

# SPACE AS DRIVER FOR INDUSTRIAL INNOVATION

## COMMERCIAL OPPORTUNITIES IN EXPLORATION

17-05-2022  
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# INTERNATIONAL SPACE STATION

European Columbus Module

408 km above Earth



A photograph of an astronaut in a white shirt working in a space station module. The astronaut is seen from the back, looking at a laptop screen. The environment is filled with complex equipment, cables, and a large circular window. The lighting is bright, highlighting the intricate details of the station's interior.

**MICROGRAVITY**

**GROUND-BREAKING RESEARCH**

- *Lack of buoyancy*
- *Lack of sedimentation*
- *Lack of phase separation*
- *Lack of hydrostatic pressure*
- *Containerless effect*

**1694 ESA Experiments**

GROUNDBREAKING

# DRIVER FOR INNOVATION

- ✓ **Improve your own products & processes**  
to increase competitiveness, customer satisfaction and revenue
- ✓ **Develop/manufacture new products**  
to increase market share, target new customer segments
- ✓ **Develop new space-based service(s)**  
to secure growth options in an emerging market, serving customers



# Agriculture and Food

- Crop science, management and monitoring
- Vertical farming / indoor agriculture
- Precision farming
- Cultured and plant-based meat
- Food product behaviour, shelf life
- Plant Nutrition and Health

***Increase Crop Yields***

***Produce More Tolerant Plants***

***Decrease Water Usage***

***Decrease Chemical Usage***

***Prevent Catastrophic Crop Losses***

***Decrease Land Use for Animal Farming***

Source: BSGN Life Science Accelerator by Space Cooperative Europe



# Life Sciences, Health, Pharma

- Immune System
- Genetics
- Oncology
- Infectious diseases
- Respiratory diseases
- Vaccine Development
- 3D Tissue Engineering

***Drug Discovery***  
***Drug Development***  
***Drug Delivery***  
***Biomanufacturing***



Source: BSGN Life Science Accelerator by MEDES



# Materials and Manufacturing

- Structural composites for aerospace, automotive, wind turbines
- 3D printing
- High temperature thermoplastics for electronics
- High performance PCBs
- Chips
- Specialty glass
- Advanced photovoltaic

***Improving material processing technologies***

***Increasing productivity in assembly***

***Shortening R&D cycles for complex products***

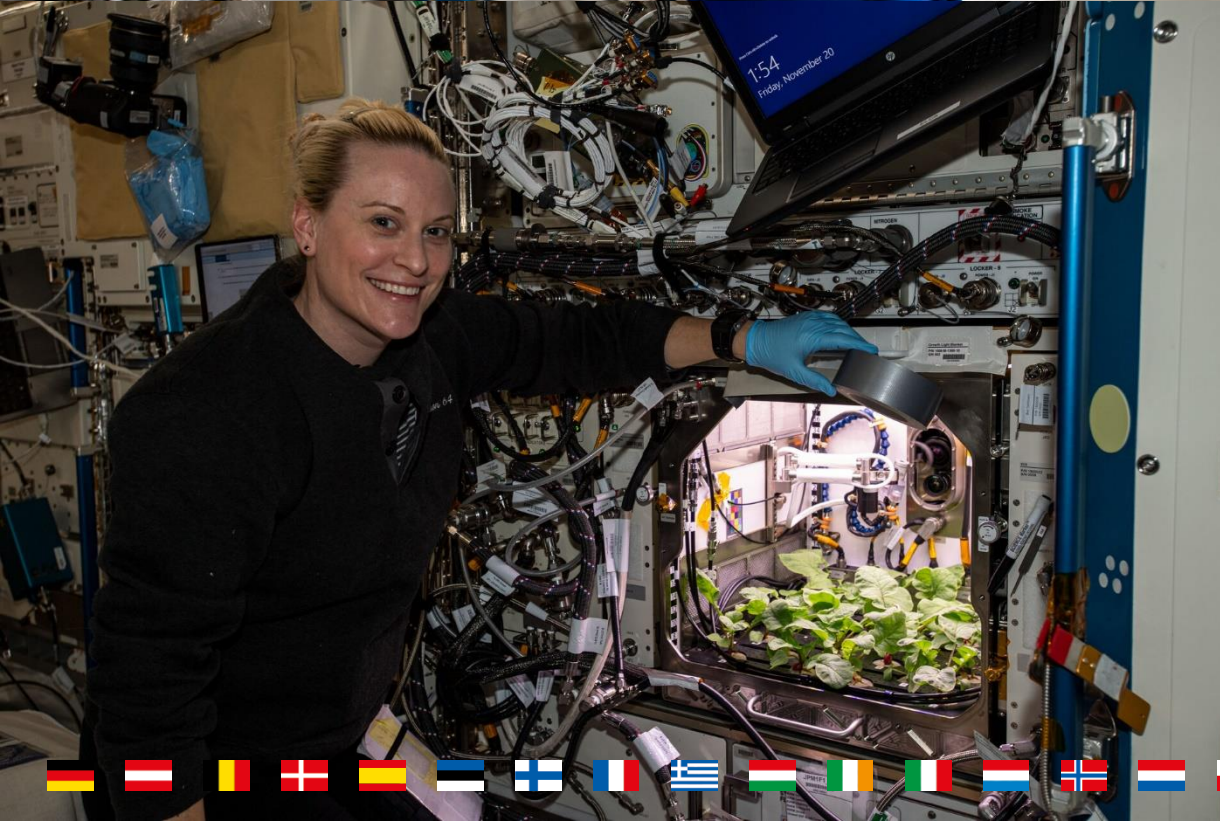
- Novel polymers and fibers
- Advanced ceramics
- Superalloys
- Thin film systems and coatings
- Nanomaterials



