group at BPE, working on novel extraction, fractionation and formulation technologies for microbial biotechnology applications. In this context, Dr. Boboescu is employing eutectic mixtures, enzyme cocktails and external fields (electric and acoustic) to enhance, simplify or completely rethink current downstream technologies.

Marta DEL BIANCO

SPEAKER

I graduated with honours in Biological Sciences at the University of Rome 'Sapienza', with a Master thesis on muscle cell differentiation with Prof. Milena Grossi. I did my PhD at the University of Leeds with Prof. Stefan Kepinski on the emergence of context specificity in auxin response. I did my first post-doc with Prof. Sabrina Sabatini at the University of Rome 'Sapienza' on hormone interaction during root post-embryonic development. I then moved back to Leeds to work on root graviresponse. Since 2019, I am an independent researcher at the Italian Space Agency and my interests range from the cellular response to microgravity and the molecular basis of cell proprioception, to BLSS and food production.

The content of the presentations was provided by the Key speakers and Speakers

Cyprien VERSEUX

SPEAKER

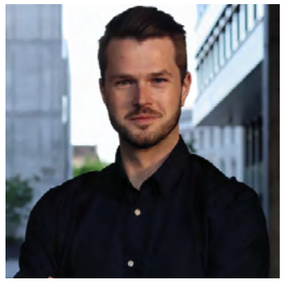
Cyprien Verseux leads the Laboratory of Applied Space Microbiology (LASM) at the University of Bremen's Center for Applied Space Technologies and Microgravity (ZARM). His young research group focuses on the development of bio-processes in support of future crewed missions to the Moon and Mars. He also coordinates the project "Sustainable bioproduction on Mars" of Bremen's "Humans on Mars" initiative. His doctoral work was oriented toward astrobiology, including contributions to the EXPOSE-R2 space mission. He has conducted field work, most notably during a one-year appointment as the Station Leader and Glaciologist at the Concordia research station (Antarctica) and as the Crew Biologist in the one-year, NASA-funded HI-SEAS IV mission (Mauna Loa volcano, Hawaii).

Maurizio LOVANE

SPEAKER

Department of Agricultural Sciences, University of Naples Federico II, via Università 100, 80055 Portici, Italy

My name is Maurizio Iovane, and I am currently a post-doc researcher in Plant Science at the University of Naples Federico II where I recently got my doctorate (2022) in "Reproductive ecology of endangered plants". During my Ph.D., my research concerned the identification of bottlenecks in plant reproductive cycle of wild and crop species when exposed to environmental constraints. More in details, I focused on the role of pollen functionality in ensuring seeds and fruit production of several species including space candidate crops such as Brassica spp. and 'Micro-Tom'. Part of my research concerns the interaction of pollen with simulated microgravity aimed at ensuring space crop reproduction and the completion of seed-to-seed cycles on board spacecraft. I am currently deepening the effect of simulated microgravity in guiding pollen tube direction to highlight criticalities during pollination in altered gravity. In addition, I took part in ROOTROPS project funded by ESA in the European Space Research and Technology Centre (ESA-ESTEC), Noordwijk (NL). Here, growth and curvature of roots were analyzed under different g levels, from simulated microgravity up to 20 g, in combination with different light quality treatments.



Aigars LAVRINOVIS

SPEAKER

Researcher, PhD student

Aigars is a PhD student and a researcher at the Riga Technical University, Water Research and Environmental Biotechnology Laboratory. His research topics involves wastewater treatment using microalgae as well as resource recovery from wastewater and high value molecule production from microalgae.
Currently Aigars is working on a technology for microalgae-based municipal wastewater post treatment for small wastewater treatment plants, supplementing the process with microalgal biomass manipulation with phosphorus stress conditions to achieve rapid phosphorus reduction to ultra-low concentration and phosphorus recovery.
Earlier in his professional career Aigars has been involved in aquatic ecosystem modelling studies and designing practical solutions for pollution control in natural water bodies.

Charlène THOBIE

SPEAKER

Process Project leader/ALGOLIGHT/France

Between 2014-2018, Charlène THOBIE did her thesis on the study of the hydrodynamics and the gas liquid transfer in an intensified photobioreactor in the GEPEA laboratory (France). She studied also the bubbling to avoid biofilm on the photobioreactor walls. In 2018, Charlène started working at Brochier Technologies (France), specializing in weaving of optical fiber for lighting applications (healthy, photobioreactors, etc.). Currrently, she works in AlgoLight as a process project manager to optimize hydrodynamics, light spectrum and culture in PRIAM photobioreactor, a breakthrough technology (very high volumetric productivity and controlled) exploited by this new start-up to produce high value molecules. The Startup ALGOLIGHT was created in July 2019 to exploit the revolutionary photobioreactor 'PRIAM' for the industrial production of mini/microplant-based biopharmaceuticals in a controlled and intensified way or thanks to the compactness of PRIAM and its high-volume productivity could respond to one of the issues of the life support for human space exploration.

Max MERGEAY

SPEAKER

MELiSSA Foundation co-director.

Brussels born (1943), formation in College St-Boniface (ancient languages). 1969 : University of Brussels (ULB) : PhD of (bio) chemistry about a complex microbial metabolism regulation. 1968: scientist in the Center of Nuclear Studies (SCK.CEN), Mol, Belgium (uptake, fate and expression of foreign genetic material). 1974/75: a Fullbright-Hays fellow, visiting scientist at Stanford University (California), and at the University of Washington, Seattle. 1987: first, fully fortuitous, encounter in the lab with Claude Chipaux (MATRA Espace). It evolved into the MELiSSA project. 1988: head Laboratory for Genetics & Biotechnology (SCK.CEN), later transferred to the Flemish Institute for Technology and Research (VITO): bioremediation of industrial sites polluted by metals and refractory organics. 1999: detached to SCK.CEN, Mol; in charge of the program for Nuclear Bioremediation (Radioactive Waste & Clean-up Division) and of Radiobiology section. 2001: Professor (Genetics) Faculty of Agronomy ULB. 2002: Microbial experiments in space (Baikonur) with Frank de Winne, "MESSAGE", 2003 Cervantes Mission "MESSAGE2", 2004 Soyouz Mission "MOBILISATSIA" (gene transfer in space) 2008: Retirement. Prof. emeritus ULB. 2009: Consultant: European Space Agency (ESA). 2013: Scientific Director, MELiSSA Foundation (in charge of project ESA-POMP (Pool of MELiSSA Ph.D.)). Married to Bernadette Gypen, happy father (4 x) & grandfather (10 x).

The content of the presentations was provided by the Key speakers and Speakers

Solveig TOSI

SPEAKER

Full Professor in Botany
Mycology Laboratory, Department of Earth and Environmental Sciences, University of Pavia, via S. Epifanio 14, 27100, Pavia, Italy

PERSONAL DATA
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WEB site http://sciter.unipv.eu/site/home/persone/scheda720004303.html
ORCID http://orcid.org/0000-0002-6769-6984
RESEARCH ACTIVITY
Biodiversity and fungal taxonomy / Eco-physiology of fungi
Mycoremediation and fungal degradation / Fungal agents for biological control

TEACHING
Botany and Mycology
Soil microbial biodiversity
RESPONSIBILITY
P.I. of the project "MicroBiomA-S. Exploring the diversity of soil microbes and their biomolecules in Victoria Land "funded by MIUR as part of the National Research Program in Antarctica.
OU responsible in the project "REBUS. In-situ Resource Bio-Utilization for life Support system ", funded by the Italian Space Agency.
OU Member in the "CE4WE (Circular Economy for Water and Energy)" project, "Research and Innovation Hub" funded by the Lombardy Region.

