TROY TECHNICAL

SPACE INDUSTRY
WEEKLY REPORT

October 31 - November 6, 2026 | Issue 2026-W44

Mission evidence, launch economics, resilient supply and regulatory access

10	10
ANALYZED ARTICLES	PRIORITY THEMES

Issued 2026-11-06 | English edition | fixed approved cover artwork



Space Industry: the boundary moved from isolated claims to qualification evidence

10 English articles were reviewed independently from the Japanese edition. Ten themes are retained for management decisions.

SIGNAL 01 | COMPONENTS

CTIS Imaging: UniSQ's Spacecraft Re-entry Breakthrough 2026

A University of Southern Queensland (UniSQ) researcher has achieved a world-first by capturing the breakup of spacecraft during atmospheric re-entry using a custom-built computed tomographic imaging spectrometer (CTIS).

SIGNAL 02 | SPACECRAFT

Project Suncatcher: Google's first orbital TPU AI response

Google has successfully received the first AI response from a data-center class TPU operating in orbit via its Project Suncatcher prototype satellite.

SIGNAL 03 | LAUNCH

Spirulina Cultivation: ISS Proof-of-Concept for Partial Gravity

Attached cultivation of Arthrospira platensis (Spirulina) was successfully demonstrated aboard the International Space Station under microgravity, 1/6G, and 1G conditions.

SIGNAL 04 | ON-ORBIT SERVICE

China Space Station: Record 9.7 picokelvin temperature achieved

Chinese scientists have cooled rubidium atoms to 9.7 picokelvin aboard the Chinese space station, the coldest artificial substance ever created.

DECISION

Focus this week's management attention on mission evidence, launch economics, resilient supply and regulatory access. Move only when the linked evidence can be reproduced under your own operating conditions.

THREE MANAGEMENT MOVES

1. Buyers: separate announced missions from funded, licensed, launched and operational capability.
2. Suppliers: qualify components and services against mission environment, traceability and cadence.
3. Executives: track funding, licensing, launch date, on-orbit performance, capacity and insurance.

EVIDENCE DISCIPLINE

FACT states what the collected English source reports. BUSINESS READ and ACTION are editorial interpretations. UNKNOWN lists information that the source file does not establish. A linked article is not treated as independent confirmation of every claim.

Five numbers or evidence anchors that require conditions

6G
A05

SOURCE-BOUND CONDITION
Attached cultivation of Arthrospira platensis (Spirulina) was successfully demonstrated aboard the International Space Station under microgravity, 1/6G, and 1G conditions.

99%
A06

SOURCE-BOUND CONDITION
Researchers successfully demonstrated extrusion-based bioprinting of microalgae-laden hydrogels during parabolic flights, achieving cell viability of 99% for Scenedesmus sp.

19 years
A04

SOURCE-BOUND CONDITION
Kyutech and JAXA have developed a CNN-based system to automatically detect surface charging on satellites, analyzing 19 years of observation data to identify approximately 3,000 events.

P04
A01

SOURCE-BOUND CONDITION
Chinese scientists have cooled rubidium atoms to 9.7 picokelvin aboard the Chinese space station, the coldest artificial substance ever created.

P05
A10

SOURCE-BOUND CONDITION
Research using the Murchison meteorite demonstrates that solar wind simulation via helium ion irradiation selectively degrades aliphatic hydrocarbons while aromatic hydrocarbons remain relatively resistant.

HOW TO USE THESE NUMBERS
Each value is shown with the condition stated in the collected English article. Do not compare values across different test methods, device sizes, operating temperatures or commercial stages without normalizing those conditions.

Where the value chain moved

Each stage combines one leading theme and one supporting theme. The report treats handoffs as evidence transfers, not decorative arrows.

1

Components

P01/P06

A University of Southern Queensland (UniSQ) researcher has achieved a world-first by capturing the breakup of spacecraft.

2

Spacecraft

P02/P07

Google has successfull y received the first AI response from a data-center class TPU operating in orbit via its Project.

3

Launch

P03/P08

Attached cultivation of Arthrospira platensis (Spirulina) was successfully demonstrated aboard the International Space.

4

On-orbit service

P04/P09

Chinese scientists have cooled rubidium atoms to 9.7 picokelvin aboard the Chinese space station, the coldest artificial.

5

Downstream market

P05/P10

Research using the Murchison meteorite demonstrates that solar wind simulation via helium ion irradiation selectively.

EVIDENCE REQUIRED AT EACH HANDOFF

Components to Spacecraft	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.
Spacecraft to Launch	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.
Launch to On-orbit service	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.
On-orbit service to Downstream market	Transfer test conditions, acceptance criteria, failure data, owner and decision date. Recheck funding, licensing, launch date, on-orbit performance, capacity and insurance.

COMMON CONTROL POINT

No theme moves to a commercial commitment until a named owner has reproduced the relevant evidence and documented funding, licensing, launch date, on-orbit performance, capacity and insurance.

Priority map: maturity and next decision locus



P01	CTIS Imaging: UniSQ's Spacecraft Re-entry Breakthrough 2026 Tech / process | cue: no system/business cue
P02	Project Suncatcher: Google's first orbital TPU AI response System / adoption | cue: system
P03	Spirulina Cultivation: ISS Proof-of-Concept for Partial Gravity Tech / process | cue: no system/business cue
P04	China Space Station: Record 9.7 picokelvin temperature achieved System / adoption | cue: platform
P05	Murchison Meteorite: Solar Wind Impact on Organic Matter 2026 Tech / process | cue: no system/business cue
P06	Extrusion Bioprinting: Microgravity Process and Algal Efficiency Tech / process | cue: no system/business cue
P07	Apollo Seismic Data: 2D Mechanical Heterogeneity of Lunar Subsurface Tech / process | cue: no system/business cue
P08	Tiangong Space Station: Material and Biological Exposure Results System / adoption | cue: platform
P09	Kyutech and JAXA: AI-based Satellite Charging Detection Method System / adoption | cue: system
P10	China's Space Station: First Remote Laser Cutting Test for Maintenance Tech / process | cue: no system/business cue

REPRODUCIBLE POSITIONING RULE

Horizontal position uses five discrete stages: Research, Prototype, Joint evaluation, Product adoption and Scale. The vertical bands classify the next decision locus: Tech / process, System / adoption, or Business / rules (including supply systems). Article-title cues take precedence; the overview is used only when the title is silent. These are categories, not impact ranks. Bubble diameter reflects the editorial score.

