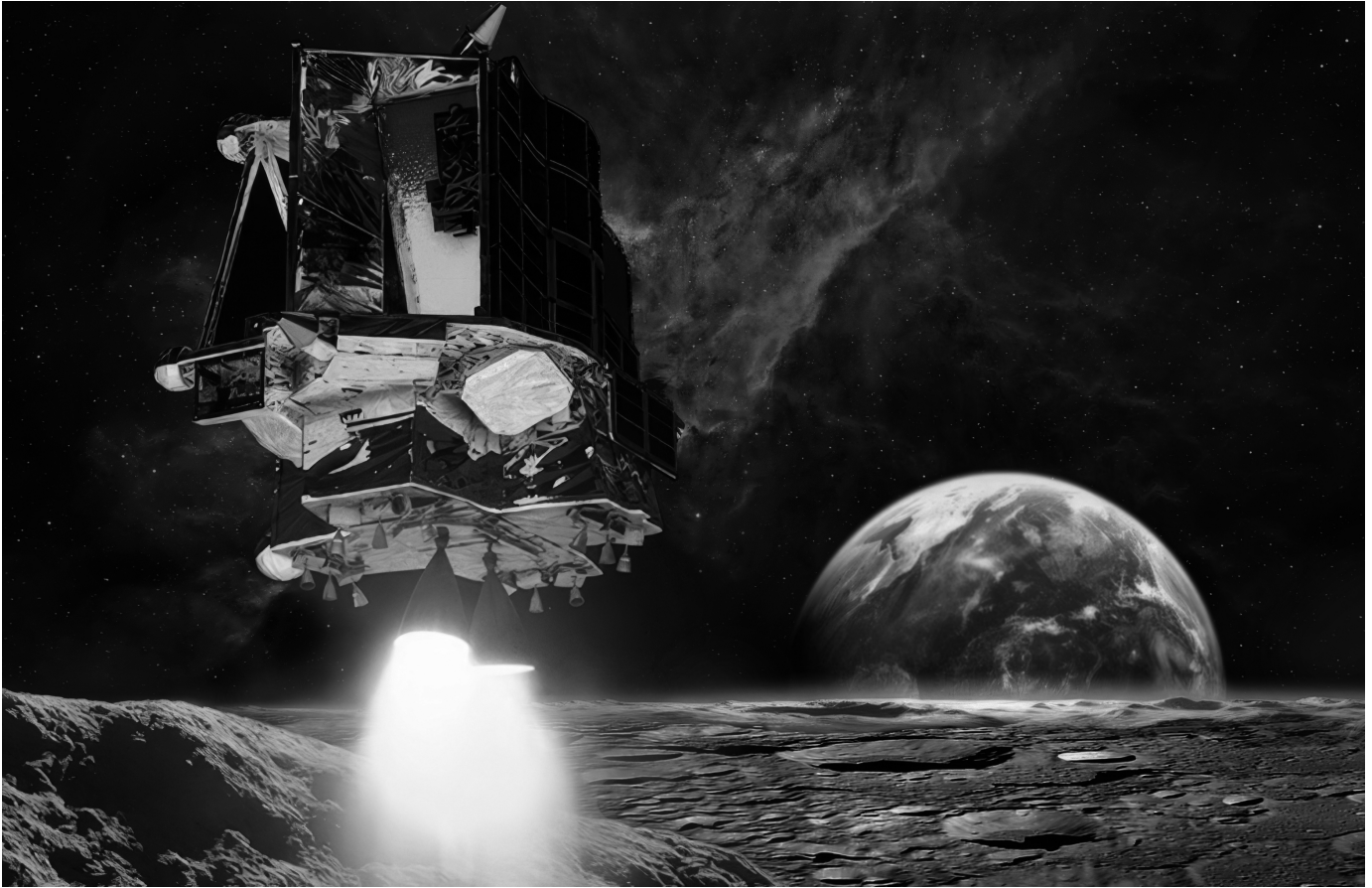


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Japan Marks Start of the Year with Lunar Feat