Source: BSGN Advanced Materials Accelerator by Catapult



# ICE CUBES SERVICE



1U (10x10x10)

From 50K €





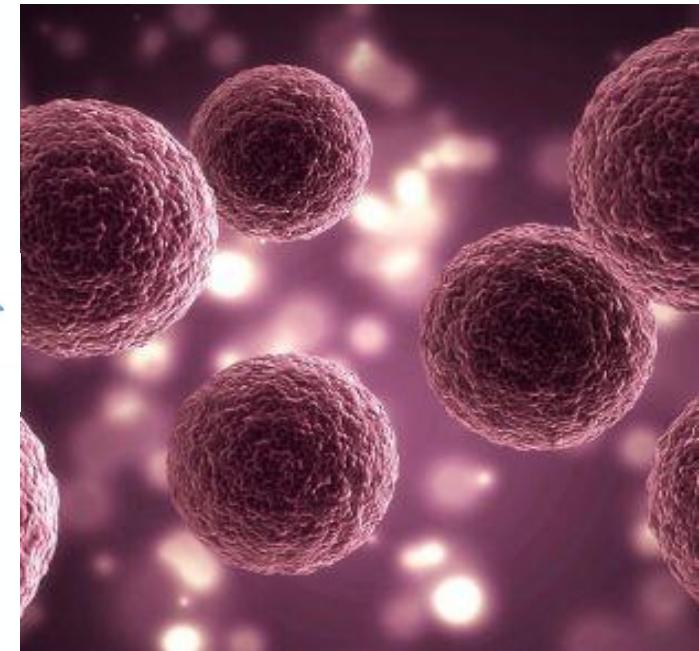


# M4PM PERSONALISED MEDICINE

Development of Personalized Medication and chemotherapeutic agents

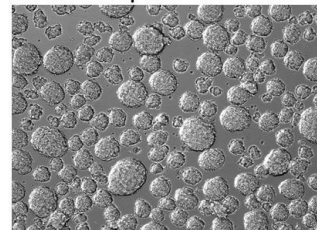
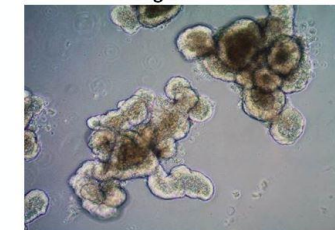
## Drug screening platform