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P01 CTIS Imaging: UniSQ's Spacecraft Re-entry Breakthrough 2026

A02 | Components | Research

2026-11-06

FACT

A University of Southern Queensland (UniSQ) researcher has achieved a world-first by capturing the breakup of spacecraft during atmospheric re-entry using a custom-built computed tomographic imaging spectrometer (CTIS). The data, collected during the KREPE-3 mission, provides critical insights into material behavior under extreme thermal and aerodynamic stress.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P01.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

P02 Project Suncatcher: Google's first orbital TPU AI response

A08 | Spacecraft | Joint evaluation

2026-11-02

FACT

Google has successfully received the first AI response from a data-center class TPU operating in orbit via its Project Suncatcher prototype satellite. The system executed prompts using the Gemma 4 open model, marking a "Hello World" milestone for space-based AI processing. This achievement validates the feasibility of utilizing orbital solar energy to power large-scale AI workloads.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P02.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 3/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P03 Spirulina Cultivation: ISS Proof-of-Concept for Partial Gravity

A05 | Launch | Product adoption

2026-10-29

FACT

Attached cultivation of Arthrospira platensis (Spirulina) was successfully demonstrated aboard the International Space Station under microgravity, 1/6G, and 1G conditions. The study confirmed that this method prevents medium floating and cell detachment, proving the feasibility of space-based microalgal production.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P03.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 4/5 | DECISION LOCUS: TECH / PROCESS

P04 China Space Station: Record 9.7 picokelvin temperature achieved

A01 | On-orbit service | Research

2026-11-06

FACT

Chinese scientists have cooled rubidium atoms to 9.7 picokelvin aboard the Chinese space station, the coldest artificial substance ever created. This achievement extends observation times to seven seconds, providing a high-precision platform for quantum simulation and dark matter detection.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P04.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 20/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P05 Murchison Meteorite: Solar Wind Impact on Organic Matter 2026

A10 | Downstream market | Research

2026-11-03

FACT

Research using the Murchison meteorite demonstrates that solar wind simulation via helium ion irradiation selectively degrades aliphatic hydrocarbons while aromatic hydrocarbons remain relatively resistant. This finding provides a framework for interpreting the chemical evolution of C-type asteroid surfaces and analyzing returned samples from Ryugu and Bennu.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P05.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: TECH / PROCESS

P06 Extrusion Bioprinting: Microgravity Process and Algal Efficiency

A06 | Components | Pilot

2026-10-30

FACT

Researchers successfully demonstrated extrusion-based bioprinting of microalgae-laden hydrogels during parabolic flights, achieving cell viability of 99% for Scenedesmus sp. and 97% for Chlorella vulgaris. The study confirms that photosynthetic performance remains stable across gravitational phases, validating the feasibility of "green" bioprinting for in-space biofabrication.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P06.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P07 Apollo Seismic Data: 2D Mechanical Heterogeneity of Lunar Subsurface

A07 | Spacecraft | Pilot

2026-11-03

FACT

Researchers analyzed active seismic experiment (ASE) data from Apollo 14 and 16 to resolve the 2D S-wave velocity (\(V_{s}\)) structure of the shallow lunar subsurface. By employing seismic interferometry and CWT-MASW, the study identifies spatial variations in mechanical properties along the Apollo 16 profile.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P07.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

P08 Tiangong Space Station: Material and Biological Exposure Results

A09 | Launch | Research

2026-11-04

FACT

China has achieved original results in material stability and biological radiation tolerance using the Tiangong space station's extravehicular exposure platform. These findings provide critical data for lunar construction and deep-space exploration, with applications extending to high-end ground equipment.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P08.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 1/5 | DECISION LOCUS: SYSTEM / ADOPTION

FACT is source-bound. BUSINESS READ, ACTION and UNKNOWN are explicit editorial layers.

P09 Kyutech and JAXA: AI-based Satellite Charging Detection Method

A04 | On-orbit service | Pilot

2026-11-02

FACT

Kyutech and JAXA have developed a CNN-based system to automatically detect surface charging on satellites, analyzing 19 years of observation data to identify approximately 3,000 events. This technology clarifies the dynamic balance between high-energy electrons and ionospheric plasma, providing a foundation for reducing operational risks and improving satellite durability.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P09.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: SYSTEM / ADOPTION

P10 China's Space Station: First Remote Laser Cutting Test for Maintenance

A03 | Downstream market | Pilot

2026-11-05

FACT

China has successfully conducted the world's first remote-operated laser precision cutting experiment outside a space station in an extreme environment. Developed by Huazhong University of Science and Technology and the Shanghai Space Power Institute, this capability enables micron-level "minimally invasive" repairs from Earth.

WHY IT MATTERS

The decision relevance is mission evidence, launch economics, resilient supply and regulatory access. The signal should be tested at the application and operating-system level, not accepted from a headline alone.

BUSINESS READ

For operating companies, compare the reported change with current qualification, sourcing and product-roadmap assumptions. For suppliers, qualify components and services against mission environment, traceability and cadence.

ACTION

Within 30 days, separate announced missions from funded, licensed, launched and operational capability; record the evidence and owner against P10.

UNKNOWN

Still unproven or incompletely stated: funding, licensing, launch date, on-orbit performance, capacity and insurance.

EDITORIAL SCORE 19/25 | MATURITY 2/5 | DECISION LOCUS: TECH / PROCESS

Playbook and 0-5 year roadmap

STAKEHOLDER	NOW | 0-30 DAYS	NEXT | 1-12 MONTHS	LATER | 1-5 YEARS
Operating companies	separate announced missions from funded, licensed, launched and operational capability	Run production-like qualification with explicit acceptance and stop criteria.	Build a portfolio and architecture that can absorb technology and supplier changes.
Materials, equipment and technology suppliers	qualify components and services against mission environment, traceability and cadence	Create shared reliability, process-window and failure-analysis data with customers.	Standardize interfaces, traceability, lifecycle support and recovery services.
Trading, investment and legal teams	Map funding, licensing, launch date, on-orbit performance, capacity and insurance.	Contract for capacity, quality, change notice, liability, alternatives and exit.	Diversify regional, technical and customer concentration risk.

ROADMAP

NOW | 0-30 DAYS
Evidence ledger
Owner: Strategy + quality
Deliverable: claim, source, condition, owner

NOW | 0-30 DAYS
Risk screen
Owner: Procurement + legal
Deliverable: unknowns, alternatives, stop

NEXT | 1-12 MONTHS
Joint qualification
Owner: R&D + supplier
Deliverable: process window and failure data

NEXT | 1-12 MONTHS
Commercial gate
Owner: Business + finance
Deliverable: unit economics and capacity

LATER | 1-5 YEARS
Platform strategy
Owner: Executive team
Deliverable: portfolio and interface roadmap

LATER | 1-5 YEARS
Service layer
Owner: Operations + channel
Deliverable: monitoring, maintenance and recovery

GO / NO-GO GATES

GATE	OWNER	REQUIRED EVIDENCE	NO-GO CONDITION
G1 Evidence	**Quality**	Source, test conditions and reproducibility	No traceable evidence
G2 Integration	**R&D**	Interface, process window and failure analysis	Cannot meet system conditions
G3 Commercial	**Business**	Capacity, total cost, contract and alternatives	Economics or supply cannot be supported
G4 Lifecycle	**Operations**	Monitoring, maintenance, change notice and exit	No accountable operating plan

ANALYZED ARTICLES | ITEMS 01-10

Every title and URL is displayed in full. URLs wrap without shortening and remain clickable. A verified-reference label means the translated HTML did not retain its original source URL.