In the early hours of January 20 Japan time, the country succeeded in landing its spacecraft on the moon in an impressive precise touchdown. It became only the fifth country to reach the moon. The country's Smart Lander for Investigating Moon (SLIM) set down roughly 55 meters from its intended landing site, thus achieving its mission priority of showcasing Japan's technology to make a pinpoint landing. The Japan Aerospace Exploration Agency (JAXA) told reporters SLIM successfully established communication with the Earth. It later was unable to generate power as solar cells pointed away from the sun due to the position the spacecraft had landed, but the situation was corrected more than a week later after an apparent shift in lighting conditions allowed it to catch sunlight. This allowed JAXA to re-establish communication with the lunar probe, which began operating again and to begin transmitting

images of its surrounding such as rocks on the moon's surface. SLIM also succeeded in setting down two small Lunar Excursion Vehicles, LEV-1 and LEV-2 — each entrusted with demonstrating new technology — before it landed on the moon. JAXA confirmed in a news release that the LEV-1 conducted its planned activities such as direct communication with ground stations and executing planned leaping movements. It has completed its activity, used up its prescribed power, and is now on standby on the lunar surface. LEV-2, a transformable lunar robot jointly developed by JAXA, Tomy Co. Ltd., the Sony Group, and Doshisha University, took images of SLIM and the surrounding environment while on the lunar surface via LEV-1's communicator. Tomy is a toy maker known for its transformer figures. The success of the lunar mission owes in part to the growing number of startups and mid-sized companies that are increasing their presence in the space industry. One well-known example is Systems Engineering Consultants Co. Ltd. (SEC) which

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worked on the development of LEV-2's control system. It was established in 1970 as a spinoff from the University of Tokyo. Other companies with sales of 30 billion yen or less with promising technologies and strategies include ispace Inc., which works on the development of lunar modules and rovers.

Japan to Introduce Law to Curb IT Giants' Monopolies

Japan is planning to introduce regulations that will curb the dominant position of information technology (IT) firms such as Google Inc. and Apple Inc. Legislation with this aim is due to be presented to the Diet, Japan's parliament, this year. The focus will be on four areas. These are app stores, payments, search browsers and operating systems (OS). The government will aim to prevent IT giants from monopolizing the system at the expense of rival firms. The Japan Fair Trade Commission (JFTC) is expected to impose fines for violations. Currently Apple apps must be downloaded onto iPhones through the App Store and no other channels. In-app payments must go through Apple's system. Google allows third-party app distribution platforms but as a rule apps must use its billing system. Japan's Ministry of Internal Affairs and Communications says the country's mobile app market will likely grow to 29.2 billion dollars in 2023, which is up 50 percent from 2018. Japan's move follows the European Union's (EU) Digital Markets Act (DMA), which bans "gatekeepers" from favoring their own tools in search results.

University of Tokyo Team Develops Technology Using Muons

The University of Tokyo has developed a technology to more precisely than previously measure the position of objects with a margin of error of just 3.9 centimeters using space-derived elementary particles falling from the sky. These elementary particles have the property of penetrating matter and can be used inside buildings

and underground. It can be used to guide robots and automated vehicles in places where radio waves from the Global Positioning System (GPS) are difficult to reach. In its experiment, the university team used two special 40-centimeter-square plate sensors that can detect muons to measure their position. One of the sensors was attached to the object whose location was to be determined, and the other was placed at a distance of at least 10 meters from the object. When a muon flying from the sky passes through the two sensors, the position was measured based on the direction from which it flew. The technology to determine location with muons, called muPS, is already available, but the margin of error previously was a few meters. Conventional technology compares the time it took to pass through the sensor and uses the difference to measure its position. This time, by using angles, the time required for measurement became faster, and a margin of error of 3.9 cm was achieved, the world's most precise system. University of Tokyo professor Hiroyuki Tanaka, a leading researcher in the field, has said: "Cosmic-ray muons fall equally across the Earth and always travel at the same speed regardless of what matter they traverse, penetrating even kilometers of rock,"