- ✓ Easier formation of 3D cell cultures and 3D constructs than under gravity
- ✓ Increased size and quality of tumors, organoids and spheroids grown in space; less size variation
- ✓ Specific phenotypes relevant for in vitro disease modelling and development of personalized medicine which cannot be obtained under gravity
- ✓ Reduce necrotic cores
- ✓ 3D Tumors /Organoids/Spheroids grown in microgravity
- ✓ Research on 3D Tumors /Organoids/Spheroids growth



Organoids

Spheroids

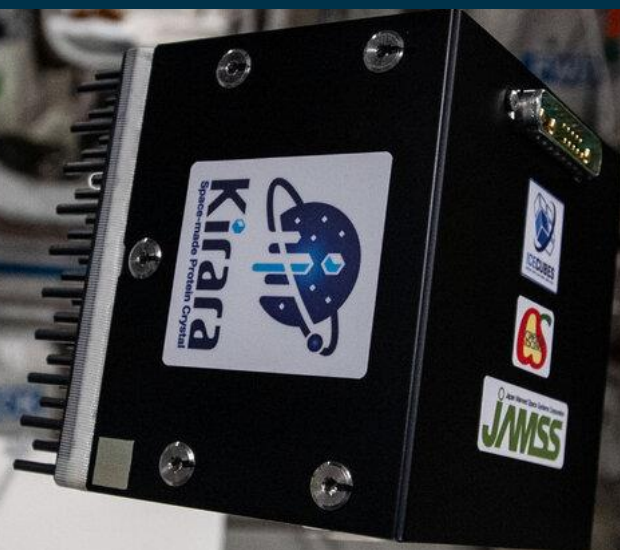


**JOIN THE COMMUNITY**





# KIRARA PROTEIN CRYSTALLIZATION



Inside ICE CUBES

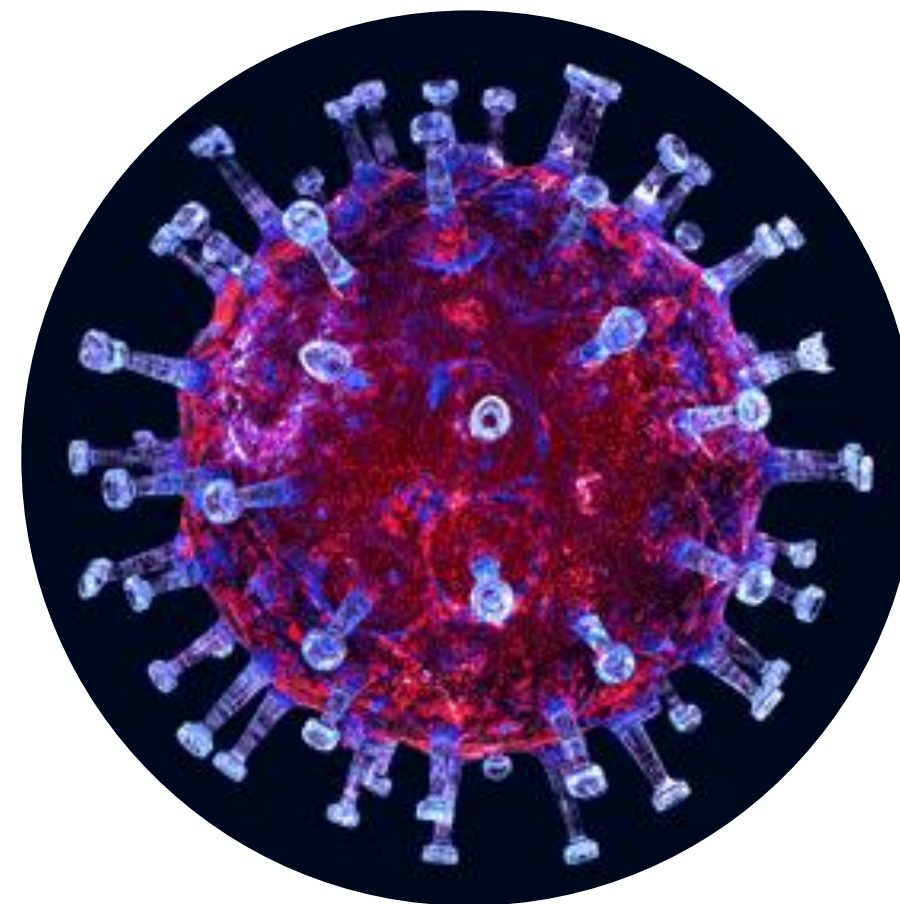




# COVID-19 RESEARCH

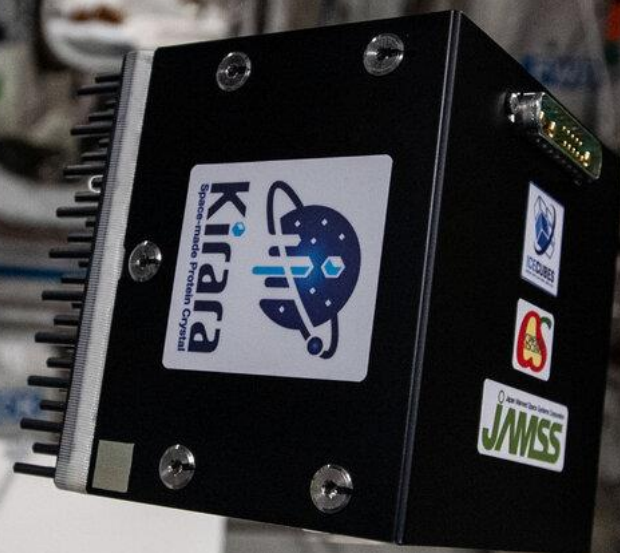
Investigates the potential effect of microgravity on the complex formation properties of Remdesivir and SBECD.

Better understanding of the remdesivir-SBECD formulation mechanism, which would allow to tailor the physico-chemical formulation process in order to reach elevated drug efficiency for COVID-19 treatment





