

A collection of cosmetic products including a large blue pump bottle, a smaller white pump bottle, an open red and black compact, and a white jar with a silver lid. In the background, there is a satellite and an astronaut floating in space.

cosmetic

WEBINAR

Choose Space for your Cosmetic R&D!

JULY, 13TH 2021 – 3PM

DURATION ☀ 90'

ORGANIZERS

PARTNERS





Introduction of Connect by CNES and Medes

connect
by

cnes



MEDES



Agenda

- **Overview (15')**
 - MEDES and Connect by CNES
 - Announcement new market opportunity
 - Introduction of Cosmetic Valley and Role in Program
- **Cosmetic Opportunities in Space (30')**
 - Why Space?
 - Scientific Overview
 - Case Studies
 - Relevant Applications and Propositions
 - Service Providers
 - How Can You Engage?
- **Panel Discussion (25')**
- **Q&A (20')**

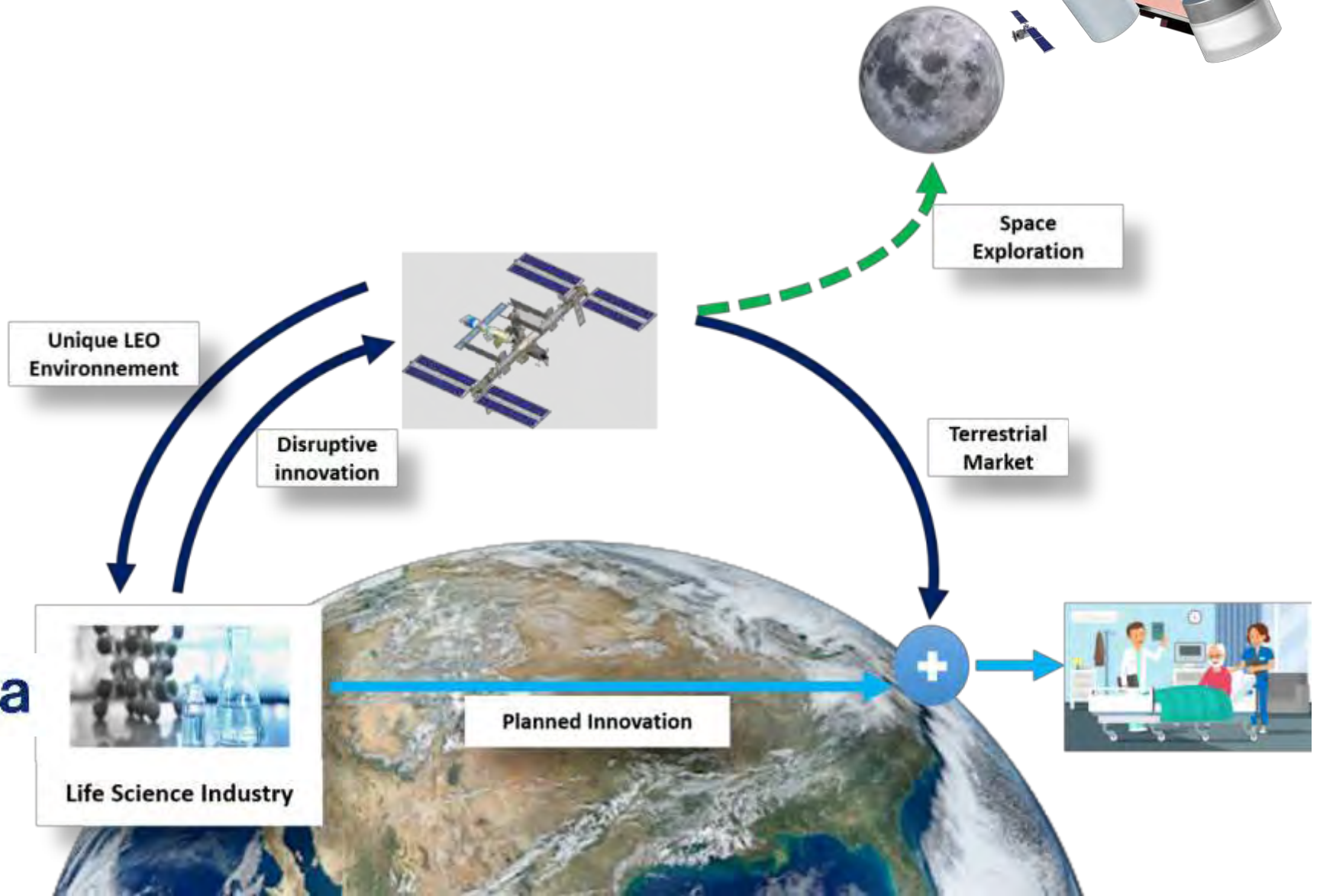


Introduction of Connect by CNES and MEDES









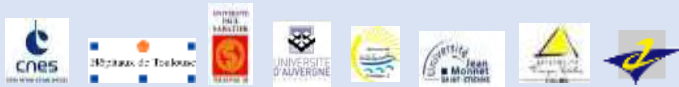
Medes

A hybrid organization – for space and health



Economic Group of Interest – Private but public members

Main members – CNES / Toulouse University Hospital, other French universities and hospitals



Our missions

- Provide expertise & operational support in the field of space physiology and medicine for space agencies for manned spaceflight
- Support ground based clinical research
- Promote societal applications and innovations for space and health



OPERATIONAL SUPPORT



Expertise for space medicine related aspects for manned spaceflights

CLINICAL RESEARCH



Expertise & clinical research infrastructure
Access to a large network of top-level medical experts at international level

APPLICATIONS & INNOVATIONS FOR SPACE AND HEALTH



Bridging space (satellite-based services / space data and technologies & knowledge from space exploration) and health