ID	FULL ARTICLE TITLE	FULL SOURCE / VERIFIED REFERENCE URL - CLICKABLE
A01	China Space Station: Record 9.7 picokelvin temperature achieved	https://english.news.cn/20261106/b1e05437fb304f60bf51fc68299dfd4f/c.html
A02	CTIS Imaging: UniSQ's Spacecraft Re-entry Breakthrough 2026	https://www.australianmanufacturing.com.au/australian-researcher-achieves-spacecraft-re-entry-imaging-breakthrough/
A03	China's Space Station: First Remote Laser Cutting Test for Maintenance	https://view.inews.qq.com/a/20261105A03M4X00
A04	Kyutech and JAXA: AI-based Satellite Charging Detection Method	https://plus-web3.com/media/latestnews_1000_11260/
A05	Spirulina Cultivation: ISS Proof-of-Concept for Partial Gravity	https://doi.org/10.64898/2026.10.27.762075
A06	Extrusion Bioprinting: Microgravity Process and Algal Efficiency	https://doi.org/10.1038/s41526-026-00669-y
A07	Apollo Seismic Data: 2D Mechanical Heterogeneity of Lunar Subsurface	https://doi.org/10.21203/rs.3.rs-11391753/v1
A08	Project Suncatcher: Google's first orbital TPU AI response	https://www.itmedia.co.jp/news/article/2611/02/2000002779/
A09	Tiangong Space Station: Material and Biological Exposure Results	https://global.chinadaily.com.cn/a/202611/04/WS6aeb1a9ae4b0aac4cf1ee354.html
A10	Murchison Meteorite: Solar Wind Impact on Organic Matter 2026	https://zaikei.co.jp/article/20261103/875955.html

SpaceIndustry — Selected Articles

Date: 2026-11-08

Articles: 10

Table of Contents

#01 China Space Station: Record 9.7 picokelvin temperature achieved

#02 CTIS Imaging: UniSQ's Spacecraft Re-entry Breakthrough 2026

#03 China's Space Station: First Remote Laser Cutting Test for Maintenance

#04 Kyutech and JAXA: AI-based Satellite Charging Detection Method

#05 Spirulina Cultivation: ISS Proof-of-Concept for Partial Gravity

#06 Extrusion Bioprinting: Microgravity Process and Algal Efficiency

#07 Apollo Seismic Data: 2D Mechanical Heterogeneity of Lunar Subsurface

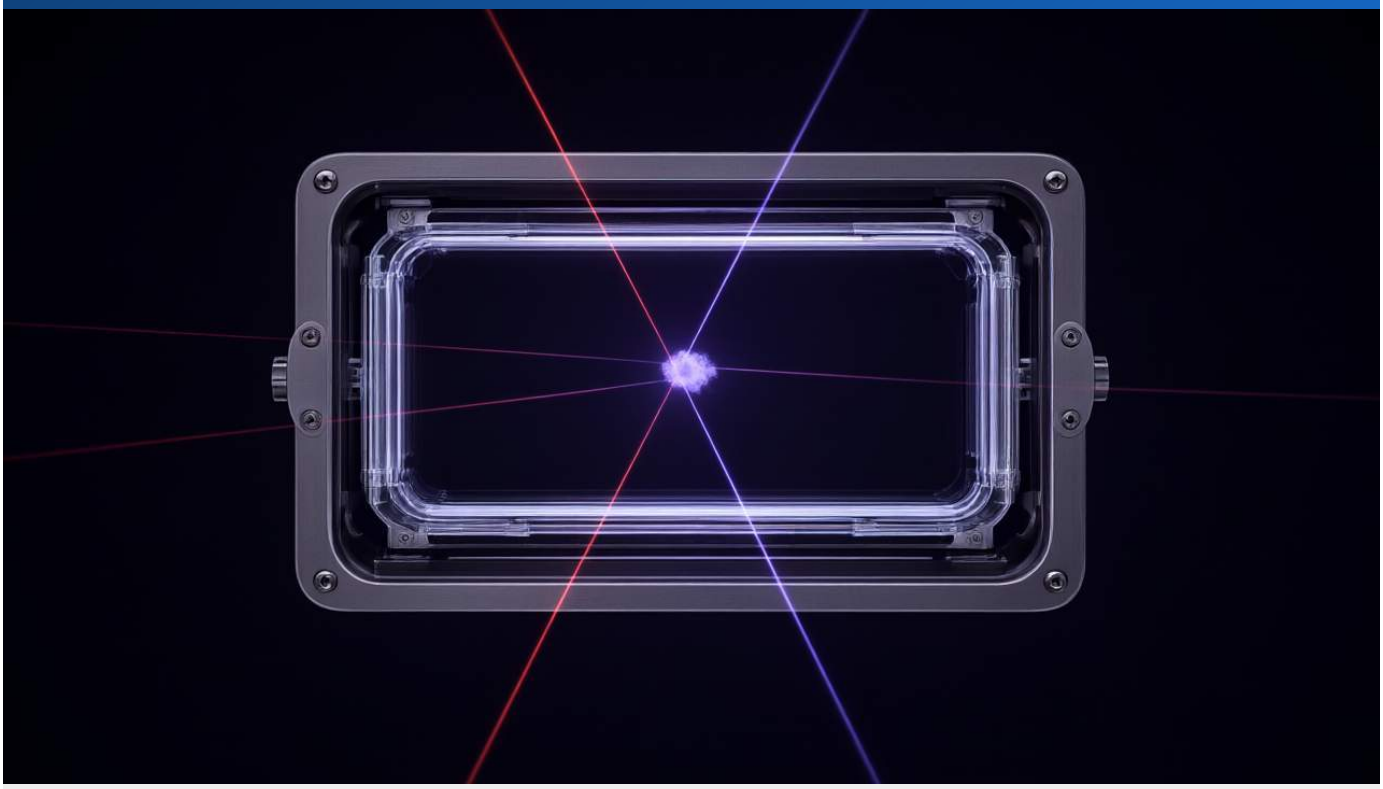
#08 Project Suncatcher: Google's first orbital TPU AI response

#09 Tiangong Space Station: Material and Biological Exposure Results

#10 Murchison Meteorite: Solar Wind Impact on Organic Matter 2026

#01 China Space Station: Record 9.7 picokelvin temperature achieved

Published November 06, 2026 Xinhua China



OVERVIEW

Chinese scientists have cooled rubidium atoms to 9.7 picokelvin aboard the Chinese space station, the coldest artificial substance ever created. This achievement extends observation times to seven seconds, providing a high-precision platform for quantum simulation and dark matter detection.

IN DEPTH

Key Findings

Researchers from the Chinese Academy of Sciences (CAS), Peking University, and the Shanghai Institute of Optics and Fine Mechanics (SIOM) have set a new world record for the coldest temperature ever achieved by humans. By cooling a cloud of rubidium atoms to 9.7 picokelvin, the team surpassed the previous record of 38 picokelvin set by a German team in 2021. The atoms remained stable for observation for seven seconds, a significant increase over the roughly 1 second possible on the International Space Station and 0.05 seconds in ground-based experiments.

Technical Details

The experiment utilized the ultra-cold atom physics rack aboard the Mengtian module. The team employed an all-optical trap to hold the atom cloud, followed by laser intensity reduction for evaporative cooling and a final "non-adiabatic diffusion" deep-cooling step. This all-optical approach offers several advantages over international magnetic-trap methods, including reduced sensitivity to magnetic interference, easier precision control in space, and increased optical access.

To fit the system into the space station, engineers condensed a ground-based system measuring 20 cubic meters and weighing 10 tonnes into a rack of 0.7 cubic meters and 0.5 tonnes. This required overcoming challenges in high-power fiber lasers, ultra-high vacuum systems, and long-term laser frequency stabilization.