Nico BETTERLE

SPEAKER

University of Verona (Italy)

Nico Betterle is a researcher at the University of Verona (Italy) and it is part of the SOLE-LAB (Solar Light Exploitation) team guided by prof. Matteo Ballottari.
His studies are focused on the production of high added value molecules in microalgae and plants grown in indoor controlled systems. His experiments on microalgae are conducted at the University of Verona while experiments on plants are mostly conducted at the pilot plant of ONO Exponential Farming, a company that combines vertical farming, artificial intelligence and robotics.
Nico was an Assistant Project Scientist in the laboratory of prof. Anastasios Melis at University of California Berkeley (> 4 years). Previously he was a Post-Doc researcher in the laboratory of prof. Roberto Bassi (UNI-VR), studying photoprotective mechanisms in plants. He holds a degree (2007) and a PhD in Industrial and Environmental Molecular Biotechnology (2011) at UNI-VR.

Silvia TABACCHIONI

SPEAKER

Department of Sustainable Territorial and Production Systems, Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) - Rome, Italy

Silvia Tabacchioni graduated in Biology in 1986 at the University of Rome, La Sapienza. After a short training period on the characterisation of virulence plasmids of enteroinvasive strains of Escherichia coli (EIEC) at the Institute of Microbiology of the Sapienza University of Rome, she joined as fellow of the Laboratory of Microbiology of ENEA Casaccia, Rome, to work on microbial degradation of chemical wastes. From May 1989 Silvia Tabacchioni was in charge as researcher at the Laboratory of Microbiology of ENEA Casaccia, Rome. Her research activity was focussed first on bacterial production of chemicals using wastes as substrate and then on the microbial ecology of plant-growth promoting rhizobacteria and opportunistic human pathogenic bacteria and on the bioconversion of biomass into biofuels, i.e., hydrogen and methane. Her present research is mainly focussed on the one hand on the use of plant growth promoting rhizobacteria as biofertilizers, and on the other hand on the bioconversion of organic wastes to recover nutrients for plant growth.

Céline COENE

SPEAKER

Céline Coene is a bioprocess engineer working at QinetiQ Space where she participates in the design and development of automated Life Support Systems based on biological and physicochemical technology. She is involved in several projects of the MELiSSA program related to Limnospira indica harvesting and processing, oxygen production and urine valorisation. Céline has previously worked in the pharmaceutical industry for two years in the quality and production department where she became familiar with quality management systems and drug manufacturing, cell therapy manufacturing in particular.
Graduated in 2019 as a Bioscience Engineer, she has a broad scientific background in chemistry, physics, biology and process engineering. She specialised in agronomy with a particular focus on food science, technologies and quality. Her master thesis was about molecular biology. It consisted in using the RT-qPCR method with Nothobranchius furzeri (killifish) as a model to explore the impact that mitochondrial (dys)functions have on ageing.

Korneel RABAEY

SPEAKER

Korneel Rabaey is professor at the Center for Microbial Ecology and Technology (CMET), Department of Biotechnology at Ghent University as well as honorary professor at The University of Queensland. He is one of the founders of CAPTURE (www.capture-resources.be), a centre focusing on resource recovery in the fields of Water, Carbon Capture and Utilization and Plastics to Resource. He is founder of HYDROHM (www.hydrohm.com), a company focusing on electrification in the water sector. His main efforts are on resource recovery from wastewater, decentralized treatment technology, bio-electrochemistry and electrochemistry for bioproduction and bioremediation and microbial protein production as a novel route for carbon neutral or negative feed, food or polymer. He is Fellow of the International Water Association and executive editor in chief of Environmental Science & Ecotechnology.

Maurizio CALVITTI

SPEAKER

Ph.D - ENEA, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development

Maurizio Calvitti currently works as senior scientist at the Division of Biotechnology and Agriculture (Department Sustainability), in ENEA, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development. He obtained a Ph.D. in Ecology and Management of Living Resources (University of Tuscia) and he has been coordinating projects related to the field of "Applied Entomology". In particular he has been involved in Entomological Research Projects ranging from "Medical Entomology" (sustainable control of mosquito vectors) to Agricultural Entomology (Biological control of pests). Recently he has been involved in research aimed at developing the exploitation of insects as "bioregenerative" agents for space mission (Rebus Project).
He is Co-author of about 90 scientific publications and a referee for several scientific journals.

Jana FAHRION

SPEAKER

Jana Fahrion is a PhD candidate in the microbiology group at the Belgian Nuclear Research Center in Mol, Belgium. Before the start of her PhD project, she performed her Master thesis at the German Aerospace Center (DLR) in Cologne, Germany, working on the microbial monitoring of the EDEN-ISS greenhouse, a ground demonstrator in Antarctica for food production in Space.
In the PhD project entitled "Biological oxygen production and air revitalisation for habitats on the Moon", biotechnology for space is developed, capable of functioning under cosmic radiation. This PhD project is part of the ArtEMISS project (Arthrospira sp. gene Expression and mathematical Modelling on cultures grown in the International Space Station) and the MELiSSA program from the European Space Agency. The ArtEMISS project is focussing on biological air revitalisation and food production via a photobioreactor containing an edible photosynthetic cyanobacterium called Limnospira indica PCC8005. It is our aim to transplant this photosynthetic microbial bioprocess to space, and test its efficiency in space, where exposed to cosmic radiation and reduced gravity, via a pilot flight experiment on board ISS.

Pierre VAN CAENEGEM

SPEAKER

Business Development and Attractiveness Manager

I'm currently head of business development and promotion department within the economic development agency of Greater Caux Seine Council in Normandy. The role of this service is to encourage investments in the Caux Seine conurbation, promote the territory, facilitate the establishment of companies, support transitions (circular economy and digitalization), lead networks and encourage new business.
I worked for nearly 15 years in the field of economic development in several local authorities. During these years I have accompanied development projects for companies in all sectors and various sizes from start-ups to large industrial groups (financing, setting-up, R&D, intellectual property, business, etc.). I hold an Executive Master in "Business Intelligence" and a Master in "Quality Safety and Environment Manager". I also worked for a large group in the energy sector EDF and in the National Graduate School of Engineering & research center of Caen (ENSICAEN) in the Industrial relationship - at the crossroads of companies, laboratories, training and local authorities.

Alberto BATTISTELLI

SPEAKER

Director of researcher of the Italian National Research Council, Research Institute of terrestrial Ecosystems (CNR-IRET). Contract professor at the Tuscia University, Viterbo, Italy on botany and plant physiology.

Agronomist and plant physiologist he studies plants, their response to the environment and productivity. Research aeras are: photosynthesis, carbohydrate metabolism and source-sink relationships in relation to productivity, food and biomass quality. He leads and participate to industrial research in tight collaboration with large and small industries particularly in the areas of technology development of bioregenerative life support systems for space and biorefinery. Involved in outreach activities on science magazines, radio and television interview and participation to scientific programmes and events. He recently contributed to define the SciSpacE Bioregenerative Life Support Roadmap of the European Space Agency and is co-coordinating the panel in charge of defining the Road Map of the Italian Space Agency on Bioregenerative life support systems for space.

Jack HOENIGES

SPEAKER

Jack Hoeniges received his PhD from the University of California, Los Angeles in mechanical engineering for his research on modeling light transfer phenomena related to outdoor cultivation of microalgae. His
current research for his PhD at the GEPEA laboratory of the University of Nantes focuses on novel methods for improving the biomass productivity of microalgae cultivation systems using experimental and modeling-based methods. He has applied and theoretical experience in heat transfer, light transfer, bio-based processes, and concentrated solar applications. With a passion for sustainability, space applications, and cross-cultural work environments, Jack will be open to employment opportunities in Europe following his defense in March of 2023.

Flora GIRARD

SPEAKER

PhD student - GEPEA laboratory (Nantes University)

Flora GIRARD graduated from ESITech engineering school in 2018 with a Master of Science in biotechnology focusing on bioprocessing and bioproduction. Following graduation, Flora worked as a bioproduction engineer at Alganelle for recombinant protein production with microalgae before starting her PhD at GEPEA laboratory (Nantes University). Her research focuses on the modeling of a microalgae biofacade as a solution for the development of sustainable buildings. The aim is to obtain a decision support tool to optimize the integration of the microalgae biofacade on its host building. This research is supported by the DISCUS project of the NExT Initiative (Nantes Excellence Trajectory) International Research Partnership.

