National Institute of

Advanced Industrial Science and Technology

AIST

The National Institute of Advanced Industrial Science and Technology (AIST), whose history started with the Geological Survey of Japan, Ministry of Agriculture and Commerce established in 1882, has been conducting research and development for 140 years to contribute to the country's development and the improvement of people's lives.

Climate change and natural disasters, low birthrates and aging populations in developed countries, infectious diseases that still continue to spread, rising tension in international affairs, economic security—these are some of the various and complex problems being faced today not only in Japan, but also throughout the rest of the world. AIST's mission is to create innovation through science and technology that will lead to solving these problems, and to contribute to strengthening Japan's industrial competitiveness.

To achieve this mission, AIST has set out its future vision of becoming "the core participant of the national innovation ecosystem" for Japan as a whole. Moreover, it is reviewing what needs to be done in order to realize this vision by 2030, and is proceeding with management reforms.

One example is the creation of the Marketing and Business Development Headquarters. To achieve our mission, it is necessary to collaborate with industry to ensure social implementation of innovative technology as products and services. We want to efficiently connect research results to social implementation via the three functions of the newly established headquarters, namely, formulation of business concepts, execution of empirical projects, and promotion of AIST-initiated startups. We are also looking into establishing a new corporate organization to further enhance these functions.

AIST is presently undergoing major reforms. We will strive to heighten AIST's appeal even further so that it will continue to be a research institute that is sought after by society.

We look forward to your understanding and continued support.

ISHIMURA Kazuhiko
President and CEO
National Institute of Advanced Industrial Science and Technology

At the test-driving site of AIST Tsukuba North

Create the Future, Collaborate Together—the fifth Medium- to Long-term Plan of AIST

The National Institute of Advanced Industrial Science and Technology (AIST) is a national research and development institute that comprehensively conducts research and development relating to scientific technology of industry as a core implementing body of industrial technology and innovation policies of the Ministry of Economy, Trade and Industry.

AIST has 7 research areas, and using its comprehensive strength as the largest public research organization in Japan having 11 research bases with AIST Tsukuba at its center, we promote a variety of activities to bring innovation to society.

In the five-year fifth Medium- to Long-term Plan which started in 2020, we set our mission of "leading the world in solving social challenges and creating innovation that contributes to strengthening industrial competitiveness," and we will focus most of all on the following three topics:

-To lead innovation for solving social challenges

-To strengthen innovation and ecosystems generated by the expansion of "bridging" between industry and research

-To organize bases that support innovation and ecosystems

To maximize the outcomes of these topics, as a Designated National Research and Development Institute, we will strengthen and accumulate technological intelligence along with pioneeringly tackling management of the research institute, and will contribute to national strategies.

Create the Future, Collaborate Together

Designing and co-creating the future with society. Encouraging mutual respect and endeavors.

Our values

We respect creating diverse values through individual strengths and organizational power.

Our mission

We promote diverse activities beyond the conventional AIST roles:
achieving excellence in research
discovering social issues and implementing solutions
underpinning intellectual infrastructure and assisting with policy advocacy

Our culture

We foster a culture that attracts diverse people with high aspirations and encourages mutual respect and endeavors.