Connect by CNES Goals

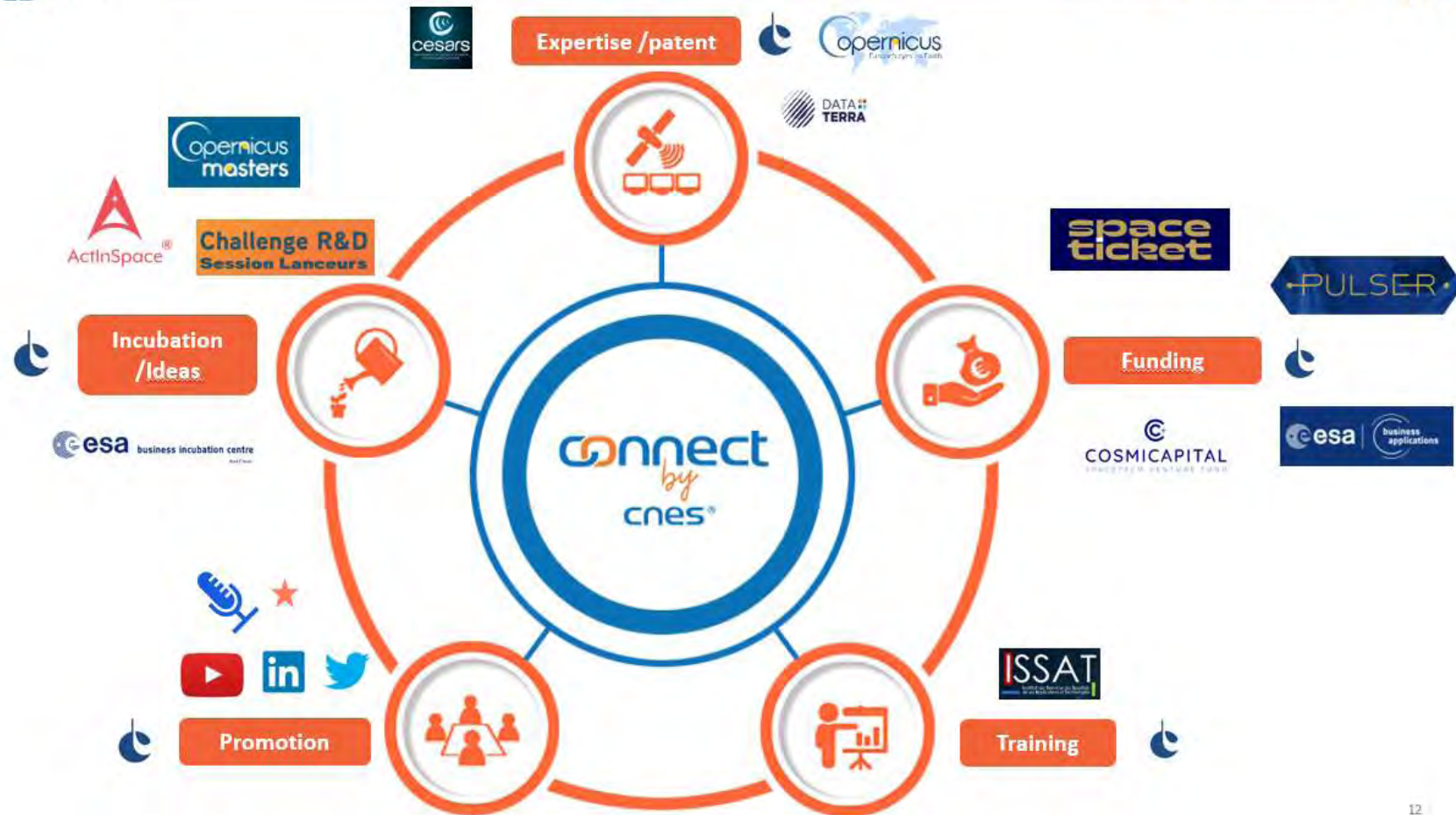
Develop a new community of users

- In order to boost economic, societal and environmental development in France in particular by adding value through the use of satellite data and innovative services for the healthcare, environment and mobility sectors.





Our OFFER





Introduction of Cosmetic Valley





Nathalie SIMONIN

COSMETIC VALLEY

Responsable Bureau Nouvelle-Aquitaine

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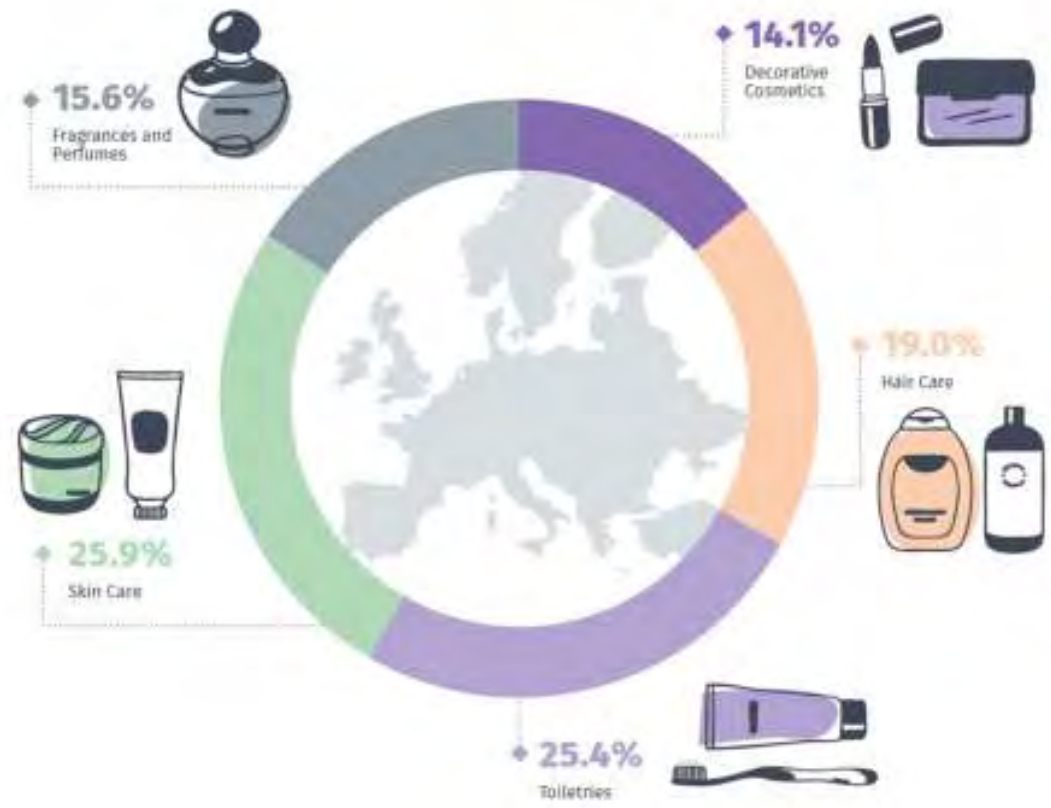


Cosmetics
&
Perfumery
in
the
World





Product segments on a world scale



Source: Cosmetics Europe



A 500-bn-Euro Consumption Market



Source: Euromonitor International



Cosmetics
&
Perfumery
in
France





France : a world leader

French
Best
seller
products



+ 50 % of the
French production is
exported



A world's leading
exporter



Famous brands, French manufacturing





The French know-how





The association

www.cosmetic-valley.com

➤ Association of companies & universities

Established in 1994 and Competitiveness cluster since 2005

➤ Board

President : Marc-Antoine Jamet (LVMH)

CEO : Christophe Masson

18 FTE

➤ Governance

A structure driven by companies, research laboratories and training organizations

A strong and structured partnership with the State and territorial collectivities

➤ 570 members

Companies (SME & Group), 14 universities and training organizations

Representing all trades in the sector

Spread over the whole of France



COSMETIC
VALLEY
FRANCE



Developping the French sector

- Promoting the brand of France
- Connecting the know-how
- Dynamising research and innovation
- Developing expertises
- Supporting exports
- Impulsing International cooperations

www.cosmetic-valley.com





Worldwide beauty connections



Global Cosmetics Cluster is the first international clusters network dedicated to innovation in cosmetics, composed of 25 members from 15 countries <https://cosmeticsclusters.com/>



This network is the dedicated European branch of Global Cosmetics Cluster and intends boost innovative projects in the cosmetics sector in Europe by encouraging the involvement of other European clusters (France, Portugal, Spain, Romania, Italy and Turkey) <https://globalcosmeticscluster.eu/>



R&D AND INNOVATION ACTIONS BY COSMETIC VALLEY

Our aim : To develop Innovation in cosmetic industry

- **Build R&D Projects** : By connecting researchers and foreign companies with French companies and by helping to build collaborations
- **Certified Research collaborations** to show to our government and the European institutions the power of innovation of this sector
- **Build thematic platform clusters with industrial and research partners specific for cosmetic applications**



performance & safety measurement



plant-to-skin research



chemistry, formulation & analytic researchs



Start-up & Process Innovation



Naturality



Lipid expertise





Cosmetic 360, the unique international fair dedicated to innovation in the perfumery-cosmetics sector