Francesca ZORATTO

SPEAKER

Centre for Behavioural Sciences and Mental Health, Italian National Institute of Health (Rome, Italy)

My main expertise pertains to the study of animal behaviour in an applied and translational perspective. I graduated at the University of Parma (Italy) in 2008 with a thesis in Ethology and I obtained a PhD in Ethology at the University of Florence (Italy) in 2013 with a research project on impulsivity and gambling proneness in rodents.
In 2016 I received a "L'ORÉAL-UNESCO For Women in Science 2016 Award" to perform research activities on the social modulation of risky decision-making in non-human primates and rodents at the Unit of Cognitive Primatology of the National Research Council of Italy.
Currently, I am working as a research scientist at the Centre for Behavioural Sciences and Mental Health of the Italian National Institute of Health. My research is mainly devoted to the neurobehavioral phenotyping of animal models of human psychiatric disorders (e.g. treatment-resistant depression, gambling disorder) and to the development of innovative therapeutic approaches.
Up to now, I have co-authored about 50 papers in international peer-reviewed scientific journals.

Christine ESCOBAR

SPEAKER

Vice President, Space Lab Technologies

Christine co-founded Space Lab® in 2016, with the mission of advancing human space exploration through research and technology development. She is a space habitat systems engineer with expertise in space agriculture, ecology, bioastronautics, information systems, and robust design for quality engineering. Christine is passionate about sustainable, Earth independent solutions for human space exploration. As Space Lab's Vice President, she leads business administration and development, and quality assurance, with over 10 years of experience managing engineering teams in the space industry. She manages several R&D projects, including µG-LilyPond - a floating plant production system for microgravity, MarsOasis® - a hydroponic Martian greenhouse, HEART – an autonomous space habitat health management tool, and PHILM - regenerative CO2 control for plant habitats. She conducts space botany research and is currently investigating duckweed (family Lemnaceae) for use as a nutritious space crop. Christine conducts PhD research in the robust design of life support systems at the University of Colorado at Boulder and is co-organizing the first global Space Ecology Workshop occurring this fall.

Ernesto LOPEZ BAEZA

SPEAKER

Associate Professor of Applied Physics (now Honorary Professor) University of Valencia. Faculty of Physics. Earth Physics and Thermodynamics Dept. Environmental Remote Sensing Group (Climatology from Satellites) - Scientific Adv

Ernesto Lopez Baeza, Associate Professor of Applied Physics at Department of Earth Physics & Thermodynamics, University of Valencia (1987-2021) and Director of the Climatology from Satellites Group (2000-2021). He is currently now Honorary Professor at Environmental Remote Sensing Research Group from Sep 2021 and Scientific Advisor at Albavalor, Spanish ACRI-ST's filial company at University of Valencia Science Park. He is responsible for the Valencia Anchor Station EO validation site since its origin, Nov 2001 (https://www.uv.es/gcsuveg/webgcsuveg.wiki?7) and successfully managed ESA Projects related to EarthCARE BBR, SMOS, technical assistances and loan agreements for ELBARA-II, GNSS-R OceanPal Radio Frequency Unit, several AOs for the validation of SMOS, EPS MetOp and OLCI and coordinated a significant number of campaigns at the Valencia Anchor Station related to CERES, GERB, EPS MetOp, SMOS (EuroSTARRS, SVRT Campaigns, CAROLS, TOSCA-CAROLS, ELBARA-II), OLCI. Ernesto has been the Coordinator of RESEWAM-O - Remote Sensing for Water Management Optimisation (EIP Water Action Group AG132) European Innovation Partnership on Water, EU (May 2013–Sep 2020)

Veronica DE MICCO

SPEAKER

PhD - University of Naples Federico II, Dept. Agricultural Sciences

She is Full Professor of Environmental and Applied Botany and responsible of the Plant and Wood Anatomy Lab at the Dept. Agricultural Sciences of the University of Naples. She investigates plant structural and eco-physiological responses to environmental stresses with applications in ecology, agriculture and extreme environments. In 2000 she graduated in Agricultural Sciences and in 2004 she got the PhD in Woody crops. Since 2000, she participated to research activities in several institutes including Washington State Univ. (USA), Univ. of Leiden (NL), WSL (CH), University of Rome La Sapienza (IT), and CNRS - CERMAV (Grenoble, FR). She is currently vice-Chair of the ESA (European Space Agency) Life Science Working Group (LSWG). She recently coordinated the ROADMAP #9: Biology in Space and Analogue Environments (Plant Biology) and ROADMAP #11: Bio-regenerative life support systems in space: space biotechnology & space agriculture, within the ESA program "Science roadmaps in life and physical sciences in space". She is member of the ESA Lunar Bioscience Topical Team and of IAWA Council (International Association of Wood Anatomists). She produced 3 books and more than 200 publications.

Yash PARDASANI

SPEAKER

My primary research interests are space microbiology and metabolomics. I have completed an MSc in Bioinformatics at Newcastle University and recently I have finished my MRes at the Scottish Association for Marine Science (SAMS, UK). My MRes was on the topic of "Survival potential of microalgae for long term space missions". The experiments were based on analysing the regrowth and metabolomic effects of neutron-based space radiation and desiccation on different microalgae such as extremophiles, fresh water, and marine species. In future, I intend to combine my computational and wet lab skills to pursue a career as an interdisciplinary scientist.

Daniella BILLI

SPEAKER

Daniela Billi is associate professor of Botany at the Department of Biology, University of Rome Tor Vergata, where she holds the courses of Astrobiology and Synthetic Biology and she is leading the laboratory of Astrobiology and Molecular Biology of Cyanobacteria.
Research is dealing with cyanobacteria thriving in extreme environments, mainly hot and cold deserts, like the Dry Valleys in Antarctica or the Atacama Desert in Chile, with the aim of the deciphering the basis of their adaptation to extreme conditions on Earth but also and under space and Martian simulated conditions. Results have implications to investigate the endurance of life as we know it and in the use of tehse cyanobacteria in developing life-support systems for human space exploration. She is co-chair of the ESA-TT Astrobiology and member of the ESA-TT Space Synthetic Biology and Lunar BioMission and member of the Scientific Committee of the Italian Astrobiology Society. Currently she is PI of the ASI funded projects BOSS_Cyano, BIOMEX-Cyano, BIOSIGN_Cyano, and leader of WPs of the ASI funded projects Life in Space and ReBUS.

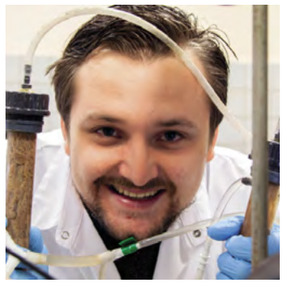
The content of the presentations was provided by the Key speakers and Speakers

Pierre JORIS

SPEAKER

PhD Student at INSA Toulouse, Toulouse Biotechnologies Institut, Fermentation Advances and Microbial Engineering (FAME) team

While I was studying biotechnologies at the chemistry, biology and physic engineer school (ENSCBP) in Bordeaux, I moved to Toulouse for my end-of-studies internship in the FAME team at Toulouse Biotechnology Institute. After my graduation in September 2020, Dr. Nathalie Gorret and Pr. Stephane Guillouet gave me the opportunity to stay in the team as an engineer on a new one-year research project in partnership with the French National Center of Space Studies (CNES). As we had promising results and new scientific questions to solve, the project was continued for three more years and I became an INSA Toulouse PhD student. My PhD project is intitled "Study of the Cupriavidus necator bacterium potentialities for a space application in life support system: Waste recycling, Food and biopolymers". Indeed, with organic wastes that could come from the MELiSSA loop we are able to monitored either protein or bioplastic productions by axenic fermentation of C. necator. More, we are currently looking for optimal fermentation conditions in order to produced best quality proteins for human consumption or 3D-printable bioplastics.