Japan Launches Entity to Verify AI

In February this year, Japan launched the AI Safety Institute which is tasked with examining the evaluation methods of artificial intelligence (AI) safety and other relevant matters. It will study AI security issues such as the risk of civilian AI technology being applied to military purposes. One of the focuses will be on ChatGPT, the generative AI technology created by OpenAI. Japan's institute will work closely with similar overseas organizations such as Britain's AI Safety Institute, which was set up in November last year. Japan's AI Safety Institute, directed by Murakami Akiko, has been established within the Information-technology Promotion Agency (IPA). Murakami previously served as chief digital officer of Sompo Japan Insurance Inc. Prior to that she also participated in the development of IBM Japan's AI system Watson.

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Japan to Hasten Review Process for Drug Manufacturing Changes

The Ministry of Health, Labour and Welfare will introduce a new procedure that will aim to reduce the review time required when changing the manufacturing method for a drug. Shortening the pharmaceutical review process will lessen the burden on companies and lead to a stable supply of drugs and stop product shortages. The ministry will introduce the new review procedure on a trial basis possibly as early as in fiscal 2024. The results will be analyzed by an advisory body to the Minister of Health, Labour and Welfare. Authorities hope to introduce a revision to the current pharmaceutical law to the Diet, Japan's parliament, as soon as possible.

University Startup Launched to Work on Peptide Synthesis Technology

Substances called peptides, which are made up of multiple amino acids connected together, are attracting attention for their potential in a variety of applications. These include their use for antibacterial and analgesic purposes as well as blood pressure and blood sugar control. Peptides are widely considered to be the mainstay of next-generation pharmaceuticals. A number of startups have been established for drug discovery related to peptides. One of the first such firms was Nagoya-based PepInnova Co. Ltd., which spun off from Chubu University in 2022. The firm was launched to commercialize the research results of Chubu University Professor Hisashi Yamamoto, a leading researcher in the field. The company aims to develop peptides for cosmetics consisting of five to six amino acids linked together, and therapeutic drugs consisting of 10 or more amino acids. It is hoped that the drugs can be used for the treatment of cancer. Conventional chemical synthesis of peptides generates a large amount of waste such as amino acids and reagents that fail to bind during the complex reaction process. This raises production costs. The Osaka-based PeptiStar Inc. is working to resolve this issue. Some of the companies that have invested in PeptiStar includes Shionogi & Co. Ltd.

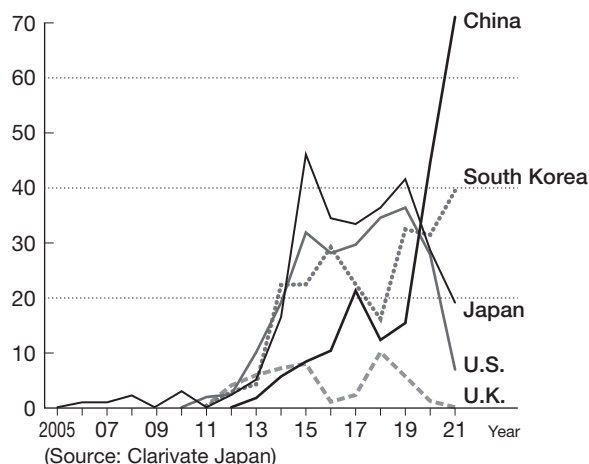
and Sekisui Chemical Co. Ltd.