220 exhibitors including 30 start-up, 6 majors (L'Oréal, Chanel, Nuxe, LVMH Research, Rodan+Fields, IFF)

30% international

6 winners at the Cosmetic 360 Awards

More than 5 000 unique visitors (+10% vs 2018)

70 countries represented

Strong media coverage: 487 French articles and 235 international articles

180 Open Innovation sessions

11 Prospective Conferences

<https://www.cosmetic-360.com/>

[Watch last edition](#)





Overview of LEO



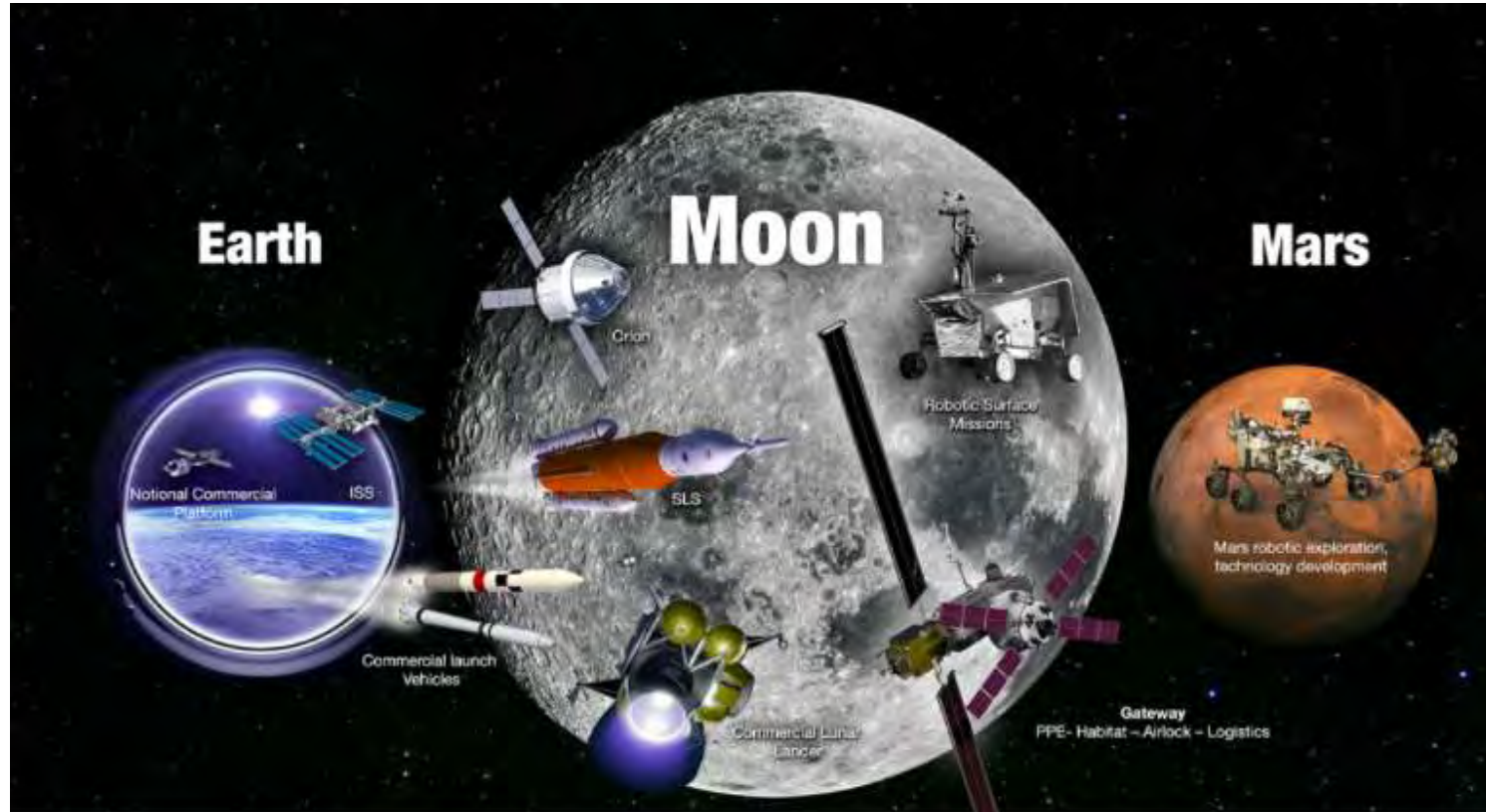


The Opportunity: International Space Station and Low Earth Orbit is Open for Business

- **New Science and Innovation** – Higher Quality R&D and Manufactured Products
- **Commercial Opportunity** – Incremental Revenue, New Product Offerings, Attract Funding
- **Marketing and Branding** – Capitalize on the PR Opportunities



Space Continuum



In LEO
Commercial & International
partnerships

In Cislunar Space
A return to the moon for
long-term exploration

On Mars
Research to inform future
crewed missions

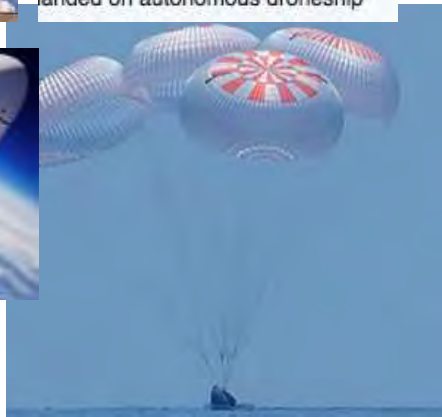
Traditional Focus on Supply Side



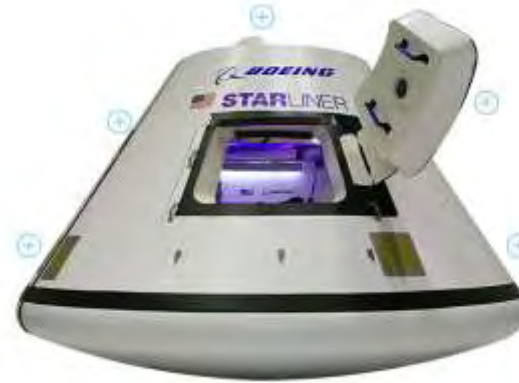
SpaceX



First stage of Falcon 9 Flight 23 landed on autonomous droneship



Boeing



Axiom announces crew for first private ISS mission



The four people who will fly on the first private space mission to the International Space Station (ISS) are (from left to right): Michael Smith (NASA), Mark Stucky (SpaceX), and two private astronauts, S. Gregory Bredes and Gregory B. Burt.

Sierra Nevada



Sierra Nevada Corp's Dream Chaser



Developed by Sierra Nevada Corp. for a commercial space market, using inflatable module technology, it is reusable and serviced by Dream Chaser spacecraft. Credit: STC.