Marijn Juliaan TIMMER

SPEAKER

Marijn Juliaan Timmer is a Bioscience Engineer who, after obtaining his Msc. at TUDelft, started a PhD with prof. Siegfried Vlaeminck at Uantwerp. His research is about denitrification of urine in space for production of filler gas (N2) and serves to compensate for gas leaks from spacecraft cabins and to simultaneously clean the water for easier reuse. He won the Science-battle, a competition between scientists to explain their research in the best way to primary school children, where his work was deemed the most interesting amongst 5000+ children. The next two years, he will work on decentralized wastewater sanitation on earth (for enhanced water reuse: closed loop system), where he will apply the membrane (aerated) reactor technology that he also investigated in the context of MELiSSA. The extremely resource-efficient treatment alternative could improve the finances of decentralization and thereby the implementation potential of a more sustainable water usage model: Implicit when facing the lower freshwater availability due to climate change.

Mattia TOFFANETTI

SPEAKER

MEG Science

Designer and researcher striving to push his knowledge forward. From April 2022 MSc Integrated Product Design graduate at Politecnico di Milano, before of that several and diverse experiences that allowed him to – slightly – get a grasp on project management and to collaborate with actors from widely varied backgrounds. Currently learning, researching and working at MEG Science, in the fields of Applied Photobiology for industrial + research applications and their entailments in crucial topics for our shared future on Planet Earth and beyond.

Tim VAN WINCKEL

SPEAKER

Dr. Ir. Tim Van Winckel - University of Antwerp

Tim Van Winckel is a post-doctoral researcher at the University of Antwerp. He obtained his PhD in 2019 from Ghent University working on high-rate activated sludge and sustainable municipal wastewater treatment. Nowadays, his interests lie in systems' analysis and creation of computational pipelines applied to the water value chain at large using material flow analysis, network analysis and other computational methods.

Agata KOBODZIEJCZYK

SPEAKER

Assistant Professor, Leader of Life Sciences for Space Laboratory - Space Technology Centre AGH UST

She obtained her PhD in Neurobiology from the University of Stockholm. Winner of the FNP Rojszczak Prize for combining biology with astronomy. Three-time winner of the first prize in the Global Space Balloon Challenge competition for taking astrobiological experiments into the stratosphere. She worked in the Advanced Concepts Team of the European Space Agency as a biomimetics expert. Currently, she is involved in scientific research and development of new laboratories at Space Technology Centre AGH UST in Kraków. Beside academia, she organizes analog simulations of space missions and trainings for future space tourists and commercial astronauts, as well as all people who want to develop their career in the space sector. Initiator of the creation of the first analog space base simulator in Poland (presented in the Cité de l'espace), currently the founder and co-owner of the Analog Astronaut Training Center habitat in Rzepiennik Strzyżewski. Together with her partner Matt Harasymczuk, she runs only organization in Poland dealing with analog human studies in space biology and medicine (www.astronaut.center).

Baptiste Leroy

SPEAKER

B. Leroy is associate professor in the laboratory of Proteomics and Microbiology of the university of Mons in Belgium. He has developed since several years a recognized expertise in microbial proteomic analysis and continuously develop and implement highly up-to-date methods in the omics field. This expertise allows him to participate to several project in the MELiSSA context and notably to analyses of the response of various prokaryotes to space conditions. Since a couple of years, B. Leroy has been focusing his work on the analysis of metabolism and response to changes in environmental conditions in photosynthetic microorganism. In particular, he is currently investigating the nitrogen metabolism of Limnospira indica and how this cyanobacterium can be used for nitrogen recovery and utilization. B. Leroy is also working on the photoheterotrophic carbon metabolism of purple bacteria and on the redox balancing mechanism of these highly versatile microorganisms. In both case, B. Leroy aims, through the deciphering of fundamental aspects of microbes metabolism, to pave the way for the development of sustainable biotechnologies.

Arnaud RUNGE

SPEAKER

Engineer for Life and Physical Sciences Instrumentation
Mechanical Engineering Department | TEC-MMG

Arnaud RUNGE has a multidisciplinary background: he holds a Master Degree in Medical Engineering from the ISIFC medical engineering school (FR). After some experience at the Hospital of Besançon (FR), he joined the European Space Agency (ESA) in 2004 to work as Medical Engineer to assess strategic needs in terms of medical technologies for future manned space exploration missions. In 2006, he started working on R&D activities for technologies related to crew health/medical operations and life sciences experiments. Passionate about aviation, he started flying at 14 and gradually obtained his Private Pilot license, became flight instructor and now holds a full commercial license (frozen ATPL). He totals almost 2000 hours on different types of aircraft. With this dual background, Arnaud has been supporting since 2008 ESA's Business Applications & Space Solutions (BASS) programme as Technical Officer on various health and aviation related projects. He is currently one of ESA's official spokespersons and one of the privileged interfaces within ESA to discuss new activities with Industry in these areas. He currently aims to bring MELiSSA-derived activities into the ESA BASS ecosystem.

Connor KISELCHUK

SPEAKER

StarLab Oasis - Lead of Science Operations

Connor is from Toronto, Canada, and joined StarLab Oasis after completing work on the VEGGIE platform at NASA's Kennedy Space Center and on EDEN ISS at the German Aerospace Agency (DLR). Connor holds an M.S. in Environmental Science from the University of Guelph where he acquired skills pertaining to Controlled Environment Agriculture. He is interested in contributing to the multinational effort to employ a Bio-regenerative Life Support System (BLSS) on future missions to the Moon and on Mars while also transferring those technologies to improve large-scale food production techniques back home on Earth.

Liu HONG

KEY SPEAKER

Professor, School Biological Science and Medical Engineering, Beihang University, Beijing, China

Dr Liu Hong is Professor of School of Biological Science and Medical Engineering of Beihang University, Full member of International Academy of Astronautics, General Designer & principal scientist of Lunar Palace 1. Since 2004, Professor Liu Hong has focused on the future space survival needs of human beings. She led the research team established the bioregenerative life support system (BLSS) after more than ten years of efforts. In 2013, she constructed Chinese first ground-based large-scale integrated experimental system of BLSS with a fourunit biological loop - the Lunar Palace 1. The longest and highest-closed experiment in the world - "Lunar Palace 365" was further completed in 2018. A picture of "Lunar Palace 365" experiment was elected as one of the best science images of 2017 by Nature. The research results will provide theoretical supports and basic techniques for the life support system during manned deep-space exploration missions such as the Moon/Mars base. In the past five years, Professor Liu Hong has published more than 50 papers in international journals in related disciplines as the correspondence author and has been awarded the national patents on 32 inventions as the first inventor.

Cesare LOBASCIO

SPEAKER

Space Exploration and Science Innovation Lead - Senior Expert, Life Support & Habitability

Cesare Lobascio graduated in Nuclear Engineering at Politecnico di Torino (Italy, 1987), and then obtained a MS in Environmental Engineering at the University of California in Berkeley in 1993. He has worked for >30 years at Thales Alenia Space in Italy, in the broad fields of Space Environment and Life Support Systems, covering a wide range of technical and management roles. He has been involved in the International Space Station project, on scientific satellites and human and robotic space exploration studies for the Moon and Mars.
He is Senior Expert in "Life Support & Habitability", teaches at the Space Exploration Master, authored more than 70 papers, book chapters and 2 patents. As the Innovation Leader for Space Exploration and Science, within the Innovation Cluster, he animates and coaches teams of innovation fellows through events, hackathons, creativity sessions, incubation of innovative ideas, ventures and open and business innovation initiatives with start-ups.