Global Increase Seen in Perovskite Solar Cells Patent Application

A study by a research organization shows a marked increase in application for light, bendable and inexpensive perovskite solar cells. Research by Clarivate Japan showed that 180 patents for perovskite solar cells were filed globally in 2021, a 45-fold increase over 10 years. That year, China filed 70 applications, nearly four times the number by Japan. However, Japan still leads in the total number of patents thanks to the accumulation over the past 20 years. Japan led the world in number of patents filed for perovskite type — which was developed by Professor Tsutomu Miyasaka of Toin University of Yokohama — for five years until 2019. Japanese companies have strengths in technologies that are oriented toward weight reduction and durability with highly flexible film substrates. Among Japanese firms, Panasonic Corp. has the world's highest level of conversion efficiency and plans to unveil its product by 2028. Sekisui Chemical Co. Ltd.'s strength lies in durability. Toshiba Corp.'s strength lies in large-area application technology, and it is aiming to put its technology to practical use around 2025. The perovskite type, widely seen as a strong candidate as next-generation solar cells, is made by applying a paint-like material to a film or other material. Manufacturing cost is expected to be half that of the silicon type used in general solar panels, and the weight is expected to be reduced to one-tenth. Because of their lightweight and bendable qualities, they can be attached to walls, roofs, and windows of buildings, areas previously difficult to install. As the installation of existing solar cells appears to be limited due to the difficulty of securing land for large-scale solar power plants, the perovskite type can be used for power generation in a wider range of locations. They are expected to be widely used from the second half of the 2020s. The Fuji Keizai Group Co. Ltd. estimates that the international market for perovskite solar cells will reach 1 trillion yen in 2035, up from 32 billion yen in 2022.

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Number of patent applications related to perovskite solar cells



Japan Ministry to Use Satellite to Provide Greenhouse Gas Data

Japan's Ministry of Environment will begin providing data on greenhouse gas emissions from factories and other facilities to companies, possibly as early as in fiscal 2025. It will use a new satellite to be launched in fiscal 2024 to determine the amount and concentration of carbon dioxide (CO₂) and methane at each business site. This will make it easier for companies to prove the results of their decarbonization efforts and thus help it raise funds and stimulate investments. It is hoped that this move will also help avoid criticism of "greenwashing," which is the process of conveying a false impression or misleading information about how a company's moves and products are environmentally correct. Satellites will use the intensity of sunlight reflected from the earth to determine the amount and concentration of greenhouse gases, such as CO₂ and methane, which absorb sunlight. The higher the concentration, the weaker the reflected light. Japan has created the world's first satellite to observe global warming gases. This will provide a model for the government to back corporate emission reductions.

Ranking of patents related to perovskite solar cell (company/organization)

Rank	Company/Organization	Number of applications	Patent score
1	Panasonic Corp. (Japan)	44	2235
2	Merck KGaA (Germany)	36	2177
3	Toshiba Corp. (Japan)	29	1574
4	Raynergy Tek Inc. (Taiwan)	25	1515
5	University of Oxford (U.K.)	22	1445
6	Sekisui Chemical Co., Ltd. (Japan)	34	1428
7	Contemporary Amperex Technology Co., Ltd. (CATL, China)	21	1389
8	Seoul National University (South Korea)	28	1377
9	Korea Research Institute of Chemical Technology (South Korea)	31	1340
10	Commissariat à l'énergie atomique et aux énergies alternatives (CEA, France)	28	1285

(Source: Clarivate Japan)

Ranking of patents related to perovskite solar cell (country/region)

Rank	Country/Region	Number of applications	Patent score
1	Japan	274	13178
2	U.S.	231	11487
3	South Korea	228	11203
4	China	196	11036
5	U.K.	46	2893
6	France	43	2019
7	Taiwan	29	1632
8	Germany	27	1353
9	Australia	12	602
10	Russia	8	475

(Source: Clarivate Japan)

Note: Patents filed in two or more countries and published by November 9, 2023 were analyzed. Some patents from European countries are included in the European Patent Office (number of applications: 110, patent score: 6,624), and excluded from this ranking. (Source: Clarivate Japan)

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Japan, U.S., South Korea Firms to Collaborate on Semiconductor Project

Nippon Telegraph and Telephone Corp. (NTT) will develop optical semiconductors that will lead to a significant reduction in power consumption in the core technology of next-generation communication infrastructure, Innovative Optical and Wireless Network (IOWN). It will work in collaboration with firms such as Intel Corp., SK Hynix Inc. and other global semiconductor manufacturers. The Japanese government will provide a total of about 45 billion yen to support the endeavor. Data infrastructure is seen as the cornerstone of the digital society. The Japan-U.S.-Korea alliance aims to establish an international standard data infrastructure technology. IOWN uses optical technology, an area in which NTT excels, to exchange large amounts of data with low power consumption, and is aiming to become an international standard for use in the “6G” communications and data infrastructure network, the next-generation communications standard that is expected to become widespread by around 2030.