Background and Context

The project began feasibility studies in 2011, with the experimental system launched in 2022. The research, published in the journal Science, leverages microgravity to allow weaker confinement of atoms, which enables lower temperatures and longer observation windows.

Significance and Outlook

Reaching temperatures near absolute zero (approximately minus 273.15 degrees Celsius) stretches de Broglie wavelengths to observable scales, making quantum effects more controllable. This platform supports the development of high-precision atomic clocks, quantum computing, and atom-interferometry inertial measurement. Furthermore, the ability to observe fainter physical phenomena allows for the study of phase transitions, non-equilibrium dynamics, early-universe simulation, and ultralight dark matter detection.

Source: https://english.news.cn/20261106/b1e05437fb304f60bf51fc68299dfd4f/c.html

Collected: November 07, 2026 | Automated Research System (AI)

#02 CTIS Imaging: UniSQ's Spacecraft Re-entry Breakthrough 2026

Published November 06, 2026 Australian Manufacturing Australia



OVERVIEW

A University of Southern Queensland (UniSQ) researcher has achieved a world-first by capturing the breakup of spacecraft during atmospheric re-entry using a custom-built computed tomographic imaging spectrometer (CTIS). The data, collected during the KREPE-3 mission, provides critical insights into material behavior under extreme thermal and aerodynamic stress.

IN DEPTH

Key Findings

Dr Byrenn Birch of the University of Southern Queensland (UniSQ) successfully utilized a computed tomographic imaging spectrometer (CTIS) to capture images of spacecraft breaking apart during the KREPE-3 observation campaign. Conducted on 12 October 2026 over the Pacific Ocean from Rarotonga in the Cook Islands, the mission marked the first reported use of CTIS technology to document spacecraft breakup during atmospheric re-entry.

Technical Details

The CTIS differs from conventional cameras by capturing spatial and color information simultaneously across more than 500 colors, whereas standard cameras record only three primary colors. This capability allows researchers to analyze various materials and physical processes as they occur. Additionally, the CTIS can capture information from multiple objects within a single image, which is essential for monitoring several fragments during a re-entry event.

UniSQ provided four instruments for the campaign:

- The CTIS spectrometer
- A tracking camera
- A conventional imaging spectrometer
- A specialized filtered camera designed to detect carbon signatures associated with spacecraft breakup

Background & Context

The observation mission involved the re-entry of 12 experimental capsules developed by UniSQ, the University of Kentucky, the University of Stuttgart, and Zafiro Systems. These capsules were designed to test how different thermal protection systems and materials respond to extreme temperatures and aerodynamic forces. The project was supported by the Australian Government’s iLAuNCH Trailblazer program and builds upon research funded by an Australian Research Council Discovery Early Career Researcher Award (DECRA).

Significance & Outlook

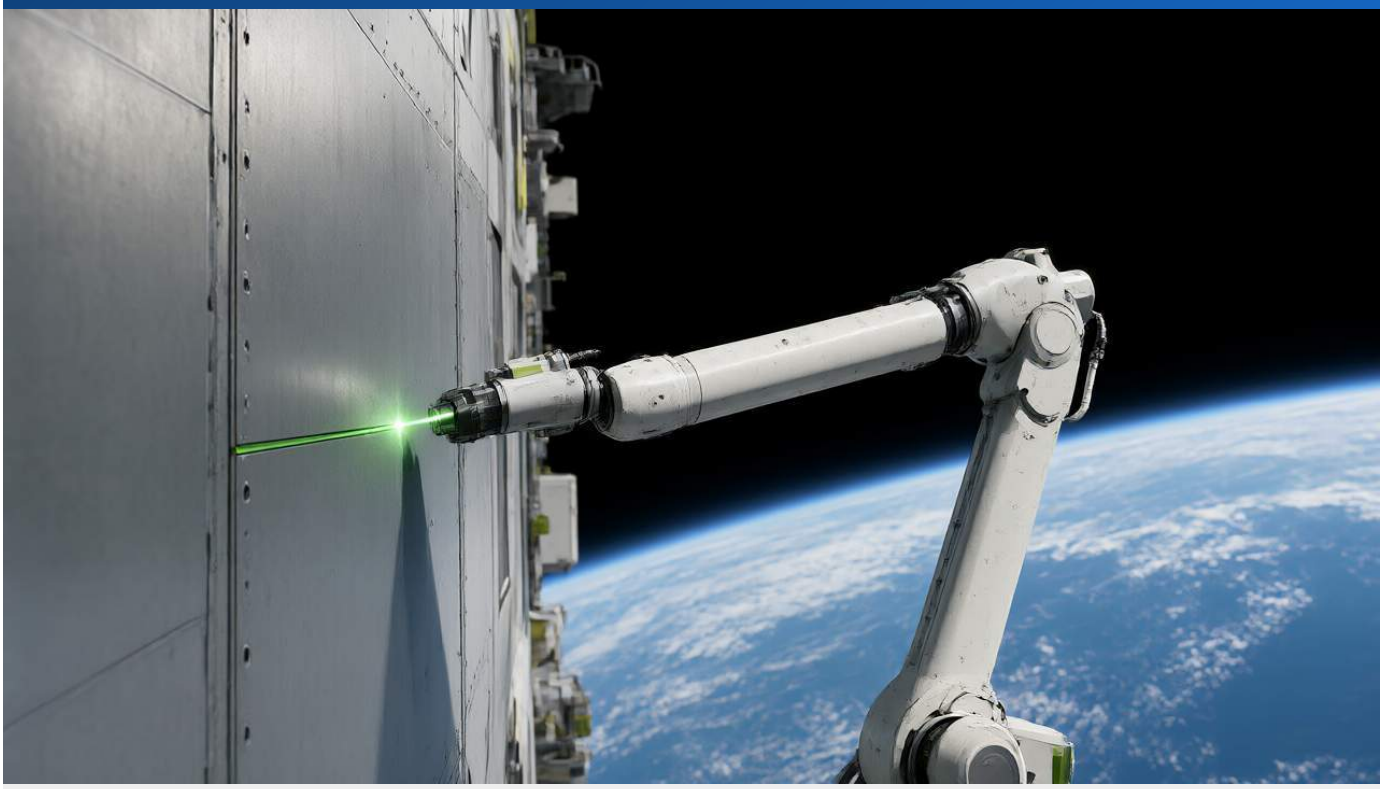
Ongoing analysis of the collected data is expected to improve spacecraft design and re-entry prediction models by enhancing the understanding of material behavior and breakup conditions. Beyond re-entry research, iLAuNCH indicates that this imaging technology has potential applications in space situational awareness, aerospace engineering, and hypersonic flight testing.

Source: https://www.australianmanufacturing.com.au/australian-researcher-achieves-spacecraft-re-entry-imaging-breakthrough/

Collected: November 07, 2026 | Automated Research System (AI)

#03 China's Space Station: First Remote Laser Cutting Test for Maintenance

Published November 05, 2026 腾讯新闻（IT之家／科技日报） China



OVERVIEW

China has successfully conducted the world's first remote-operated laser precision cutting experiment outside a space station in an extreme environment. Developed by Huazhong University of Science and Technology and the Shanghai Space Power Institute, this capability enables micron-level "minimally invasive" repairs from Earth.

