# Researchers launch miniature lab to produce sustainable resources in space



A team of researchers from Imperial College London, Cranfield University, and space technology firms Frontier Space and ATMOS Space Cargo has launched a pioneering miniature laboratory into Earth’s orbit to investigate sustainable resource production in space. The mission commenced on 21 April 2025, marking Europe’s first commercial returnable spacecraft mission aboard Phoenix, which was delivered via SpaceX.

The laboratory contains genetically engineered microbes capable of producing proteins and various essential materials including pharmaceuticals, fuels, and bioplastics. These microbes will be studied to assess their ability to synthesise such resources in the unique environment of microgravity. Upon completion of the mission, the specimens will be returned to Earth for detailed analysis to better understand how factors such as microgravity, extended storage, and space transportation influence their productivity.

The pressing need for efficient food and resource production in space underpins this mission, as human space exploration activities are expanding. The logistical and financial burdens of transporting food, water, and fuels to space are substantial; Imperial College researchers estimate that sustaining a single astronaut’s food requirements could cost as much as £20,000 per day. Engineered yeasts capable of precision fermentation may offer a viable alternative by producing critical supplies locally, thus addressing these challenges.

Dr. Rodrigo Ledesma-Amaro of Imperial College London, who leads the project from the Department of Bioengineering, emphasised the significance of the collaboration between academic institutions and industry partners in overcoming the challenges of space travel. He stated, “If just a handful of cultivated cells could provide all our food, pharmaceuticals, fuels, and bioplastics using freely available resources, that would bring the future closer.” Dr. Ledesma-Amaro’s work builds upon his research at Imperial’s Bezos Centre for Sustainable Protein and Microbial Food Hub, where his efforts focus on creating sustainable, nutritious, and affordable non-animal foods for consumption on Earth.

A crucial component of the mission is the innovative SpaceLab Mark 1—a compact, “lab-in-a-box” platform developed by Frontier Space. This technology enables sophisticated biological experiments to be conducted in microgravity, effectively overcoming numerous traditional obstacles to conducting space-based scientific research.

Beyond the immediate scope of food production, the experiment holds promise for advancing space-based manufacturing, pharmaceutical research, and supporting long-duration space missions. This development aligns with growing international interest, including prior studies by the European Space Agency (ESA) and SpaceX, in producing proteins and meat alternatives using bioreactors and other biotechnological techniques in space environments.

Aqeel Shamsul, CEO of Frontier Space, reflected on the mission’s broader implications for the space research community. He said, “This mission represents a major milestone in democratizing access to space research. Our technology will help mature bio-experimentation solutions for future space environments, including the infrastructure that will follow the International Space Station.”

The success of this experiment could represent a significant step forward in evolving sustainable space exploration technologies and build a foundation for scalable bio-manufacturing beyond Earth’s atmosphere.

Source: [Noah Wire Services](https://www.noahwire.com)

## References

* <https://www.imperial.ac.uk/news/263213/first-microbes-blast-testing-production-food> - Confirms the launch of a miniature laboratory into Earth's orbit with genetically engineered microbes designed to produce edible proteins and other essential materials like pharmaceuticals and fuels, marking a significant event in space-based resource production, led by Imperial College London and partners.
* <https://www.proteinproductiontechnology.com/post/imperial-scientists-launch-microbe-lab-to-test-food-production-in-space> - Details the collaboration between Imperial College London, Cranfield University, Frontier Space, and ATMOS Space Cargo, and the mission's launch aboard a SpaceX rocket on 21 April 2025. It also explains the goals to test yeast strains for producing proteins, bioplastics, pharmaceuticals, and fuel in microgravity.
* <https://vegconomist.com/ingredients/space-mission-explores-microbe-based-precision-fermentation-solve-astronaut-food-challenges/> - Provides information on the mission's context as Europe’s first commercial returnable spacecraft mission aboard Phoenix via SpaceX, emphasizing the precision fermentation approach to produce critical supplies in space.
* <https://www.zmescience.com/future/yeast-space-food-experiment/> - Describes the use of genetically engineered yeast microbes to produce edible proteins in the microgravity environment, highlighting the experiment's aim to investigate sustainable food production in space.
* <https://frontierspace.com/space-lab/> - Explains Frontier Space's development of the SpaceLab Mark 1, the compact 'lab-in-a-box' technology used for carrying out sophisticated biological experiments in microgravity during the mission.