Kyocera to Develop Device for Superior Underwater Communication

Kyocera Corp. will develop a device that will enable the world’s highest level of underwater communication at 1 gigabit per second. The technology to deliver data 100 meters underwater will be put to practical use by 2028. This will make it possible to easily inspect offshore wind power generation facilities based on images taken by underwater drones. This means the Internet of Things (IoT), which connects everything to the Internet, will extend underwater. Kyocera will develop communication devices that use blue lasers instead of radio waves. Land-based radio waves for smartphones reach only about 1 centimeter underwater. Using visible light, which can reach more than 100 meters even underwater, the company aims to achieve a communication speed that is about one-tenth that of 5G. In 2021, Kyocera acquired a laser technology that is about 100 times more powerful than light-emitting diodes (LEDs) through

the purchase of a U.S. startup. The underwater communications market is expected to be worth 3 trillion yen in 7 years.

Japan Camera Firms Develop Technology to Fight Fakes

Japan’s mirrorless camera manufacturers, which dominate the global market, are planning to successively unveil new models that are fitted with technology to prevent fake images. Information such as location, photographer, and editing history will be embedded in the image, and digital signature technology will ensure the authenticity of the image. The Japanese firms with such a camera in the pipeline are Canon Inc., Sony Group and Nikon Corp.

Japan to Introduce Strict Security Clearance Bill that Includes Penalty

Japan is in the process of drafting a bill to establish a security clearance system to certify people who will have access to crucial information on economic security matters. The bill will include imprisonment as a penalty if a person is found guilty of leaking key information. It is hoped that if Japan introduces a system on a par with major Western countries, Japanese companies will have more opportunities to handle highly classified information. This is essential for companies that handle cutting-edge technologies to maintain international competitiveness. Japan is the only country within the Group of Seven (G7) lacking a comprehensive legal framework to address the issue of leaks on information related to economic security. The new bill, which is due to be submitted to the Diet, Japan’s parliament, will address this issue by adding a second clearance system to protect key economic security data. This will be added to a 2014 state secrets law, which was designed to safeguard classified information on defense, diplomacy, counterintelligence and terrorism prevention. But, that law did not cover economic security. The United States has a three-

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tiered framework, that is top-secret, secret and confidential information.

Japan to Launch Organization to Work on Fusion Power Development

Japan's public, private sectors and academia will join hands to work on the practical application of fusion power generation, a next-generation energy technology. An organization that includes the three parties is due to be launched in March 2024. Some 50 firms and organizations will be involved. These include firms involved in fusion reactor construction, such as IHI Corp., materials manufacturers, trading firms and startups, such as Kyoto Fusioneering Ltd. and Ex-Fusion Inc. Major firms also involved include JGC Holdings Corp., Obayashi Corp. and Inpex Corp. The United States, which leads in the effort to develop fusion power, already has an organization that is working to commercialize the technology, the Fusion Industry Association.

Japan's Proposed Flying Base Stations Due to Launch in 2025

Flying base stations used for telecom services are expected to be put into practical use, possibly as early as in fiscal 2025. The World Radiocommunication Conference held late last year in Dubai agreed to adopt four frequency bands proposed by Japan as international standards for airborne base stations. The four bands are compatible with High-Altitude Platform Systems (HAPS). Airborne base stations will use the 1.7 gigahertz, 2 GHz and 2.6 GHz bands as global standards. The three frequencies form the core of cellular communications. The 700 to 900 megahertz "platinum" band, which allows for improved mobile services, will operate in Europe, Africa, the Americas and parts of Asia. The recent development is expected to give Japanese companies, which are ahead in technological development in the sector, a boost in expanding exports of unmanned aircraft and communications infrastructure to developing countries.