IN DEPTH

Key Findings

China has achieved a global first by performing a remote-operated laser precision cutting maintenance test on the exterior of its space station. The operation was carried out via teleoperation from Earth, marking a significant shift from previous maintenance missions that relied exclusively on astronaut extravehicular activities (EVAs).

Technical Details

The "Extra-vehicular Laser Maintenance Device" was developed within one year, moving from initial design and prototype to a flight-ready unit. To operate in the extreme conditions of space—characterized by high vacuum, strong radiation, and severe temperature fluctuations—the team overcame three primary technical bottlenecks: vacuum/radiation adaptability, millimeter-level high-precision positioning, and micron-level laser precision cutting.

The system integrates several specialized components to ensure accuracy:

- An "8+2" axis multi-degree-of-freedom fine-tuning mechanism.
- A three-degree-of-freedom precision capture mechanism.
- An advanced multi-level vision guidance system.

These technologies allow for intelligent high-precision positioning and micron-level laser thermal effect cutting despite the complex attitudes of the space station.

Background & Context

The project was a joint effort between Professor Huang Yu's team at the School of Mechanical Science and Engineering of Huazhong University of Science and Technology and the Shanghai Space Power Institute (part of the China Aerospace Science and Technology Corporation Eighth Academy). This development follows two previous manual repair missions: one in March 2024 by the Shenzhou-17 crew and another in August 2026 by the Shenzhou-23 crew, both of which focused on repairing solar wings damaged by space debris.

Significance & Outlook

Regular maintenance is critical because space debris, traveling at speeds of 7 to 10 kilometers per second, poses a constant threat. While millimeter-sized fragments can reduce the transmittance and power efficiency of solar wings, centimeter-sized debris can penetrate hulls and destroy fuel tanks or pipelines. The transition to remote laser maintenance provides a high-precision, "minimally invasive" method to ensure the long-term safety and operational continuity of space station facilities.

Source: https://view.inews.qq.com/a/20261105A03M4X00

Collected: November 07, 2026 | Automated Research System (AI)

#04 Kyutech and JAXA: AI-based Satellite Charging Detection Method

Published November 02, 2026 Plus Web3 Japan



OVERVIEW

Kyutech and JAXA have developed a CNN-based system to automatically detect surface charging on satellites, analyzing 19 years of observation data to identify approximately 3,000 events. This technology clarifies the dynamic balance between high-energy electrons and ionospheric plasma, providing a foundation for reducing operational risks and improving satellite durability.

IN DEPTH

Key Findings

Kyutech and JAXA have successfully developed a method using artificial intelligence to automatically detect surface charging phenomena on artificial satellites. By applying this system to approximately 19 years of observation data, the research team identified approximately 3,000 charging events and elucidated the conditions under which these phenomena occur.

Technical Details

The research team, including Associate Professor Mariko Teramoto of Kyutech and Chief Researcher Teppei Okumura of JAXA, utilized Convolutional Neural Networks (CNN), a type of image recognition technology, to build the detection system. This automation addresses the significant burden previously associated with manually verifying charging events within vast datasets.

The analysis revealed a dynamic mechanism regarding satellite charging:

- High-energy electrons that cause auroras increase negative charging on the satellite surface.
- Plasma in the ionosphere (the region between approximately 60 and 1,000 km above Earth) acts to suppress this charging.

Background and Context

In the vacuum of space, satellites cannot be grounded, leading to the accumulation of electrons and the development of electrical charges on the surface. When local potential differences expand, electrostatic discharges can occur, which may cause physical damage to components such as solar panels and lead to system failures.

Significance and Outlook

This technology allows for the quantitative capture of the dynamic balance of charging intensity, which is expected to significantly enhance operational safety. By improving the prediction of high-risk timeframes and environments, operators can preemptively avoid discharge accidents and the resulting loss of equipment or operational downtime.

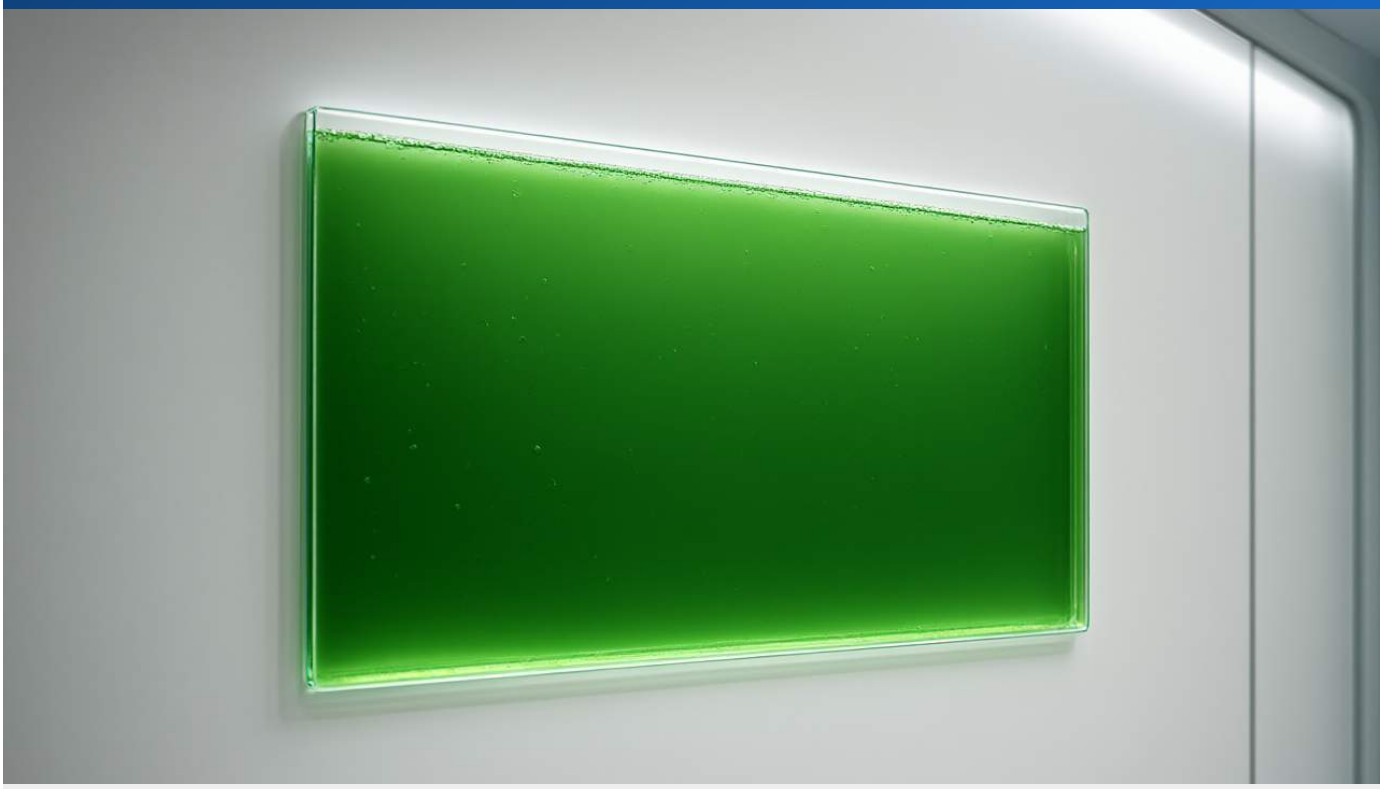
While the researchers note that further verification is required to ensure stability across different orbits and extreme space weather—as AI accuracy can be affected by training data bias—the long-term outlook includes applications in real-time space weather prediction and the design of next-generation charging-resistant satellites. Such advancements are seen as a technical foundation for the growth of private-sector space business by increasing the reliability of communication and meteorological infrastructure.