Axiom

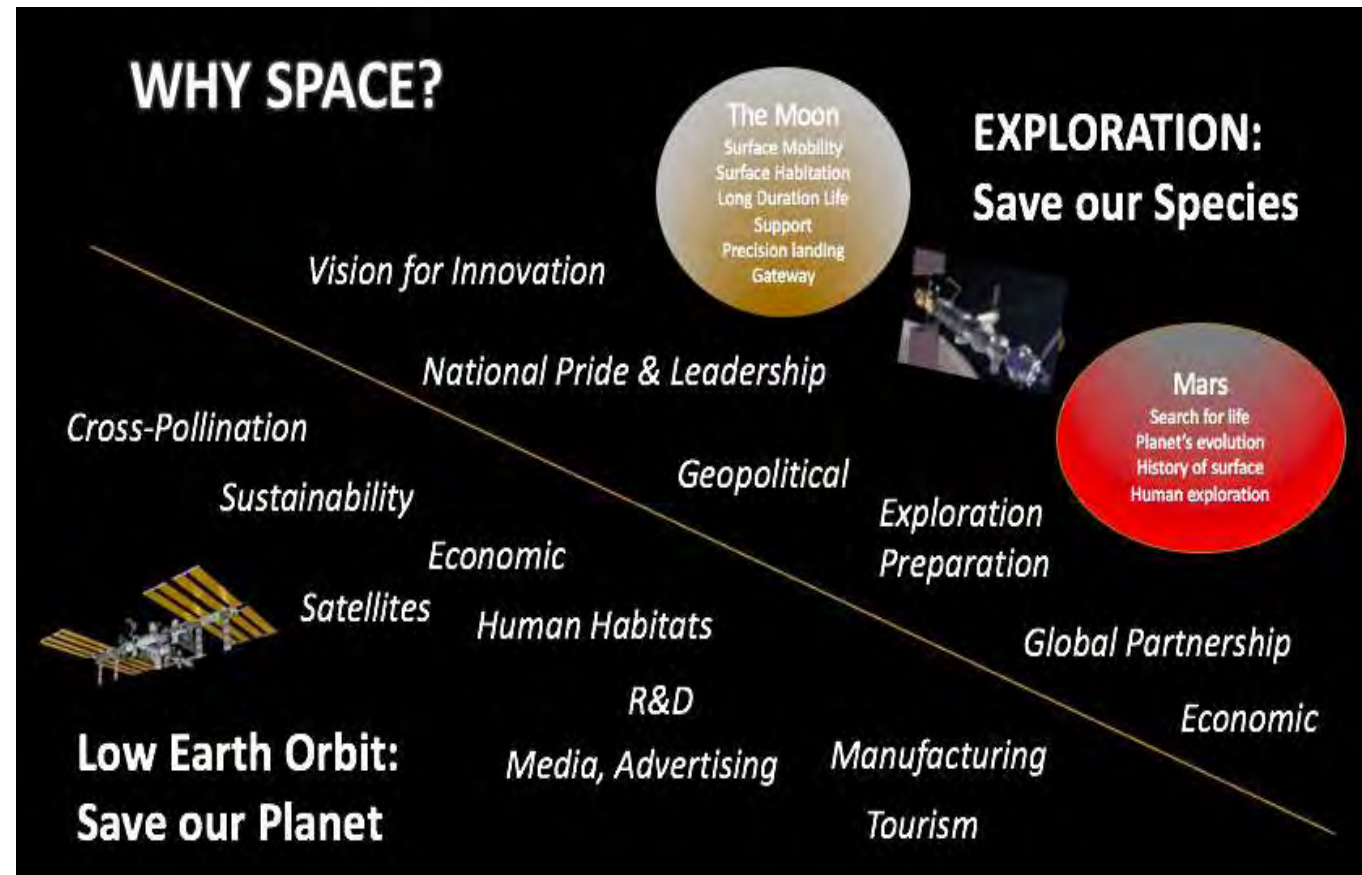


Axiom Space will install its service module on the International Space Station (ISS) in 2024.



But What About Demand? Why Space?

- Formulation of novel materials and better manufacturing processes
- Broad-based sustainability programs focused on: climate change, plastics in the ocean, water scarcity, sustainable crop production, and energy conservation.
- Better drug delivery systems: increased access of therapies
- Accelerated disease modeling: aging and chronic disease
- Regenerative medicine: repair, restore, or replace damaged tissues and organs
- Crop science: indoor/vertical agriculture, water management, and beneficial bacteria
- Remote sensing and satellite technology capability: maritime security, weather monitoring, agriculture monitoring, energy, urban development, and national security





Broader Benefits from Space-Based Activity

Economic

- ✓ New Job Creation
- ✓ New Revenue
- ✓ Accelerated Time to Market
- ✓ Cost Saving

Innovation/Science

- ✓ Innovation Pathways
- ✓ Published Papers and Citations
- ✓ Patents
- ✓ Ideation Volume

Humankind/Social

- ✓ Quality of Life
- ✓ Environmental Impact
- ✓ Sustainability
- ✓ Lives Saved



Currently there is Extensive Commercial and Scientific LEO Activity



Life Science & Crop Science

- Drug Discovery & Development
- Cellular Biology
- Regenerative Medicine
- Accelerated Disease Models
- Manufacturing & Optimization

Consumer Products & Industrial

- In Orbit Manufacturing
- Accelerated Degradation
- Material Synthesis
- Combustion
- Transport Phenomena
- Interfacial Phenomena

Technology & Communications

- VR/AR/AI
- Optics/Photonics
- Robotics
- Autonomous Systems
- Data Imagery
- IOT

Sustainability

- Climate Change
- CO₂ Sequestration
- Ocean Health
- Water Efficiency
- Energy
- Mobility



Benefitting Research Areas and Industries

Research:

- Materials Science
- Chemistry
- Fluid Dynamics
- Plant Science
- Earth Science
- Remote Sensing
- Technology Demonstration
- Disease Modeling
- Cell Biology
- Genomics

Industries:

- Consumer Products
- Food & Beverage
- Raw Materials
- Industrial Materials
- Pharmaceuticals
- High Tech
- Aerospace
- BioTech
- CleanTech
- Energy



Coalition Support for Social Responsibility and Sustainability Programs



Coalition
Management and
Support

Focused on Large
Issues like Climate
Change &
Sustainability

Using X-Prize type
Open Innovation
Competitions



Scientific Benefits of LEO





Microgravity

Microgravity, weightlessness, alters observable phenomenon within the physical and life sciences. Microgravity influences cell behavior, organism health, fluid physics, combustion, and various processes across the physical and life science.





Extreme Conditions



Extreme Environmental Conditions of space include extreme thermal cycling, atomic oxygen, ultra-high vacuum, debris impacts and high energy radiation.



Vantage Point

The ISS offers a unique vantage point at about 400km overhead in Low Earth Orbit (LEO). The orbital path of the ISS covers about 90% of the Earth's population every few days and provides unique spatial resolution and variable light conditions.