Dries DEMEY

SPEAKER

Project Manager and Senior System Engineer – QinetiQ Space

EDUCATION
- University of Ghent – Graduation 1992
- Master of Science in Bioscience Engineering - Environmental Technology

EXPERTISE AND ACHIEVEMENTS
- Actually working at QinetiQ Space as project manager and process engineer for about 10 years. Responsible for projects related to Life Supports systems which include treatment of water, waste and gas in closed environments with the aim to recover water and nutrients
- Before QinetiQ Space, 20 years active as engineer, consultant, project manager and team leader in the field of environmental technology
- Specialized in optimization and design of industrial waste water treatment plants and process water production units
- Almost 30 years involved in ESA (European Space Agency) programs related to Advanced Life Support Systems and In-situ Resource Utilization technology, among MELISSA, the Bioregenerative Life Support development framework of ESA.

Peter WEISS

SPEAKER

Peter is the Founder CEO of SPARTAN SPACE. He has more than 20 years of experience in the maritime and space sector. He worked at DLR, Germany, MIT, USA, Cybernetix, France, the Hong Kong Polytechnic University and for over ten years as Director of the Space Department and Company Board member of Comex, France. He was Co-Founder and President of Powersea, a start-up company developing underwater connectors.

Robert LINDNER

SPEAKER

Head of Life Support & Physical Sciences Instrumentation Section
TEC-MMG - European Space Agency ESA-ESTEC

Robert Lindner studied Chemical Engineering at the University of Karlsruhe (Dipl.-Ing./MSc), specialising in Thermal Engineering and Thermodynamics. He works for the European Space Agency since more than 20 years and has focussed on life support engineering and instrumentation development. For many years he has been working for the ExoMars project as an instrumentation engineer and technology support for several instruments, amongst others the Mars Organic Molecule analyser (MOMA). His interests comprise instrumentation development for manned and unmanned missions (ISS, planetary exploration...), life support system development and In Situ Resource Utilisation. He is currently leading the Life Support and Physical Sciences Instrumentation Section in the Technology and Quality Management Directorate (TEC).

Cécile RENAUD

SPEAKER

Cecile Renaud, PhD student at Umons

Biologist by training, I specialized in space activities after a Master of Marine Biology and a second master of Innovation's management. After working in Earth Observation industry, I decided to take part of the MELiSSA journey by joining the University of Mons beginning of February 2022. I am involved in the ARTEMISS project where I study the effects of the space environment on metabolites of Limnospira indica, a photosynthetic cyanobacteria.

Izabela Świca

SPEAKER

Project of algae-bacterial reactor for the extraction of iron from lunar regolith
University Warmia and Mazury in Olsztyn

I am PhD student in the scientific discipline of environmental engineering, mining and energy. In my research work, I deal with the production of fertilizer form microalgae-fungal biomass produced on the basis of biodegradable sewage in order to regenerate the barren soil on the Earth and symulants of Marian and Lunar regolith. One of my greatest achievements is obtaining a protection certificate for a utility model entitled "Device for the production of organic biomass with internal CO2 supply". I also participated in The James Dyson Award competition, where I won the title of runner-up for the project "The New Life Capsule". I am also a scholarship holder in the project SONATA BIS-10, entitled „Regolith harvesting on Moon surface: Excavation and beneficiation in low gravity environments" implemented in a scientific consortium: UWM in Olsztyn, University of Science and Technology in Kraków and Space Research Center in Warsaw. As part of the work plan, I carry out the task related to the cultivation of microgreens on the Lunar regolith.

Laia Vulart

SPEAKER

PhD Student at Universitat Autònoma de Barcelona and Ghent University

Laia Vulart is a doctoral student at Universitat Autònoma de Barcelona and Ghent University, with an interest in bio-engineering and biotechnology processes for Closed Ecological Life Support Systems (CELSS). She is a biotechnologist graduated from Universitat Autònoma de Barcelona. She developed her Master's Thesis at Institut de Biotecnologia i de Biomedicina, where she studied the potential role of biotechnological protein-only nanoparticles as antimicrobial agents.

In her PhD research, she works on the development of resource recovery technology for long-term space missions, as part of ESA's MELiSSA project. Specifically, she focuses on combining anaerobic fermentation and bioelectrochemical systems for carbon recovery from organic wastes.

Icíar Giménez de Azcárate Bordóns

SPEAKER

ETH Zürich

Can human urine recycled within the MELiSSA loop provide sufficient available phosphorus to plants grown in hydroponics?

I completed my undergraduate and master's degree in Agricultural Engineering at the Polytechnic University of Madrid, specializing in plant production. After my studies, I worked in an agricultural cooperative and in a fertilizer and hydroponic systems company as a research engineer. In the last year, I participated in the PACMAN2 project (PlAnt Characterization unit for closed life support system - engineering, MANufacturing & testing phase 2) of the European Space Agency as scientific assistant in the Group of Plant Nutrition at ETH Zürich. I am currently conducting my PhD in the same group on the assessment of how bio-waste recovered nutrients affect plant growth as a MELiSSA POMP3 student.

Clara Plata RÍOS

SPEAKER

PhD Manager of Operations and Technologies SEMiLLA IPStar

Clara holds a bachelor and PhD in Physics from the University of Granada. Between 2010 and 2021 she worked in the design and management of national and international projects at the University of Malaga, having worked on areas such as Smart Campus, Innovation, Entrepreneurship and Circular Economy. In 2018 she joined the Circular Economy Leaders programme promoted by the Advanced Leadership Foundation. Since 2019 she holds the position of Manager of Operations and Technologies in the development of Circular Economy initiatives at international level in the Dutch company IPStar SEMiLLA, linked to the European Space Agency, where she has developed project in the water sector and new circular business models. Since November 2021 she holds the position of Project Manager in the Smart City Cluster where she is in charge of the Circular Economy area as well as International Projects.

The content of the presentations was provided by the Key speakers and Speakers

Catherine Creuly

SPEAKER

Phd, Associate Professor In Biochemical Engineering

Catherine Creuly engineer at the Centre Universitaire des Sciences et Techniques (Biochemical engineering, Polytech Clermont-Ferrand, France) in 1985. She worked for Rhone-Poulenc in the laboratory of Pr J.P. Larpent on microbiology (1985 - 1987) of lactic acid bacteria and obtained her PhD Thesis in 1987. In 1988, she joined the Laboratoire de Génie Chimique et Biochimique (LGCB) and has first worked until 1990 for Sanofi BioIndustries in the field of bioconversions of aroma compounds.
Since 1997, she has been involved on anaerobic fermentations and on the culture of Fibrobacter succinogenes. She has been responsible for several contracts with CNRS and with European Space Agency (Microgravity Application Program) focussing on the digestion and the recycling of vegetable wastes produced by on-board Life Support Systems. She particularly investigated the area of biocatalysis, pure and mixed cultures, anaerobic digestion and waste recycling. She has field experience with analytical methods of metabolites identification and metabolic fluxes calculation.
She has a track record experience in the design of MELiSSA (Micro-Ecological Life Support System Alternative) ecosystem, which is the biological life support system developed by European Spatial Agency (ESA) for long duration spatial missions. Her main domain of expertise covers the process engineering aspects of MELiSSA system (e.g.) the first compartment. She has been involved in food characterization of diet for astronauts. Her main research activities concern:

- Biochemical engineering and integrated design;
- Bioreactor design (anaerobic digesters; fiber degradation; nitrifying compartment);
- Database demonstrator.

Anna VERSHININA

SPEAKER

KU Leuven, Dep. of Architecture, Campus Sint Lucas, Ghent/Belgium

Originally from Russia, Anna Vershinina has completed BA in Architecture at Newcastle University, UK, and MSc in Architecture at KU Leuven, Belgium with a Magna cum laude. Her master dissertation, "Microbial Gardens", was personally highlighted by the dean and was nominated for the Van Hove award (2022). Vershinina continued the conversation about human-microbial cohabitation in extreme environments at the MEEP Symposium in Lucerne, Switzerland (2022). Her work investigates the potential of forming alliances with the microbes that comprise the base of the biosphere as a more-than-human solution to the extreme challenges and changes of Anthropocentric ways of making living spaces.
Anna Vershinina has worked at a diverse set of architecture firms in Germany (2018) and China (2018-2020). She has exhibited her BioDesign prototypes at the Dutch Design Week (2022) and Evoluon in Eindhoven, Netherlands (2022). She is currently based in Rotterdam, Netherlands, as she continues her research into biomaterials, interspecies symbiotic relationships for surviving extreme environments and sustainable ways to apply them in specially designed "homes" or bio-processors.