# SPACE PHARMA



**Inside ICE CUBES**

**Lab-on-chip technology**





# 3D CULTURED MEAT

## Axiom-1 RAKIA - Cow cells orbit Earth for high steaks

Aleph Farms will be looking into the effects of microgravity on two basic processes responsible for muscle tissue formation. These processes include proliferation and differentiation of cow cells into the building blocks of our steak.

Understanding processes in such an extreme environment like space, will allow Aleph Farms to eventually develop an automated, closed-loop system that can produce steaks during long-term space missions. Similarly to car manufacturers and Formula One, in space the most efficient processes are being developed under the toughest environments. The processes being validated in space can then be transferred to their mainstream production on Earth to help increase efficiencies, and reduce environmental footprint. Aleph Farms' space program targets to help develop more sustainable and resilient food systems anywhere.

Source: <https://www.icecubesservice.com/journal/cow-cells-orbit-earth-for-high-steaks/>



SPACEPHARMA  
simply microgravity





# BIOREACTOR EXPRESS SERVICE



DECK

Thermal control

Centrifuge



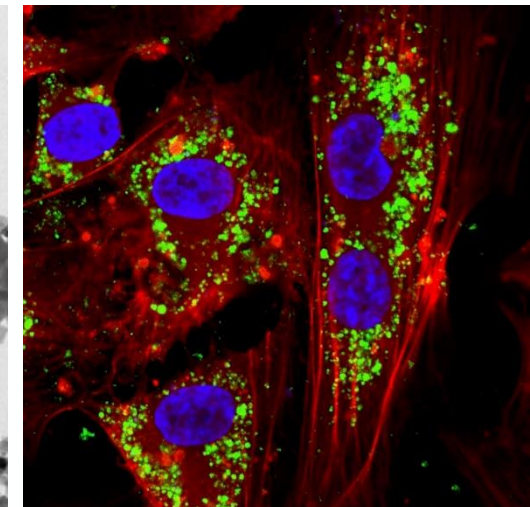
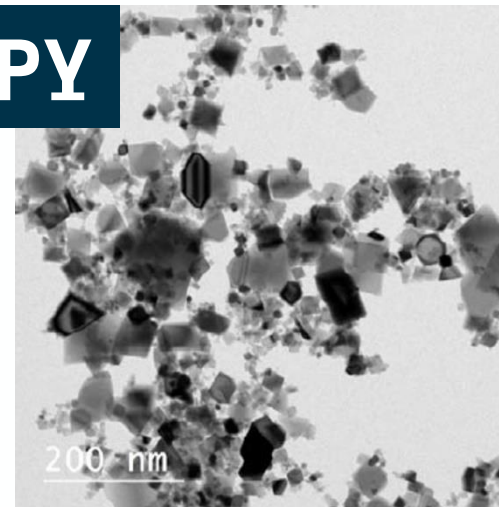