Crystallization

Larger more ordered structures can be obtained in microgravity

- Microgravity Molecular Crystal Growth (MMCG)
- New targets for significant diseases
- Drug discovery, formulation and delivery
- Biomarker discovery

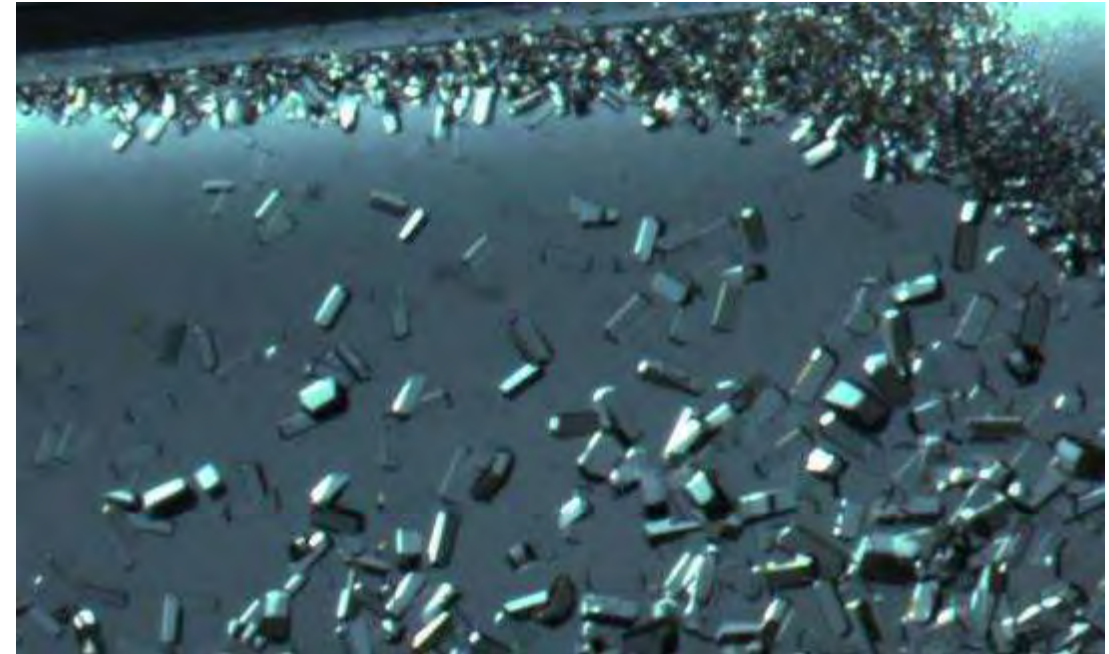


Image courtesy of phys.gov and Lawrence DeLuca.



Cell Biology

Microgravity effects cell's behavior, gene expression, and allows 3D structures to form without the use of a scaffolding or matrix

- Tissue-on-Chips
- 3D Cell Culture
- 3D Bio-printing
- Stem Cells
- Regenerative Medicine



Image courtesy of Science.



Microorganisms

The diffusion driven environment of space induces changes in the behavior and virulence of microorganisms

- Bacteria
- Fungus
- Viruses
- Biofilms





Disease Models

Microgravity induces changes in the human body and cells that mimic age related diseases

- Muscle & bone loss
- Immune dysfunction
- Cancer Tumors
- Organoids
- Model organisms - rodents



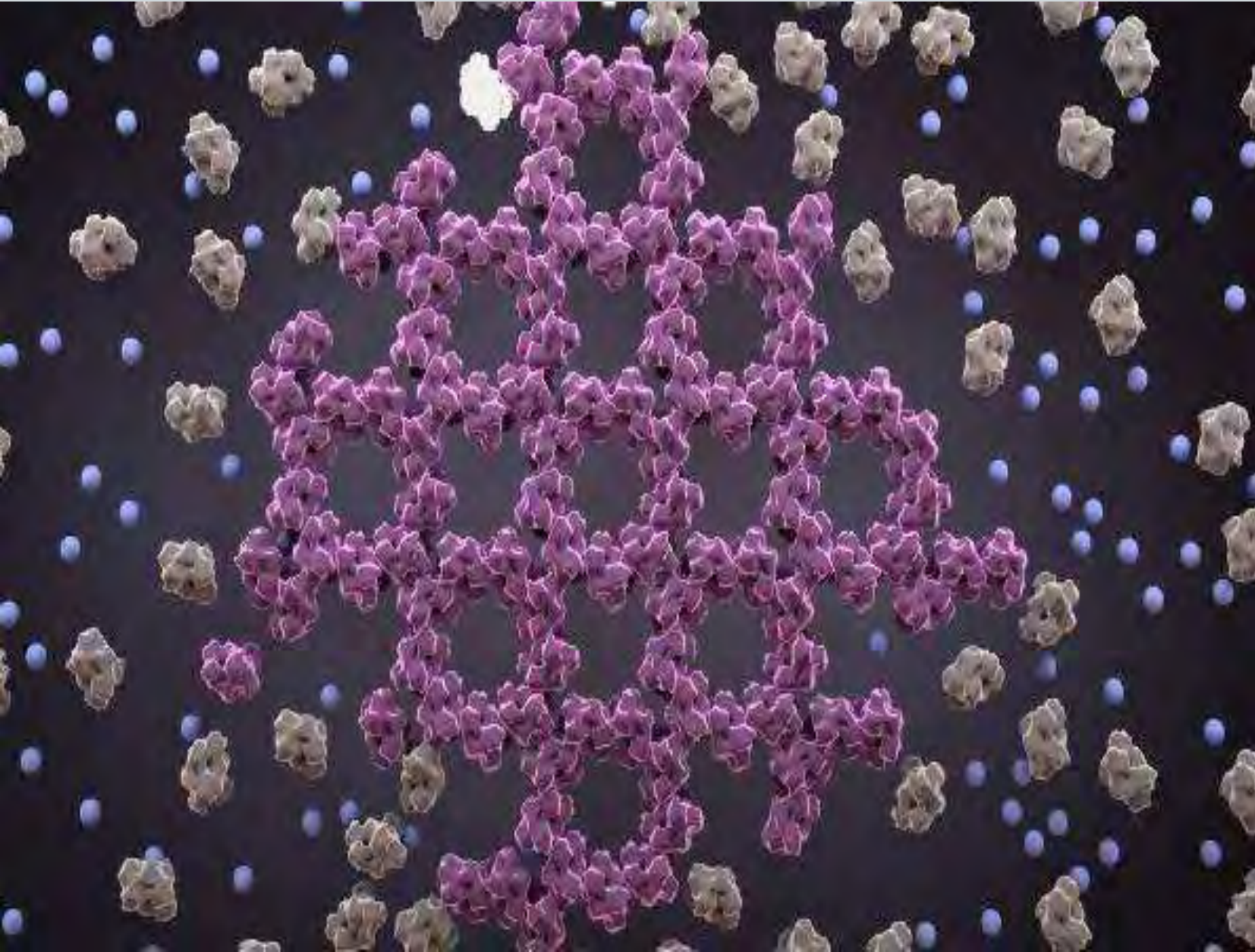


Plant Science

Microgravity can be used to probe mechanisms to understand how terrestrial plants respond to gravity and activates stress response in plants

- Plant growth
- Plant Stress
- Plant/microbe interaction
- Crop monitoring
- Water monitoring





Materials Synthesis

More ordered material structures can be developed in microgravity

- Polymers
- Biomaterials
- Composites
- Ceramics
- Metals
- Semiconductors



Property Measurements & Behavior

Critical properties of materials and systems can be measured more accurately in microgravity leading to more exact design models

- Thermophysical Properties
- Transport & Modeling Coefficients
- Phase Transitions



Fluid Dynamics & Transport Phenomena

Unique fluid behavior in microgravity can allow for easier studies of:

- Multiphase Flows
- Capillary Flow
- Diffusion
- Surface Tension
- Separation and Agglomeration
- Interfacial Behavior