Source: https://plus-web3.com/media/latestnews_1000_11260/

Collected: November 07, 2026 | Automated Research System (AI)

#05 Spirulina Cultivation: ISS Proof-of-Concept for Partial Gravity

Published October 29, 2026　bioRxiv（プレプリント）



OVERVIEW

Attached cultivation of Arthrospira platensis (Spirulina) was successfully demonstrated aboard the International Space Station under microgravity, 1/6G, and 1G conditions. The study confirmed that this method prevents medium floating and cell detachment, proving the feasibility of space-based microalgal production.

IN DEPTH

Key Findings

The proof-of-concept study confirms that attached cultivation of Arthrospira platensis (Spirulina) is feasible in space environments. The research demonstrated that Spirulina can expand without the occurrence of cell detachment, component separation, or medium floating across three different gravity levels: artificial 1G, 1/6G, and microgravity (μG).

Technical Details

The study measured relative radial growth rates across the different gravity environments to evaluate performance. The recorded growth rates were as follows:

- Artificial 1G: 0.28% 0.5 day -1
- Partial gravity (1/6G): 0.22% 0.5 day -1
- Microgravity (μG): 0.17– 0.21% 0.5 day -1

Background & Context

Traditional liquid-suspended cultivation of microalgae faces significant challenges in space due to gas-liquid separation issues. Attached cultivation is proposed as a technical alternative to circumvent these specific problems. Prior to this study, the performance of attached cultivation under reduced gravity conditions remained unevaluated.

Significance & Outlook

By eliminating the risks of medium floating and cell detachment, this attached cultivation method provides a stable framework for producing microalgae aboard the International Space Station. The data indicates that while growth rates vary slightly depending on the gravity level—with the highest rate observed at 1G and the lowest in microgravity—the process remains viable across all tested conditions. This establishes a baseline for future biological life support or nutritional production systems in partial and zero-gravity environments.

Source: https://doi.org/10.64898/2026.10.27.762075

Collected: November 07, 2026 | Automated Research System (AI)

#06 Extrusion Bioprinting: Microgravity Process and Algal Efficiency

Published October 30, 2026 npj Microgravity



OVERVIEW

Researchers successfully demonstrated extrusion-based bioprinting of microalgae-laden hydrogels during parabolic flights, achieving cell viability of 99% for Scenedesmus sp. and 97% for Chlorella vulgaris. The study confirms that photosynthetic performance remains stable across gravitational phases, validating the feasibility of "green" bioprinting for in-space biofabrication.

IN DEPTH

Key Findings

Extrusion-based bioprinting of an alginate-methylcellulose bioink is functionally achievable under short-term microgravity conditions. The study successfully produced layer-by-layer prints at layer distances between 260–610<0xE2><0x80><0x89>µm and created unsupported filament bridges reaching up to 13<0xE2><0x80><0x89>cm. Furthermore, the first "green" bioprinting of microalgae-laden hydrogels was performed, with cell viability on day 7 post-printing exceeding 99% for Scenedesmus sp. and reaching 97% for Chlorella vulgaris.

Technical Details

To assess photosynthetic efficiency, the researchers used real-time pulse-amplitude modulated (PAM) fluorometry. The results showed that the effective quantum yield of photosystem II remained stable across all gravitational phases for both liquid cultures and bioprinted samples. While stability was maintained, species-specific differences in non-photochemical quenching between the two microalgae species persisted.

Background and Context

As crewed space missions extend in distance and duration, relying on Earth-based medical supplies becomes impractical due to storage limitations, mass and volume constraints in rockets, and product expiration dates. 3D bioprinting is a promising solution for on-site medical care because it integrates patient-specific image processing with cell-compatible manufacturing. Extrusion bioprinting is particularly suited for space use because the hardware is compact and robust, can be operated as an open system in microgravity, and is accessible to non-specialists.

Significance and Outlook

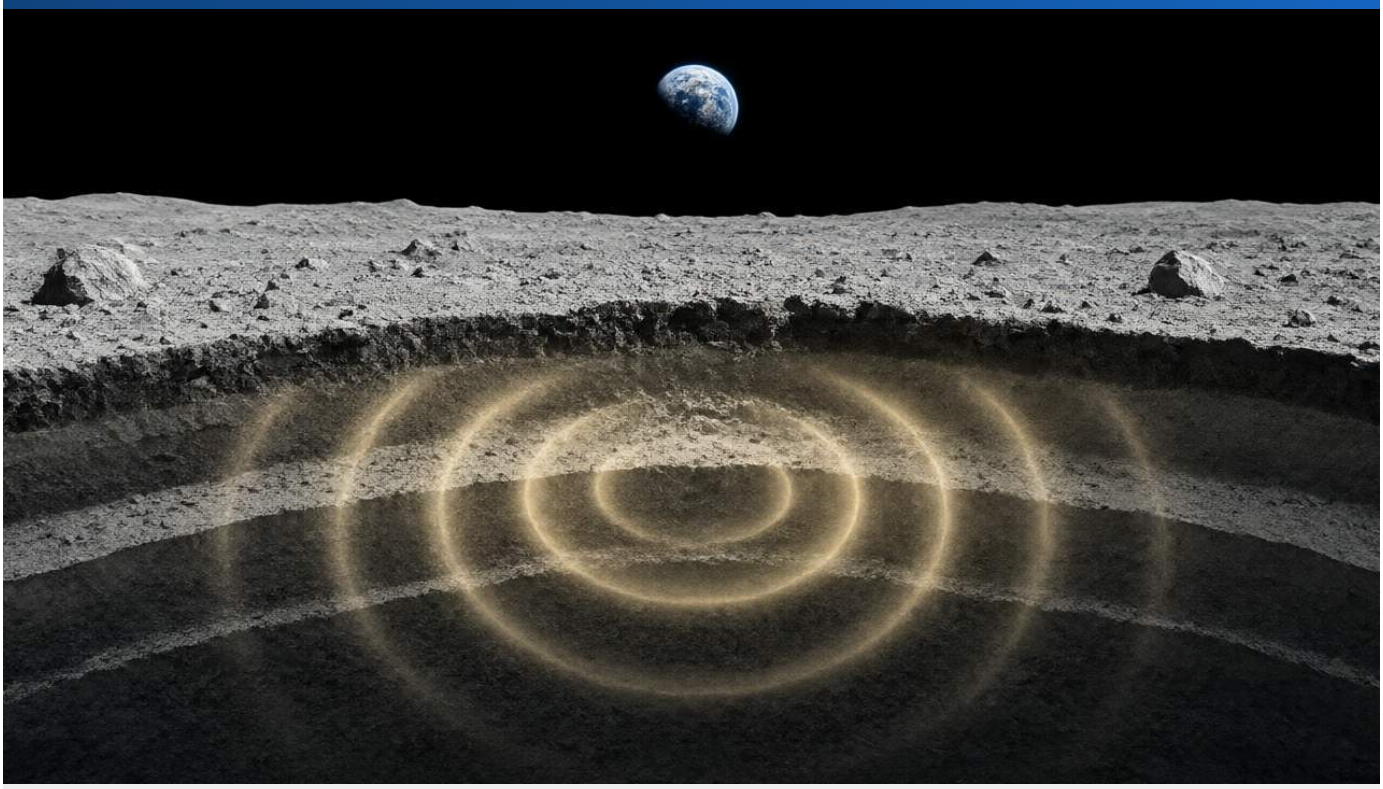
The absence of gravity alters the balance of forces, making surface adhesion and hydrophilicity more influential than on Earth, while simultaneously offering greater geometric freedom for overhangs and spanning cavities. Because peer-reviewed data on real microgravity is rare and often proprietary, using parabolic flights to validate basic functionality is essential before committing to expensive space flights. This study demonstrates that photosynthetically active structures can be cultivated in space without loss of photosynthetic performance, establishing a foundation for reliable biofabrication capabilities during crewed missions.