# NANOMEDICINE & IMMUNE THERAPY

Hybrid magnetic-polymeric nanoparticles for nano medicine and immune therapy.

Creating a nano-technology platform for the diagnosis and treatment of cancer and nervous system diseases. Using a combination of targeted and controlled drug delivery, hyperthermia and radiofrequency and laser imaging methods.

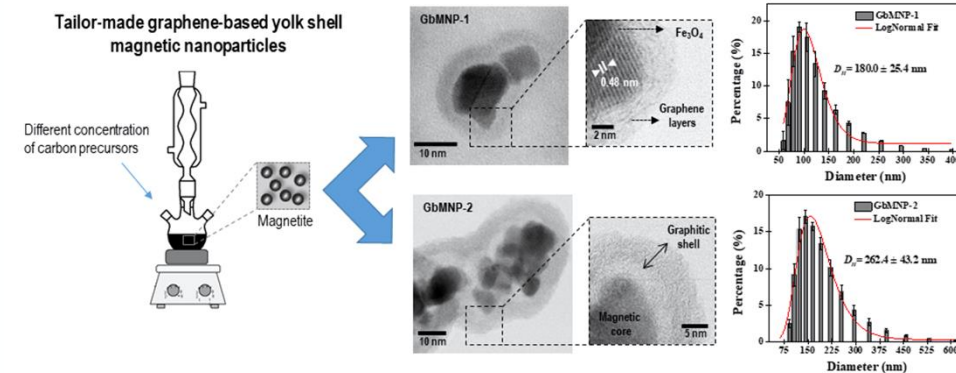
Expected to lead to different products, including a contrast agent, drug formulation, a cell therapy system and a portable and integrated medical device to produce the cell therapy system.



COLOROBBLIA



UNIVERSITÀ  
DEGLI STUDI  
FIRENZE

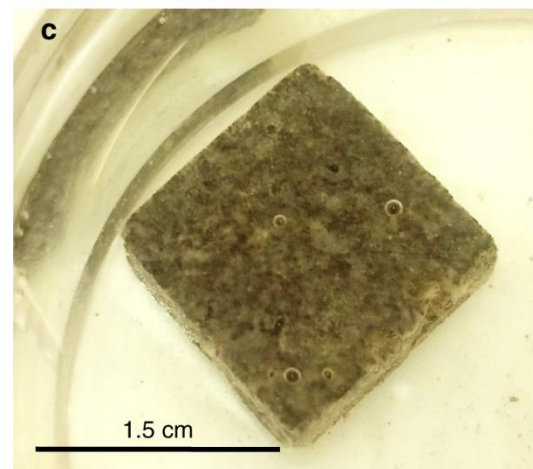
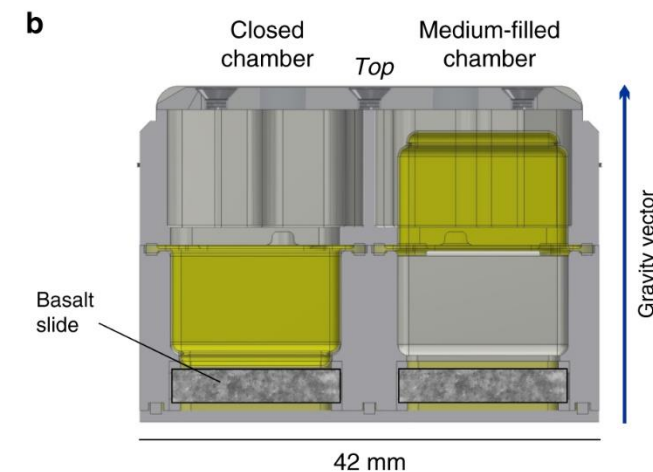
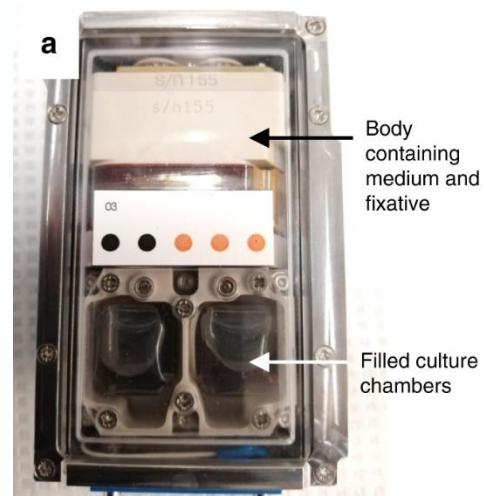