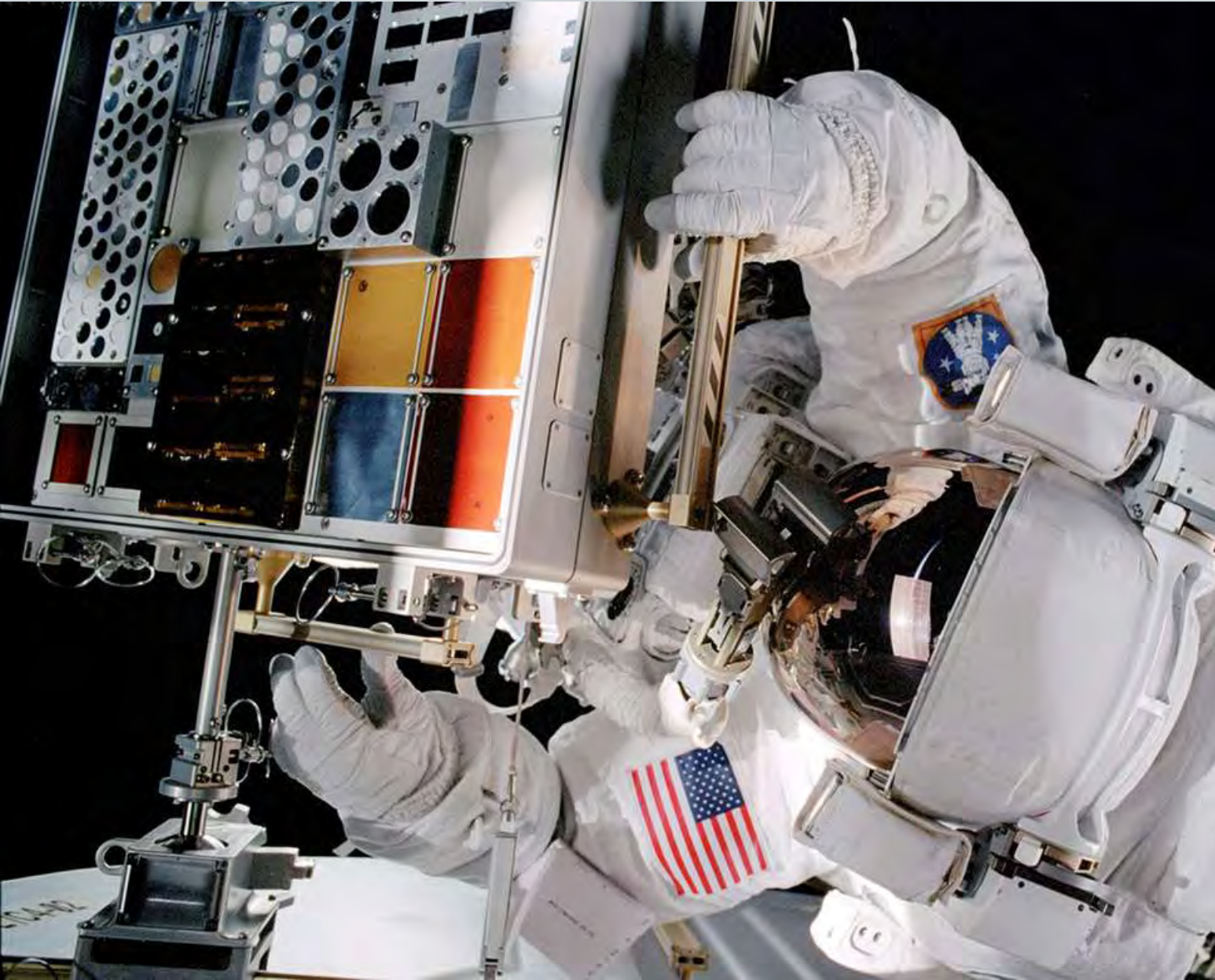


Reaction Chemistry

Lack of gravitational forces can influence:

- Chemical Product Formulation
 - Flow
 - Batch
- Mixing Behavior
- Combustion





External Materials Testing

- The extreme conditions of space provide the ultimate platform for materials testing:
 - Degradation
 - Corrosion
 - Other Failure Modes
- Degradation Process occurs orders of magnitude faster than on Earth



Remote Sensing

- Vantage point of ISS provides opportunity to collect important data sets (regional, continental, global)
- Sensing Options:
 - Visible/Hyperspectral
 - Infrared
 - RADAR
 - RF
- Data Applications:
 - Sustainability
 - Climate Change
 - Planet Health
 - Raw Materials
 - Mapping

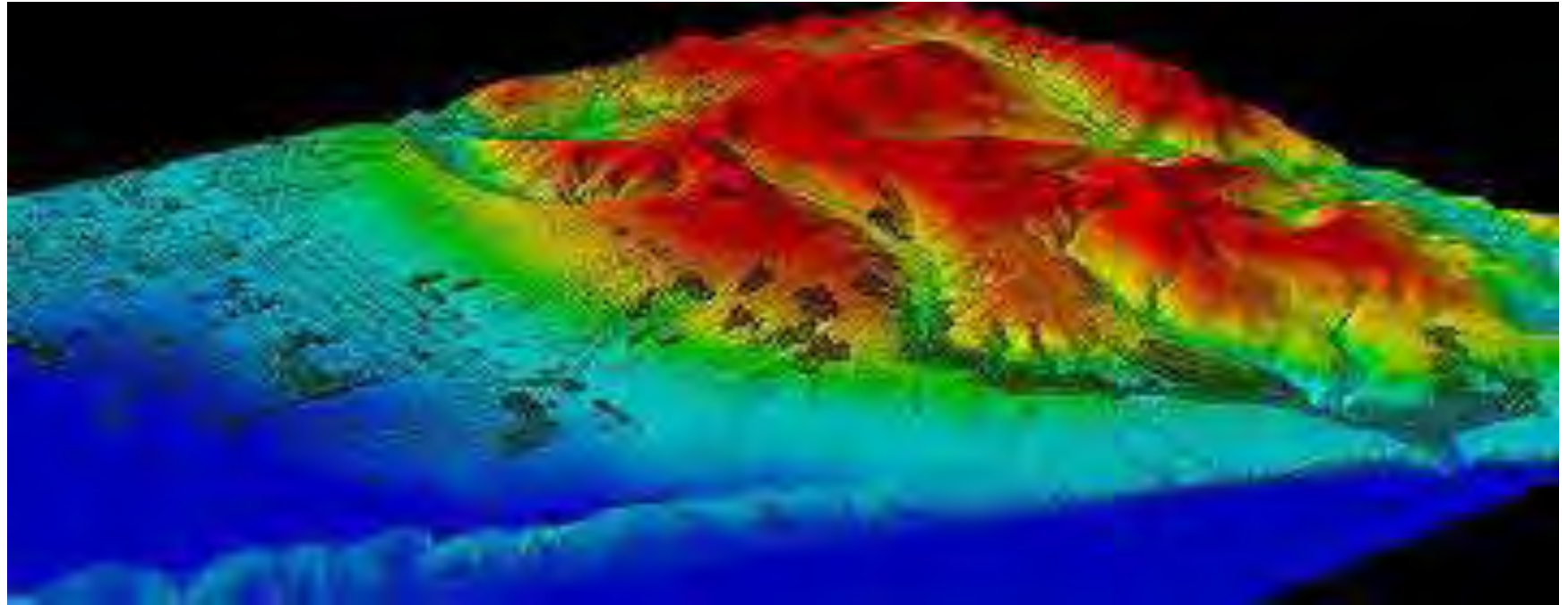


Image courtesy of NOAA



Examples of Flight Projects





Colloidal Stability – Procter & Gamble



- Phase separation is significant issue in the reduction of shelf life for consumer products (foods, cleansers, etc.)
- Sedimentation, driven by gravity, is not the only driver of phase separation

Why Space: Non-gravitational factors contribute to phase separation of colloids, but these factors can only be clearly studied in microgravity since sedimentation is nullified

Value Impact: Increased shelf life and formula stability of numerous, everyday household products



Droplet Formation – Delta Faucet

- Looking to understand droplet formation in microgravity (where surface forces can be isolated and studied) out of a patented shower head design
- How do you make less water feel like more due to droplet size and velocity?