Katharina OST

SPEAKER

Osnabrück University of Applied Sciences - Faculty of Agricultural Sciences and Landscape Architecture - Laboratory for Food Biotechnology

Katharina J. Ost is a bioprocess engineer and biotechnology researcher driven by a lot of passion. She is in her first year of the PhD program in Biology at the University of Münster (WWU) and Osnabrück University of Applied Sciences (HSOS), Germany.
Her dissertation explores the potential of filamentous fungi as a universal, innovative and selfsustained expression platform used in a circular bioeconomy for different food applications.
In her current work, she examines the adjusting screws to produce high yields of food-grade substances and complex biocatalysts used as additives or active ingredients in Aspergillus niger. The project deploys recent research on high-throughput screening technologies and leads to questions on how high-throughput screening systems in filamentous fungi can be detectable, feasible and quantitative in order to express and screen functional and stable recombinant proteins. This is why, Katharina is broadly interested in smart multipurpose microbial cell factories which can be used for the production of novel proteins and proteins of interest on earth - and in space. She thinks that fungal biotechnology in space needs to be more attention because filamentous fungi can be the perfect companion for space travel by using the fungus as a sustainable life support system. Katharina holds a Bachelor of Industrial Biotechnology from Biberach University of Applied Sciences and a Master of Biotechnology from the University of Münster in Germany. Her earlier research focused on biomass-degrading enzymes in Aspergillus niger at BRAIN AG (Zwingenberg, Germany) and Leiden University (Leiden, The Netherlands). The projects included the biotechnological production of plant cell wall degrading enzymes in an industrial relevant A. niger strain and the understanding of transcriptional regulation of the enzyme network in fungi. Katharina's Master thesis in close collaboration with the Centre of Structural and Functional Genomics at Concordia University (Montreal, Canada) allowed a better understanding of protein production to the next level. There, she learned that complex biocatalysts such as chitin and chitosan modifying enzymes can be expressed in filamentous fungi and those are important for chitin chemistry since the products became interesting resources in various fields such as medical and cosmetic applications. The second part of the thesis with a focus on cell wall modifying enzymes for the reuse of fungal biomass led to new possibilities to transform waste products or by-products into new valuable products. Furthermore, she has also worked as a tutor at Biberach University to develop photosynthetic bacteria generating electricity using dye-sensitized solar cells. Prior to arriving at HSOS for her PhD, Katharina completed several traineeships in the Netherlands and Belgium. Her work on purple bacteria screening for photoautohydrogenotrophic food production during her Master's traineeship at UAntwerp has been recently published in New Biotechnology. Currently, her Team is looking for interesting collaboration partners.

Célia LOINTIER

SPEAKER

KU Leuven, Dep. of Architecture, Campus Sint Lucas, Ghent/Belgium

Célia Lointier joined in 2019, the Vienna Textile Lab: a biotech/fashion tech company that focuses on the research, development and production of textile dyes and pigments manufactured from microorganisms. After a bachelor's in chemistry and a master's degree in the field of pollution management, Célia's present mission is with Vienna Textile Lab to contribute to our R&D goals in the field of impact assessment and antimicrobial research. At the beginning of her assignment, Célia could not anticipate that she will be deep diving soon into a joint project with the European Space Agency (ESA) and the Austrian Space Forum (ÖWF) by researching innovative methods to make space suit underwear even more hygienic and more durable in the future. Célia got an exciting challenge to explore the full potential of secondary metabolites as viable agents for space textiles.

The content of the presentations was provided by the Key speakers and Speakers

Øyvind Mejdell JAKOBSEN

SPEAKER

Research Manager, PhD
Centre for Interdisciplinary Research in Space (CIRiS), NTNU Social Research

Øyvind Mejdell Jakobsen is a Senior Researcher and Research Manager at CIRiS at NTNU Social Research in Norway. Formal educational background lies within life sciences and chemical engineering, with a PhD in biotechnology. Jakobsen works on bioregenerative Life Support Systems, combining biology and technology towards new concepts, know-how and solutions for human spaceflight and Earth applications. A key topic is closed-loop hydroponic cultivation of higher plants in a human spaceflight context, with substantial co-activity within related Earth applications such as improved resource utilization and monitoring and control of closed food production systems. R&D projects span from international multi-partner activities on Life Support Systems funded by the European Space Agency and EU, to regionally funded collaboration with aquaculture and agriculture industry. Considerable outreach activities towards children and students are motivated by the potential of space research to inspire the coming generation of engineers and scientists, illustrating for example how biology and technology can be combined for improved food production in Space and on Earth.

Abdallah HAYDAR

SPEAKER

PhD Student, Nantes Université, CNRS, GEPEA, UMR 6144,
F-44600 Saint-Nazaire, France.

Abdallah HAYDAR was born in Lebanon in 1995. He completed his Master degree in food sciences and technologies engineering in 2019 from ENSAT Toulouse and Lebanese University. He has started his PhD thesis in Nantes University on January 2020, on the topic "Photobioréacteur de type colonne à bulles confinée: hydrodynamique, transfert gaz-liquide, influence des bulles sur le cisaillement pariétal et performances de production". This doctoral thesis is taking place at GEPEA laboratory Saint-Nazaire, and is being supervised by Pr. Caroline GENTRIC and Dr. Walid BLEL. His PhD thesis is funded by ANR "Agence nationale de la recherche".

Gioia ARIETI

SPEAKER

TEDx Speaker and human-centered designer for the Banking industry by day, and for Space and Smart Cities by night.

Since 2018 she has been working on Wide Time - a mission to start measuring time in width, not length, with use cases focusing on well-being and smart cities. Gioia is a speaker, workshops organizer and partnerships lead. After living in China and attending a Space Summer Camp, she got inspired by astronauts' common experience of the Overview Effect. She is a user experience advocate and is currently using design thinking to help Danske Bank, one of Denmark's most recognizable banks, in developing and anticipating digital financial demands for major corporate clients. She holds a Master's degree in Product Design and Bachelor's in Economics from Denmark.

Arman GRUMEL

SPEAKER

Arman Grumel is an agricultural engineer from AgroParisTech, France with an intertwined passion for space and plant science.
For his master's thesis he joined the MELiSSA Pilot Plant team in Barcelona, where he worked on a model for light capture by lettuce in the higher plant chamber He also worked on the implementation of a new potentiometric ion analyzer for at-line analysis of ion uptake by the plants.

Angelo VERMEULEN

SPEAKER

Angelo Vermeulen is a space systems researcher, biologist, and artist. He works on bio-inspired concepts for interstellar exploration at Delft University of Technology, with a specific focus on self-replicating architecture and biological life support. He has a deep interest in complex system science and is fascinated by principles of self-organisation, emergence and evolution. Vermeulen is also an adviser for a range of space companies such as SpaceBorn United in the Netherlands and Warpspace in Japan. In 2013 he was crew commander of the first NASA-funded HI-SEAS Mars simulation in Hawaii. He is an expert at the IAF Committee for the Cultural Utilisation of Space (ITACCUS), and previously at the European Space Agency Topical Team Arts & Science (ETTAS). He co-founded SEADS (Space Ecologies Art and Design), a cross-cultural collective of artists, scientists, engineers, and activists. In 2019 and 2020, SEADS sent its Ênginos of Êternity art project twice to the International Space Station. Over the past years, Vermeulen has been (guest) faculty at several universities across Europe, the US, and Southeast Asia. To date, he wrote over 50 publications covering his research in art and science.