Source: https://doi.org/10.1038/s41526-026-00669-y

Collected: November 07, 2026 | Automated Research System (AI)

#07 Apollo Seismic Data: 2D Mechanical Heterogeneity of Lunar Subsurface

Published November 03, 2026　Research Square（プレプリント）　USA



OVERVIEW

Researchers analyzed active seismic experiment (ASE) data from Apollo 14 and 16 to resolve the 2D S-wave velocity (\(V_{s}\)) structure of the shallow lunar subsurface. By employing seismic interferometry and CWT-MASW, the study identifies spatial variations in mechanical properties along the Apollo 16 profile.

IN DEPTH

Key Findings

The analysis of Apollo 16 active seismic experiment (ASE) data reveals 2D mechanical heterogeneity in the shallow lunar subsurface. By processing data from 19 thumper shots and three geophones, researchers were able to generate 27 Rayleigh-wave phase-velocity dispersion curves distributed along a 90 m-long profile, allowing for spatially localized estimates of the lunar subsurface structure.

Technical Details

The study utilized different datasets for 1D and 2D analysis. The Apollo 14 dataset was used to obtain a 1D V_{s} profile for comparison, while the Apollo 16 dataset was used for 2D resolution. The Apollo 16 experiment, conducted on 21 April 1972, featured geophones G1, G2, and G3 positioned at 0, 45.7, and 91.4 m along the profile.

To overcome the limitation of having only three geophones, the team constructed receiver gathers by treating multiple shot locations as spatial samples. Due to source-receiver reciprocity, these receiver gathers were analyzed similarly to conventional shot gathers. The researchers implemented the following technical processes:

- **Seismic Interferometry:** Used to retrieve an approximate impulsive response and mitigate the effects of long-duration source wavelets.
- **Cross Coherence:** Applied to reduce sensitivity to absolute amplitude variations and localized distortion caused by amplitude saturation near shot locations.
- **CWT-MASW:** Continuous Wavelet Transform-based Multichannel Analysis of Surface Waves was used to estimate phase velocity from dispersive wave packets in the time-frequency domain (5–22 Hz), reducing noise interference.
- **Moving Windows:** Each receiver gather was divided into windows of six adjacent traces to balance depth sensitivity (approximately 10 m) and lateral resolution.

Background and Context

The Apollo 16 ASE data presented challenges including high noise levels and amplitude saturation, particularly in records from shot 1 at G3 and shot 19 at G1. To address this, the researchers selected reference shots with clear signals and minimal saturation—specifically shot 2 for G3, shot 18 for G1, and shots 10, 11, and 12 for G2.

Significance and Outlook

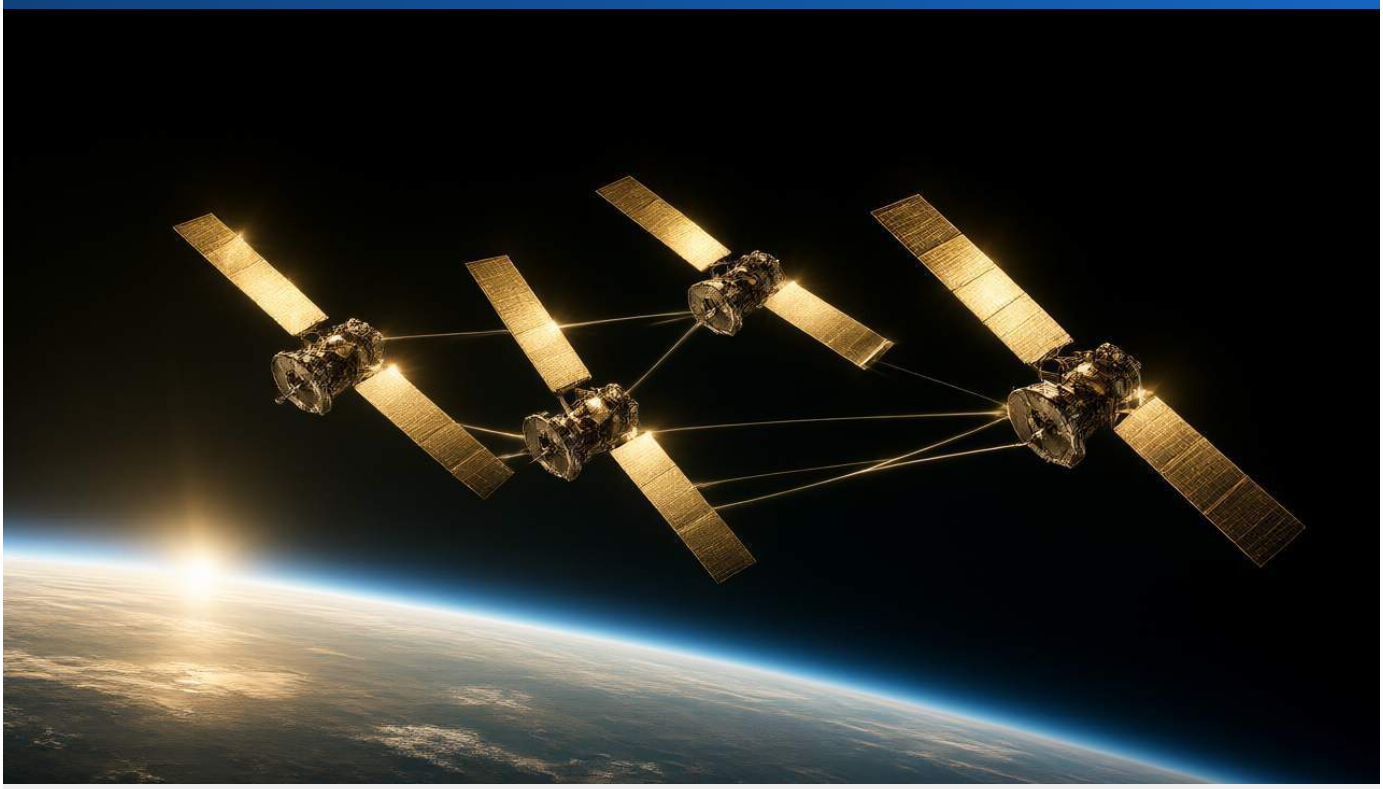
This methodology allows for the resolution of lateral variations in the lunar subsurface that 1D profiles cannot capture. By independently inverting the 27 generated dispersion curves, the study provides a more detailed understanding of the mechanical heterogeneity of the Moon's shallow subsurface.