***Why Space:** Space eliminates gravitational forces, making it easier to study how surface forces impact droplet formation out of a shower head, which can help improve future head design*

***Value Impact:** More efficient showering, ultimately helping water conservation (less water needed during shower) and energy conservation (less heat needed during shower)*





Concrete Mixing – Penn State & BASF



- Concrete is the single most widely used human-made material in the world (~10 billion tons/yr produced)
- Study mixing & solidification process of cement/water without the interference of gravity, how can this improve production efficiency?
- *Why Space: Space provides the long-term environment to isolate the impact of non-gravitational forces on concrete mixing*
- *Value Impact: Improve cement and concrete processing techniques, reduce carbon dioxide emissions during production, develop concrete with stronger material properties*



Hard to Wet Solids – Eli Lilly

- How do tablets dissolve in liquid without the interference of gravity?
- “Suspended” tablets can provide a better understanding of how solid interacts with surrounding liquid



Why Space: Microgravity allows to only examine the impact surface forces have on the dissolution of a tablet in a liquid and how that plays a role in the drug delivery process

Value Impact: Manufacturing of tablets which allow for more of the medicine to be absorbed by the body, and react more efficiently, leading to quicker and healthier recoveries by patients





Biofilm Thickness & Corrosion – ChampionX

- Microbiologically Influenced Corrosion (MIC) causes \$0.5-1.5T in damages and lost revenue annually, mostly in oil & gas industries
- Driving forces behind MIC risk: number of cells, total mass, and thickness of film
- The microgravity environment enables these factors to increase in biofilms
- Can determine if these thicker films lead to more corrosion in carbon steel

Why Space: Biofilms grow significantly faster and larger in microgravity, compared to what can be grown on Earth. This provides a much better platform to determine the extent of biofilm growth on surfaces

Value Impact: Reduction of damaged oil & gas pipelines, lessening the risk of leaks/spills, potentially saving billions of dollars in damages





Possible LEO Topics for the Cosmetic Sector





Possible LEO Topics for the Cosmetic Sector

- Formulations
 - Synthesis
 - Mixing
- Product Stability
 - Phase Separations
 - Active Agents
- Manufacturing
 - Self-assembled Peptides
 - Application of Coatings
 - Separations
- Raw Materials
 - Sustainability
 - Global Material Sources
- Biofilms
 - Rapid Growth
 - Product Contamination
- Packaging
 - Sustainable Packaging
 - Insulation
 - Flow Profiles
 - Container Design
 - Degradation



How Do You Engage?





Where to Start?

- Talk to us! Lucie.campagnolo@medes.fr Marie-Laure.gouzy@medes.fr
- You have an idea / project?
 - We work with you to consolidate your project and build a proposal
- You are not sure but are interested?
 - Secure a Keynote and Workshop at your headquarters / facility to work hands-on with your innovation team



Hardware – Service Providers





ZIN Technologies (USA)

- Mostly directed towards physical science payloads, acting as a NASA fluids and combustion hardware manager
- Support projects focused on:
 - Shelf Life & Product Stability
 - Mixing & Emulsifying
 - Separations
 - Interfacial Studies
 - Fluid Dynamics
 - Combustion



ICE Cubes (Belgium)

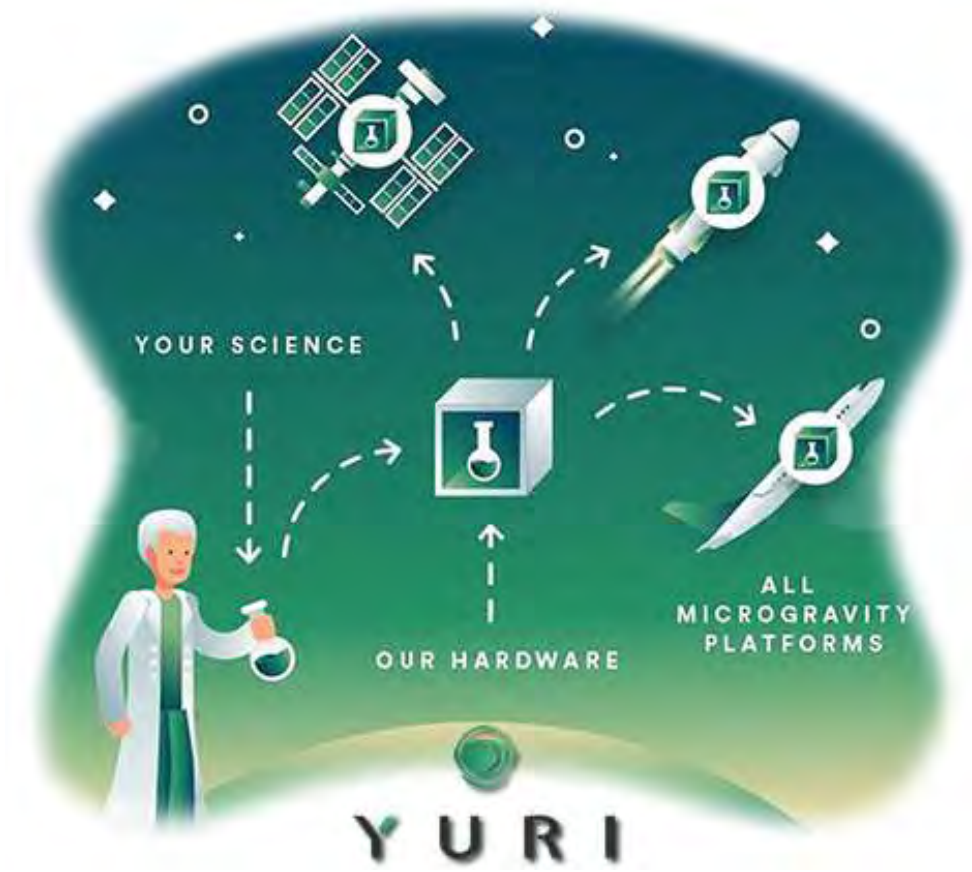
- Hardware designed for use by life sciences, food & beverage, material sciences, and Technology Readiness Level (TRL) demonstrations using their experiment cube
- Partner with yuri and Bioreactor
- Support projects focused on:
 - Microorganisms
 - Shelf Life & Product Stability
 - Mixing & Emulsifying
 - Interfacial Studies
 - Fluid Dynamics
 - Separations
 - Medical Devices





Yuri (Germany)

- General microgravity facility focused on life and material sciences
- Partners with ICE Cubes and LaMont
- Support projects focused on:
 - Crystallization
 - Shelf Life & Product Stability
 - Mixing & Emulsifying
 - Fluid Dynamics
 - Medical Devices