Nicolas DROUGARD

SPEAKER

Associate Professor at ISAE-SUPAERO

Associate Professor in Artificial Intelligence for driving autonomous systems and aerospace vehicles at ISAE-SUPAERO, I teach Machine Learning, Planning under Uncertainty, Statistics, Mathematics, and I am in charge of the advanced master's degree "AI & Business Transformation". I supervise three PhD students and one postdoc in the field of AI and human-computer interaction, and I lead the ALICE project: "AI for Life In spaCE".
Originally from Toulouse, I followed a training in Mathematics (Orsay), I graduated from the master "Mathematics Vision Learning" (ENS Cachan), and I continued with a PhD in AI (Onera & IRIT), which I defended in 2015. After a couple of post-doctorates in human-machine interaction and brain-computer interfaces, I got my current position.
I discovered MELiSSA while leading student research projects on the automation of food production systems for space exploration (ALICE). Since 2019, we have been working on two prototypes, the Farmbot and a hydroponic system, to use advances in AI in optimizing the resources and performance of Life Support Systems: Learning for Planning and Semantic Segmentation are indeed immediate promising AI domains for such systems.

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Sandra ORTEGA

SPEAKER

Both, a Pharmacist (specialized in Molecular Toxicology) and Biochemist by education, Dr. Sandra Ortega Ugalde has been involved within biotechnology companies in the development of engineered proteins and gene therapy approaches for several diseases. From April 2021, she joined the of Life Support & Physical Sciences Instrumentation Section (D/TEC-MMG) at the European Space Agency (ESA) as an Environmental Control and Life Support Systems Engineer (ECLSS). Sandra is part of the MELiSSA team where she supports the development regenerative life support technologies enabling long distance exploration missions. Her focus is the characterization and optimization of biological processes in R&D activities as well as to provide project support for human spaceflight.

Virginie BLANC

SPEAKER

Née en Seine Saint Denis, Virginie BLANC s'oriente vers une Licence d'Art et d'Histoire des Arts. Enseignante dans les écoles situées en zone d'éducation prioritaire, puis maitre-formatrice, elle est décorée chevalier de l'Ordre des palmes académiques pour la qualité de ses nombreux projets. Pour sensibiliser les enfants, futurs citoyens de demain, Virginie Blanc propose des projets mettant en exergue les objectifs de développement durable dont l'ODD6 "EAU ET ASSAINISSEMENT". La réflexion et l'éducation liées aux problématiques de l'eau doivent être un souci quotidien dans l'éducation et ce, dès le plus jeune âge.

Eugénie CARNERO DIAZ

SPEAKER

Doctor - Institut de Systématique, Evolution, Biodiversité from Sorbonne Université (Paris, France)

Dr. Eugenie Carnero Diaz. Associate Professor of Plant Biology at the Faculty of Science and Engineering of Sorbonne University (Paris-France). Since 2014, she leads the Space Biology group integrated in the Institut de Systématique, Evolution, Biodiversité of Sorbonne Université.
She has participated in several space experiments that took place on board the International Space Station and in this context, she was principal investigator (PI) of the "GENARA-A" space experiment, performed in 2010, and co-investigator (co-I) of "SEEDLING GROWTH" space experiment, carried out in 2013, 2014 and 2017 and for which the scientific team received a Group Achievement Award from NASA.
In addition, she was co-I of an ESA-CORA-GBF "GIA2 project: From GBF to ISS with A. thaliana and crop species". This project aims to optimize the outcomes of recent experiments performed within the frame of "SEEDLING GROWGTH" and to design and perform next space experiments using ground based facilities providing altered gravity levels and irradiated environment.
She is also PI of national projects supported by CNES, such as "Plant Development", "RadioBotanic" and "Spatial Agriculture" which aim to study the action of space environment (microgravity, radiation and heavy metals) on plant development and their acclimatization to this environment.
Eugénie Carnero Diaz is also consultant for ESA scientific roadmap "Biogenerative Life Support" and "Plant Biology" and Member of the ESA-Space Omic Topical Team.

Gabriela SOREANU

SPEAKER

Assoc. Prof. Dr. Eng. Gabriela Soreanu, "Gheorghe Asachi" Technical University of Iasi (TUIASI)

After a PhD in Chemical Engineering from the "Gheorghe Asachi" Technical University of Iasi (2001), Gabriela Soreanu performed two postdoctoral stages in Canada (Université de Sherbrooke, QC, 2002-2003; Environment Canada, Burlington, ON, 2004-2007) in the field of gas biotreatment (air, biogas). She is a continuous promoter of environmental biotechnologies as a green tool for solving the air pollution issues, being an initiator of this research current at national level and contributing to the development of this research field in response to the multitude of challenges related to both terrestrial and space applications. Gabriela Soreanu is the head of the BIO-SPACE LIFE (Laboratory of gas biofiltration and space technologies for life support in space) inaugurated in 2018 at TUIASI, co-editor of the Elsevier book "From Biofiltration to Promising Options in Gaseous Fluxes Biotreatment: Recent Developments, New Trends, Advances, and Opportunities" (2020) and director of several RDI projects in gas biofiltration field (BIO-MARS, BIO-UP, BIO-AUTO) recently awarded by the Romanian Space Agency (ROSA) and Romanian Research Authority (UEFISCDI), respectively. Her scientific portfolio includes articles (62), books/chapters (12) and patents (4). Cumulated IF > 120. Hirsch (h) = 16.

Borja POZO

SPEAKER

Dr. Borja Pozo, is a Telecommunications engineer specialising in electronics (BSc+MSc, 2013) and a master's degree in advanced electronic systems (MSc, 2014) from the University of the Basque Country (EHU/UPV). Since 2014 he has been working at Tekniker, where he obtained his international doctorate with honours (PhD, 2018) in the field of energy harvesting and spending 5 months in Fraunhofer IIS Institute in Nuremberg (Germany) as a doctoral student. Since 2019 is the space technology leader and multidisciplinary researcher at Tekniker, managing around 30 people of different departments to accomplish space projects. The work involves contacting International Spaces Agencies as ESA and NASA, industry, and research institutions. As a multidisciplinary scientific researcher, is focused on the research and development of new space technology. In addition, the work as a multidisciplinary researcher, is oriented to integrating different technologies related to space applications (technology and scientific). In addition, is currently managing 5 projects with ESA, 2 of them as leader, and another regional project. Being the author of 15 international papers/conferences and 2 patents.

The content of the presentations was provided by the Key speakers and Speakers

EARTH SPACE TECHNICAL ECOSYSTEM ENTERPRISES SA

Earth Space Technical Ecosystem Enterprises SA Terrestrial and Space Technological Co-Developments as Drivers for Satisfying Current and Future Market Needs Earth Space Technical Ecosystem Enterprises SA (ESTEE) is a Swiss-based start-up that develops Life Support System (LSS) components, prototypes and applications. The vision of ESTEE is to facilitate both sustainable living on Earth and human space exploration through the integration and adaptation of existing technologies related to advanced LSS. Its mission is to develop products that are designed and engineered to transform wastes into resources. ESTEE is the only private company to implement a full-scale crewed LSS ground demonstrator operating in closed-loop, by developing the Scorpius Laboratory Prototype 1 (SLP1).

SLP1 aims to integrate, scale and interface technological building blocks from space LSS development (e.g. microalgae-based photobioreactors; black, yellow, and grey water treatment; nutrient recovery; CO_2 capture and valorisation; health monitoring, etc.) within a closed habitat.

With this proof of concept, ESTEE aims to adapt, scale, test, demonstrate and validate on Earth hardware, processes and operations for the preparation of a manned mission to Mars and to identify any remaining critical issues before flight hardware developments.

SLP1 will benefit from the lessons learned from ESTEE past and current projects with European Space Agency and other key partners developing related Earth-based applications (e.g., University of Lausanne, Ecole Polytechnique Fédérale de Lausanne, eSpace, Swiss Center for Electronic and Microtechnology - CSEM, etc.).