JAXA, Astroscale Launch World's First Debris Inspection Satellite

Japan Aerospace Exploration Agency's (JAXA) initiative to remove space debris moved a step forward with the successful launch of startup Astroscale Japan Inc.'s commercial debris inspection demonstration satellite from New Zealand in February. Space debris, which consists of terminated or failed satellites and other unwanted man-made objects, is circling the Earth. They are a cause of concern as they could hit and damage satellites operating in space. JAXA's Commercial Removal of Debris Demonstration (CRD2) is a collaborative effort with private companies such as Astroscale to work on this problem. Astroscale said in a news release: "(It has) confirmed the successful launch of its commercial debris inspection demonstration satellite, Active Debris Removal by Astroscale-Japan (ADRAS-J)...The ADRAS-J mission is the world's first attempt to safely approach, characterize and survey the state of an existing piece of large debris."

SoftBank to Launch Alliance to Work on AI for Telecoms

SoftBank, Japan's telecommunications giant, will launch an organization to develop technology that can process data at cell phone transmission towers without having to rely on data centers. The organization, named the AI-RAN Alliance, is expected to include about 10 firms such as U.S.-based chipmaker Nvidia Corp., Sweden's Ericsson and Finland's Nokia Corp. The alliance will work to develop a technology to distribute data processing by installing artificial intelligence (AI) in cell phone base stations. The group aims to commercialize a technology that will prevent traffic from concentrating at a particular base station and also reduce power consumption at the base station.

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Researchers Develop Technology to Produce Sugar from CO₂

A team of researchers including those from Osaka University and Toyota Central R&D Labs have developed a technology that uses carbon dioxide (CO₂) to produce sugar at a rate several hundred times faster than photosynthesis. The technology may make it possible in the future to produce edible sugar and raw materials to make cultured meat which can be used as a protein source. As a technology useful for decarbonization, the researchers aim to put this technology to practical use in the 2030s.

Seiko Epson to Work on Textile Recycling

Seiko Epson Corp. will start a business to recycle fibers from clothing possibly as early as in 2025. The company plans to develop an equipment that applies paper recycling technology, which will be supplied to clothing manufacturers and other related firms. Seiko Epson's effort comes in the wake of the European Union's decision to introduce a ban on destroying unsold clothing from 2025, in a bid to reduce waste. The Japanese firm will work with the Hong Kong Research Institute of Textiles and Apparel Ltd. (HKRITA) in the development of a recycling solution.

Startup Founded by Ex-Google Researchers Raises 4.5 Billion Yen in Funding

Sakana AI, a Tokyo-based startup founded by prominent artificial intelligence (AI) researchers from Google LLC, announced that it has raised a total of approximately 4.5 billion yen in funding from top Japanese firms such as NTT Corp., KDDI Corp. and the Sony Group. Founding members of Sakana AI include Llion Jones and David Ha, both from Google. Sakana AI is working on next-generation technologies that overcome the challenges of current generative AI.

Japan to Establish Recycling System for Plastics

Japan's academia and industrial sector, including Tohoku University and NEC Corp., will collaborate to create a recycling system for plastics. The collaboration calls for creating a database of information such as the production history of recycled materials. This database will be made available to molding and processing manufacturers. The effort is in response to the growing pace of recycling around the world, as seen, for example by the European Unions move to mull making the use of recycled materials in automobiles mandatory. The database of recycled materials is due to include basic information such as sorting method and amount of impurities, as well as physical properties such as bending and impact strength. Molding and processing firms will be able to produce a stable quality of products with the advance availability of such information. This project has been adopted by the Cross-ministerial Strategic Innovation Promotion Program (SIP), a Japanese government initiative to realize the country's scientific and technological innovation.