Source: https://doi.org/10.21203/rs.3.rs-11391753/v1

Collected: November 07, 2026 | Automated Research System (AI)

#08 Project Suncatcher: Google's first orbital TPU AI response

Published November 02, 2026 ITmedia NEWS Japan



OVERVIEW

Google has successfully received the first AI response from a data-center class TPU operating in orbit via its Project Suncatcher prototype satellite. The system executed prompts using the Gemma 4 open model, marking a "Hello World" milestone for space-based AI processing. This achievement validates the feasibility of utilizing orbital solar energy to power large-scale AI workloads.

IN DEPTH

Key Findings

Google has achieved the first successful AI response from a Tensor Processing Unit (TPU) located in orbit. Using a prototype satellite under "Project Suncatcher," the company transmitted a prompt from a ground station and received a completed response. This milestone, described by CEO Sundar Pichai as a "hello world" moment, confirms that data-center class TPU hardware can function and return AI-generated content from space.

Technical Details

The prototype satellite was launched on October 1 via a SpaceX Falcon 9 rocket. Following several weeks of power-on sequences for the host and TPU trays and initial machine learning tests, Google performed the following operations:

- **AI Generation:** The open model "Gemma 4" was prompted to write a haiku about being in space. The response was received as the satellite passed over the Svalbard islands in Norway. The English haiku described the blue Earth, flowing data, and starlight.
- **Additional Testing:** The team also tested prompts for a limerick and telemetry-based prompts to report the technical status of the payload system.

Background and Context

Project Suncatcher is a long-term research project announced in November 2025. The initiative explores the viability of large-scale AI processing in low Earth orbit (LEO), where satellites have nearly constant access to sunlight, potentially allowing for solar power generation up to eight times greater than on the ground. The prototype satellite was developed in collaboration with Planet Labs.

Significance and Outlook

The next phase of the project involves evaluating TPU performance under the stresses of orbital radiation and thermal fluctuations. Once the reliability of these workloads is confirmed, Google plans to move toward its next milestone in 2027, which involves the deployment of two interconnected satellites.

Source: https://www.itmedia.co.jp/news/article/2611/02/2000002779/

Collected: November 07, 2026 | Automated Research System (AI)

#09 Tiangong Space Station: Material and Biological Exposure Results

Published November 04, 2026 China Daily China



OVERVIEW

China has achieved original results in material stability and biological radiation tolerance using the Tiangong space station's extravehicular exposure platform. These findings provide critical data for lunar construction and deep-space exploration, with applications extending to high-end ground equipment.

IN DEPTH

Key Findings

China has completed multiple batches of in-orbit experiments on material and biological samples, yielding several original results. Notably, the country achieved the world's first in-orbit verification of the space stability of a stainless magnesium alloy, confirming its lightweight and radiation-resistant properties. Additionally, simulated lunar soil bricks remained intact after one year of exposure to extreme space conditions, verifying the feasibility of these materials for lunar surface construction.

Technical Details

The space station is currently executing its fourth round of extravehicular exposure experiments, which include 26 sample units across eight scientific projects with exposure periods ranging from one to two years. Samples are placed on platforms outside the station to be directly exposed to the real space environment, including:

- High vacuum and atomic oxygen erosion
- Cosmic radiation and sharp temperature fluctuations
- Micrometeoroid impacts

Following testing, samples are retrieved by astronauts or a robotic arm for Earth-based analysis. In materials research, friction tests using gel lubrication and solid-liquid composite lubrication achieved near-zero wear. In biological research, experiments on nematodes and extremophile microorganisms provided data on life tolerance and radiation damage.

Background and Context

The Tiangong space station has entered an era of long-term human habitation. The Shenzhou XXIII spacecraft launched on May 24, 2026, and its crew has been in orbit for over five months. One crew member is scheduled for a one-year stay as China advances its 2030 crewed moon landing mission.

Significance and Outlook

The established evaluation system for space service of materials provides key data for protection design and material selection for crewed lunar missions and deep-space exploration. Furthermore, these results are applicable to high-end ground equipment in the aviation, nuclear power, and precision transmission sectors to improve radiation resistance, wear, and corrosion.

Source: https://global.chinadaily.com.cn/a/202611/04/WS6aeb1a9ae4b0aac4cf1ee354.html

Collected: November 07, 2026 | Automated Research System (AI)

#10 Murchison Meteorite: Solar Wind Impact on Organic Matter 2026

Published November 03, 2026　財経新聞　Japan



OVERVIEW

Research using the Murchison meteorite demonstrates that solar wind simulation via helium ion irradiation selectively degrades aliphatic hydrocarbons while aromatic hydrocarbons remain relatively resistant. This finding provides a framework for interpreting the chemical evolution of C-type asteroid surfaces and analyzing returned samples from Ryugu and Bennu.

IN DEPTH

Key Findings

A study by Futing Yin, Hong Tang, and their team at the Chinese Academy of Sciences reveals that different types of organic matter exhibit varying levels of resistance to solar wind. When subjected to helium ion (He^+) irradiation, aliphatic hydrocarbons showed the most significant changes, whereas aromatic hydrocarbons demonstrated higher stability. The researchers observed an overall increase in structural disorder and a decrease in the total amount of organic matter due to the breaking of carbon bonds in high-molecular-weight organics and subsequent sputtering.

Technical Details

The team used the Murchison meteorite, a CM2 carbonaceous chondrite, as the experimental subject. The irradiation dose was set at 1.2×10^{17} ions per square centimeter, simulating approximately 800 years of solar wind exposure on a C-type asteroid surface. To analyze the changes, the team combined Raman spectroscopy—which identifies structural disorder via D and G bands—with nano-IR (nanoscale infrared spectroscopy). Nano-IR, combining atomic force microscopy and infrared spectroscopy, allowed the team to analyze chemical structures in micro-regions of tens of nanometers, maintaining the spatial relationship between minerals and organics.

Background and Context

The Murchison meteorite contains both insoluble organic matter (IOM), consisting of complex high-molecular-weight aromatic and aliphatic structures, and soluble organic matter (SOM), including amino acids and carboxylic acids. Solar wind consists of plasma including protons, electrons, and helium ions traveling at 400–800 km/s near Earth's orbit, with energy of approximately 1 keV per nucleon. This process contributes to "space weathering," which alters the surface properties of airless bodies.

Significance and Outlook

These results help explain the presence of aromatic components on the surfaces of asteroids like Ryugu and Bennu. Specifically, the degradation of aliphatic components may weaken the 3.4μm infrared absorption feature used in remote sensing. By comparing these experimental results with returned samples—such as the 5.4g from Ryugu and 121.6g from Bennu—researchers can better distinguish between original chemical compositions and subsequent surface alterations caused by the space environment.

Source: https://zaikei.co.jp/article/20261103/875955.html

Collected: November 07, 2026 | Automated Research System (AI)