Bioreactor Express (Italy)

- Primarily life sciences based using miniaturized bioreactors for biotechnology, food & beverage, and fluids applications
- Support projects focused on:
 - Microorganisms
 - Shelf Life & Product Stability
 - Mixing & Emulsifying
 - Medical Devices





LaMont Aerospace (USA)

- Life and materials science research centered on their LaMont BioResearch Facility and centrifuge and now moving into more complex project work in the cell culture arena
- Partners with yuri and Bioreactor Express
- Supports projects focused on:
 - Crystallization
 - Microorganisms
 - Mixing & Emulsifying
 - Interfacial Studies
 - Shelf Life & Product Stability
 - Separations
 - Medical Devices





Techshot (USA)

- Primarily life science focused on complex payloads, with capability in 3D Bioprinting, tissue chip, cell culturing and stimulation, microorganisms, and bone densitometry
- Support projects focused on:
 - Crystallization
 - Shelf Life & Product Stability
 - Interfacial Studies
 - Mixing & Emulsifying
 - Fluid Dynamics
 - Separations
 - Medical Devices





panel discussion

DURATION ☀ 25'



Lucie Campagnolo

CNES / MEDES



Cynthia Bouthot

Space Commerce Matters



Nathalie Simonin

Cosmetic Valley



Mike Johanson

Zin Technologies



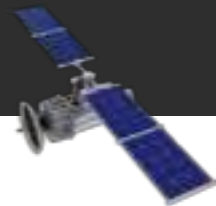
Matthew Lynch

P&G



Hilde Stenuit

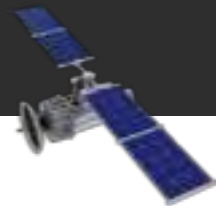
Space Application Services





Q&A

DURATION ☀ 20'





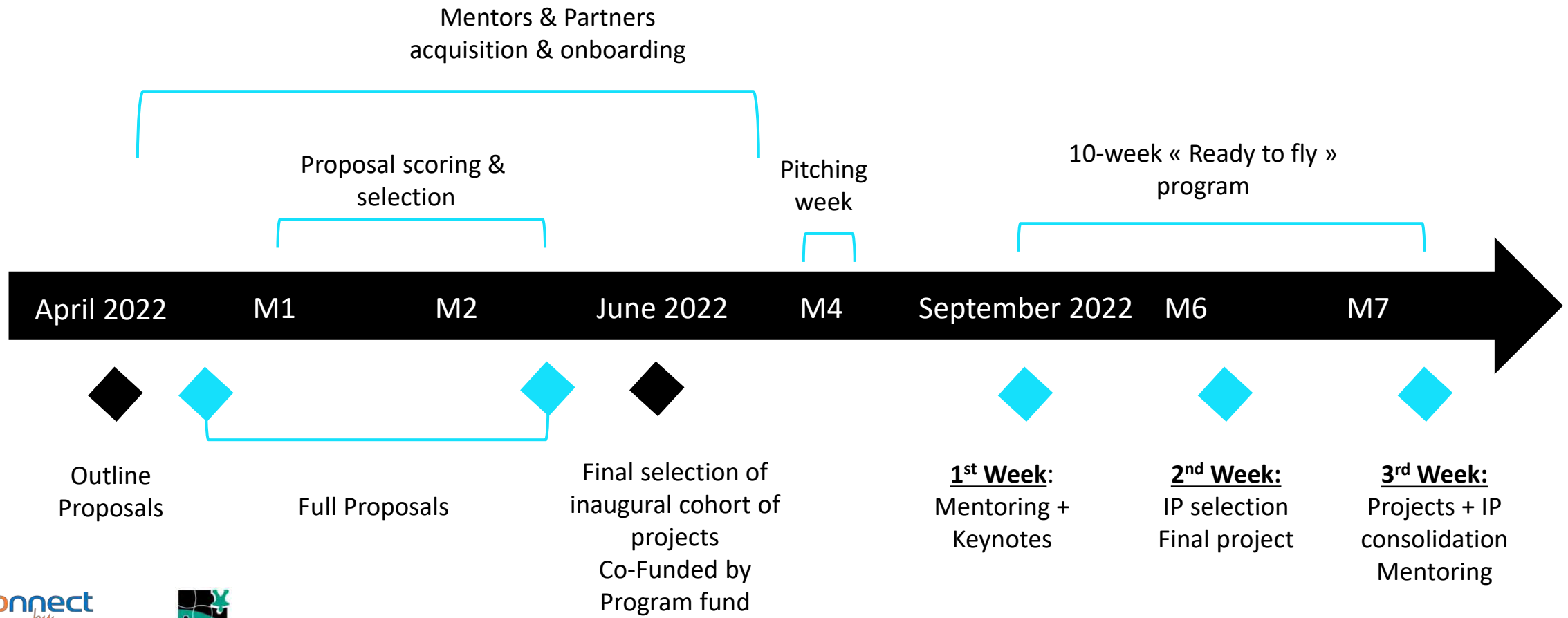
thank you



Appendix



Program Timeline





Possible LEO Topics for the Cosmetic Sector

- Formulations
 - What does the lack of convection, buoyancy, and sedimentation have on the synthesis of:
 - Active agents
 - Emulsions
 - Gels
 - Aerosols
 - Other Colloids
 - Additives
 - How do ingredients mix differently in microgravity?
 - Can apply to various phases
 - Solid/Liquid/Gases
 - Singular and multiphase mixtures



Possible LEO Topics for the Cosmetic Sector

- Product Stability
 - In addition to sedimentation, are there any other forces at play that contribute to phase separation of products? On both a macro and microscale?
 - How do these forces affect the performance of active agents?
 - Can microgravity help form a more stable emulsion of a cream or ointment?
- Manufacturing
 - Can optimal crystalline structures & multilayered materials be manufactured with gravitational forces being suppressed?
 - How do peptides used in making cosmetic products self-assemble without interference from gravity?
 - How does a surface tension dominant environment (microgravity) affect the application of coatings to products or products to a surface (i.e., make-up on skin)?
 - Can a better separation process be developed to purify a liquid with the knowledge of how things behave without sedimentation, convection, and buoyancy?



Possible LEO Topics for the Cosmetic Sector

- Raw Materials
 - Use the vantage point of LEO to develop remote sensing opportunities that help better identify sources of raw materials on ground:
 - Oils extracted from various plants/crops
 - Minerals
 - Butters from trees
 - What are other areas that could possibly contain or produce these raw materials based on soil characteristics, climate, etc.?
- Biofilms
 - How does significantly accelerated biofilm growth in microgravity compared to ground help determine the severity that biofilms have on the surfaces they impact?
 - In what ways do rapidly growing biofilms contaminate a product?



Possible LEO Topics for the Cosmetic Sector

- Packaging
 - Sustainable Packaging
 - Formulate novel packaging materials in microgravity that are more sustainable and less harmful to the environment (i.e., plastics polluting the oceans)
 - Insulation
 - How does conduction solely drive the insulation performance of a packing material?
 - Flow Profiles
 - What are the differences in flow profiles within liquid dispensers in microgravity?
 - Container Design
 - How does mascara bind to the brush in only the presence of surface forces?
 - Degradation
 - Rapidly accelerate degradation of packaging material to learn about failure modes