# BIOMINING IN SPACE

Biomining is an environmentally friendly and energy efficient way of **extracting useful elements** by using microbes to **break down rocks** to make soil or provide nutrients.

One major question is how these microbes attach to surfaces, or form biofilms, in space.



Watch full story: <https://www.youtube.com/watch?v=wr6gNLPR0q8>

Read more about Biomining and rare earth extraction in Nature <https://www.nature.com/articles/s41467-020-19276-w>





# BARTOLOMEO SERVICE

**100% Space**



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# FEELING LOST? FIND PARTNERS

Assemble the right team and selection of implementation partners to make your mission a success.

Use our [search and filters](#) to identify and contact partners.

From 2022 also financing, business, innovation, engineering and science partners.

## SERVICE CATEGORY

- Commercial Space Access (4)
- Ground Stations & Antennas (1)
- Labs & Testing Facilities (1)

## USE CASES

- In-Orbit Demonstration and Verification (2)
- In-Space Manufacturing (3)
- Mission Support Services (3)
- Research & Product Development (4)

## SPACE ENVIRONMENT

- Cosmic Radiation (1)
- Extreme Temperature (1)
- Microgravity (3)
- Space Resources (1)
- Vantage Point (2)

## INDUSTRIES

- Agriculture (2)
- Biotech (2)
- Education (3)
- Food (1)
- Manufacturing (2)
- Materials (3)
- Navigation (2)
- Resources (2)
- Space (3)
- Technology (4)

## PRICE RANGE IN EUR

- < 50.000 (2)
- < 250.000 (1)
- < 500.000 (1)
- upon request (2)

## PROJECT LEAD TIME

- < 1 month (1)
- < 12 months (3)
- < 18 months (1)
- < 3 months (1)



### Bioreactor Express Service

Bioreactor Express is a service which aims to establish an "express" way to perform scientific and/or technological experiments on board the International Space Station (ISS).

[Read more >](#)



### ICE Cubes Service

ICE Cubes Service is a simple and cost-effective way for your experiment or technology to fly onboard the International Space Station

[Read more >](#)



### Bartolomeo

EASY ACCESS TO LOW-EARTH ORBIT  
The Bartolomeo platform, attached to the European Columbus Module of the International Space Station (ISS). [...]

[Read more >](#)



### ESA Materials & Electrical Components Laboratory

Made up of more than 20 dedicated experimental facilities and hundreds of instruments overall, ESA's Materials & Electrical Components Laboratory guarantees an [...]

[Read more >](#)



### Goonhilly Deep Space Communication

Goonhilly now has the capability to support the exploration of Lunar and Deep Space for institutions and private enterprise. Modifications [...]

[Read more >](#)



### Lunar Pathfinder

The Lunar Pathfinder spacecraft is designed to provide affordable communications services to lunar missions via S-band and UHF links to [...]

[Read more >](#)