Japan to Launch Company to Develop Quantum Computer

A new company will be established in fiscal 2024 with the goal of commercializing the next generation of high-speed quantum computers. The effort will be led by the National Institutes of Natural Sciences, Institute for Molecular Science, a national research institute, with the participation of about 10 companies from the private sector. These include Fujitsu Ltd., Hitachi Ltd., NEC Corp., Hamamatsu Photonics K.K., as well as the Development Bank of Japan. The new company will aim to leverage Japan's strengths in proprietary technologies to strengthen industrial competitiveness and economic security for the future. It will work on a new type of quantum computer called the cold-atom quantum computer. A prototype is planned to be created in fiscal 2026, and a commercial model by fiscal 2030, which if achieved will be the world's first such machine.

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Growing Number of Japan Startups Making their Mark in Space Industry

A growing number of startups and mid-sized companies in Japan are increasing their presence in the space industry. One well-known example is Systems Engineering Consultants Co. Ltd. (SEC) which participated in Japan's Smart Lander for Investigating Moon (SLIM) program that succeeded in landing Japan's first spacecraft on the moon in January. SEC worked on the development of the control system of LEV-2, one of two small Lunar Excursion Vehicles that took part in the mission. LEV-2 only weighs about 250 grams and is about the size of a ball used in baseball. SEC spun off from the University of Tokyo in 1970. The company's strength lies in autonomous control systems that change the movements of robots and equipment in response to the surrounding environment. In 1971, the company was contracted to develop a performance test system for rocket engines as its first project in the space field. One company with sales of 30 billion yen or less with promising technologies and strategies is ispace Inc., which works on the development of lunar modules and rovers. Another startup is tackling the growing issue of space debris. This is Osaka University startup EX-Fusion Inc., which recently reached an agreement with Australia's EOS Space Systems Pty Ltd. for a demonstration experiment to capture small space debris. Space debris, such as rocket fragments, poses a risk of colliding with satellites and has become an issue that needs to be addressed. The team will work on a demonstration experiment to capture 3-centimeter class space debris, which is difficult to capture with conventional technology. EX-Fusion's strength lies in laser technology. It said in a news release: "EOS Space and EX-Fusion will explore possibilities for cooperation on space debris issues by integrating EX-Fusion's high-power laser technology into one of EOS' existing optical ground stations and evaluate it for tracking and removal of space debris." EX-Fusion says EOS Space Systems, which was founded in 1983, is a leader in delivering unique optical surveillance capabilities for space domain awareness, space intelligence, and space control.

Kyocera to Develop Device for Superior Underwater Communication

Kyocera Corp. will develop a device that will enable the world's highest level of underwater communication at 1 gigabit per second. The technology to deliver data 100 meters underwater will be put to practical use by 2028. This will make it possible to easily inspect offshore wind power generation facilities based on images taken by underwater drones. This means the Internet of Things (IoT), which connects everything to the Internet, will extend underwater. Kyocera will develop communication devices that use blue lasers instead of radio waves. Land-based radio waves for smartphones reach only about 1 centimeter underwater. Using visible light, which can reach more than 100 meters even underwater, the company aims to achieve a communication speed that is about one-tenth that of 5G. In 2021, Kyocera acquired a laser technology that is about 100 times more powerful than light-emitting diodes (LEDs) through the purchase of a U.S. startup. The underwater communications market is expected to be worth 3 trillion yen in 7 years.

KEK Resumes Operation of Its Particle Collider

In January, the High Energy Accelerator Research Organization (KEK) restarted operation of Japan's largest circular accelerator, in which particles collide with each other at nearly the speed of light to study changes. The performance of the accelerator has been greatly improved, and it will study the mystery of the birth of matter, which constitutes the universe, and explore unknown physical phenomena. The SuperKEKB is located under the grounds of KEK's Tsukuba campus in Ibaraki Prefecture, near Tokyo. The particle collider had been shut down since June 2022 for maintenance and renewal.

These news articles were compiled by IP•L Communications.