SLP1 derived technologies present a clear market potential for commercial uses, with promising terrestrial LSS applications based on the use of specific technological brick(s), and/or a combination of them.

ESTEE uniqueness relies in its capacity to cross-fertilise the terrestrial and space technological roadmaps for LSS, where synergies of terrestrial and space technological development can act as drivers for implementing sustainability to satisfy market needs.

So far, over 10 million Euros were invested in various innovative and technological projects, which makes ESTEE a competence center with state-of-the-art know-how and one of the strongest networks in the field of LSS.

ESTEE is now looking for the co-development of:

1) additional technological bricks with leading terrestrial and space industrial partners;
2) terrestrial and space spin-off companies based on commercial opportunities from LSS technologies;
3) green investments to address the challenges of tomorrow's habitat for a more circular economy.

THALES ALENIA SPACE

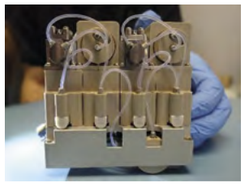
A Joint Venture between Thales (67%) and Leonardo (33%), Thales Alenia Space is a global space manufacturer delivering, for more than 40 years, high-tech solutions for telecommunications, navigation, earth observation, environmental management, exploration, science and orbital infrastructures. Thanks to our diversity of skills, talents and cultures, our customers (governments, institutions, space agencies, telecommunications operators) have Space to Connect, Secure & Defend, Observe & Protect, Explore, Travel & Navigate. We also team up with Telespazio to form the Space Alliance, which offers a complete range of solutions including services.

LIVING & WORKING OFF EARTH.

The International Space Station holds a special place in the hearts of Thales Alenia Space engineers based in Turin, Italy. Thales Alenia Space has in fact supplied half of the pressurized volume on the ISS, including Nodes 2 and 3, the Permanent Multipurpose Module, the 3 Multipurpose Logistics Modules, the Cupola and the Columbus lab structure, along with ATV resupply vessels and the structure for the Bishop commercial airlock. In addition, **Thales Alenia Space supplies pressurized cargo modules for the Cygnus resupply vessels.** We are also building for Axiom Space two pressurized elements of their future commercial space station in Low Earth Orbit, for which the French designer Philippe Starck creates the habitation module interiors.

In 2020, Thales Alenia Space was awarded several contracts to build key modules dedicated to the Gateway cislunar space station. The company will build ESPRIT and I-HAB modules as prime contractor on behalf of ESA and will provide Northrop Grumman with HALO's pressurized module. The Lunar Gateway is at the heart of NASA's ARTEMIS ambitious program aiming to bring astronauts back to the Moon in the years to come. Thales Alenia Space is also a major partner onboard Orion, NASA's human transportation vehicle for deep space exploration. Our company provides thermomechanical systems for Orion's European Service Module.
Following the success of the IXV atmospheric reentry demonstrator, Thales Alenia Space, with AVIO as co-contractor, will build ESA's Space Rider, Europe's new-generation, low-orbit, reusable space transportation system.

BEYOND GRAVITY



As a leading global supplier of the space industry, Beyond Gravity has successfully delivered thousands of products for the satellites business. In addition, Beyond Gravity Slip Rings SA (BGR) develops pressurized payloads for in-orbit biological experiments on board of sounding rockets (BIM), the ISS (PADIAC, SPHEROID) or in orbit technological demonstration (BIORAT-1, BIORAT-2). As industrial partner and payload developer, BGR is performing for agencies or contractors, the activities necessary to fly a payload over its different project life phases (from Feasibility, Design, Qualification/ Production, Operations to Disposal) such as definition and validation of the requirements from an Experiment Scientific Requirements (ESR) or Statement of Work (SOW), Sizing, Assembly-Integration & Testing (AIT), Safety Standards Verification, Quality / Project Management, Logistics etc. BGR core competencies are the design of bioreactors and photo-bioreactors for algae cultivation from 10ml up to several liters with their necessary supporting functions such as feeding, sampling, gas/liquid transfer (via membrane contactor), air humidity control and thermal control system compatible with on-ground and in-orbit operations.

BIOX TECHNOLOGIES

BioX Technologies is the technology company based in Slovakia. It is specialized in spirulina cultivation and harvesting technology. The main activities are biotechnology R&D services and projects, innovative technology solutions and prototypes development. The main products are: Harvesting units, smart DRYer – food and pharma compact size freeze dryers, M4MEL – artificial intelligence in microbiology imaging and sustainable packaging eco-DISH from cereal, fully degradable material. More details you can find at www.biox.sk

BLUE HORIZON

Blue Horizon is a Luxembourg-based company, owned by OHB SE, being active in the fields of bio-engineering also using selected space technologies. On Earth, the company's mission is to become a major player in the improvement of environmental conditions using microorganisms and biotechnologies in combination with selected space technologies to monitor and fight against desertification, pollution and other man-made effects. For Space, Blue Horizon aims to become the indispensable partner for all human space flights and settlements on other planets based on its expertise related to the production of food, O2 as well as smart material design and processes.

ENGINSOFT

EnginSoft is a privileged member of the MELiSSA consortium by more than a decade.
The collaboration with ESA in the MELiSSA program has seen EnginSoft coordinator of several projects (HYSSE, AtSSE, PaCMan, VARSITY).
Expertise and know-how have been developed, in particular for:

- Improvement and upgrade of the MPP compartment 4b: air chamber and hydroponic
- Engineering of a state of the art PCU – PaCMan - one of the most modern facilities for plant characterization
- Hydroponic subsystem - design and engineering
- Atmospheric subsystem - design and engineering
- System study integration for the control of complex systems: software development (ALISSE)

QINETIQ

QinetiQ Space has a broad experience as a developer of complex space instruments for fluid, material and life science, and human physiology. The capability to perform such interdisciplinary projects with system level responsibilities has been developed gradually over the last 40 years.
We also deliver valuable expertise in the field of Life Support Systems for future long term human space exploration thanks to our experience and the know-how of a multidisciplinary team of mechanical, electronics, software, bio, and process engineers, resulting in performant equipment and systems.
QinetiQ Space is involved in several projects related to waste and wastewater treatment, urine processing with nutrient recovery, carbon dioxide capturing concentration, and oxygen production by photosynthesis processes using microalgae and plants. We work closely together with ESA and research institutes and universities linked to the MELiSSA community.

SHERPA ENGINEERING

Sherpa Engineering is a System Engineering Consulting Company specialized in the model-based system approach for the design and validation of complex systems in several industrial fields as automotive, aerospace, naval, energy and power and agriculture.
Sherpa Engineering puts multi-criteria system modeling and simulation at the core of your engineering by promoting an object-process approach to master complexity, capitalize and improve resource reuse, and reduce system and project risks.
Sherpa Engineering supports its industrial customers by modeling their system from several points of view (teleological, functional, technological) and by linking their requirements with the functional and structural architectures.
SHERPA Engineering has based its knowledge and experience on dynamic modeling, real-time simulation, control of dynamic systems and functional validation of embedded systems at all phases of the system life cycle.

SPARTAN SPACE

SPARTAN SPACE is a French start-up in the New Space sector. We strongly believe that humanity will work and live on the surface of the Moon. In this new paradigm, SPARTAN will play a vital role by having its first orbital habitat and lunar habitat deployed by year 10 of the company foundation.
SPARTAN SPACE was founded in 2021 by a team of engineers, astronauts, and architects with a vision to develop systems that allow humans to live and work in extreme environments using a novel life-support system and energy management system.

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THE SUCCESS OF OUR CONFERENCE IS ALSO DUE TO THE SUPPORT OF OUR SPONSORS, A WINNING ECOSYSTEM! WE ARE INFINITELY GRATEFUL!

ESTEE
EARTH SPACE TECHNICAL ECOSYSTEM ENTERPRISES

ThalesAlenia Space
a Thales / Leonardo company

beyond gravity

BioX technologies

BLUE HORIZON

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