Employees and Budget

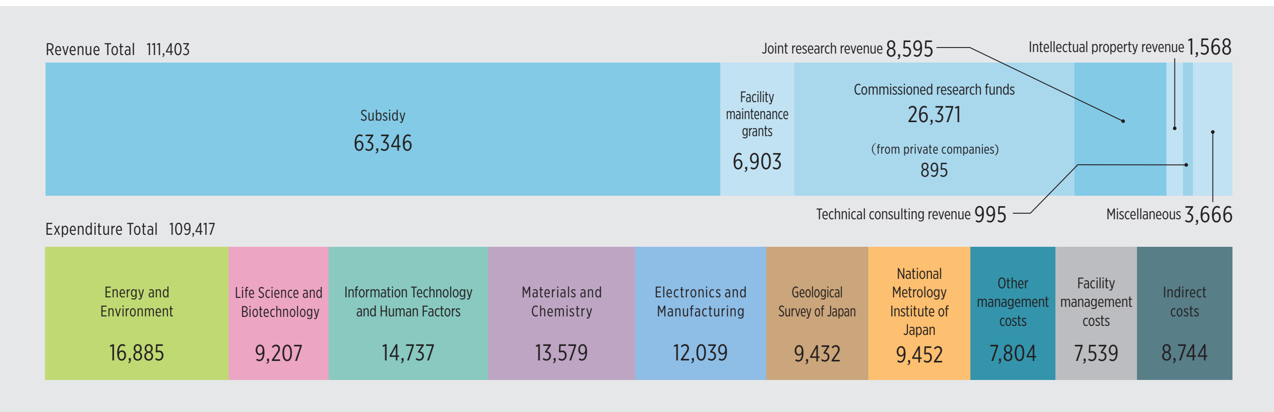
Employees (as of July, 2022)

Researchers	2,214
Administrative employees	687
Total number of employees	2,901
Executives (full time)	7
Visiting researchers	291
Postdoctoral researchers	168
Technical staff	1,497

Number of researchers accepted through industry/academia/government partnerships (Total number of researchers accepted in FY 2021)

From —companies	1,523
—universities	1,963
—public organizations	747

Financial results for FY 2021 (unit : million yen)



Research domains

Department of Energy and Environment

Research Institute of Electrochemical Energy
Research Institute for Energy Conservation
Research Institute of Science for Safety and Sustainability
Energy Process Research Institute
Environmental Management Research Institute
Advanced Power Electronics Research Center
Renewable Energy Research Center
Global Zero Emission Research Center

Department of Life Science and Biotechnology

Health and Medical Research Institute
Cellular and Molecular Biotechnology Research Institute
Biomedical Research Institute
Bioproduction Research Institute

Department of Information Technology and Human Factors

Human Informatics and Interaction Research Institute
Artificial Intelligence Research Center
Cyber Physical Security Research Center
Human Augmentation Research Center
Industrial Cyber-Physical Systems Research Center
Human-Centered Mobility Research Center
Digital Architecture Research Center

Department of Materials and Chemistry

Research Institute for Sustainable Chemistry
Research Institute for Chemical Process Technology
Nanomaterials Research Institute
Innovative Functional Materials Research Institute
Multi-Material Research Institute
Interdisciplinary Research Center for Catalytic Chemistry
Research Center for Computational Design of Advanced Functional Materials
Magnetic Powder Metallurgy Research Center
Nano Carbon Device Research Center

Department of Electronics and Manufacturing

Device Technology Research Institute
Research Institute for Advanced Electronics and Photonics
Advanced Manufacturing Research Institute
Sensing System Research Center
Research Center for Emerging Computing Technologies
Platform Photonics Research Center

Geological Survey of Japan

Research Institute of Earthquake and Volcano Geology
Research Institute for Geo-Resources and Environment
Research Institute of Geology and Geoinformation
Geoinformation Service Center

National Metrology Institute of Japan

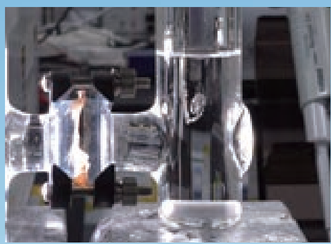
Research Institute for Engineering Measurement
Research Institute for Physical Measurement
Research Institute for Material and Chemical Measurement
Research Institute for Measurement and Analytical Instrumentation
Center for Quality Management of Metrology

Toward the realization of carbon neutrality

Response to energy and environmental limitations

To realize a carbon neutral society, we are conducting innovative R&D, such as for novel solar cells, hydrogen energy carriers and synthetic fuel, carbon dioxide capture, utilization and storage (CCUS), a next-generation battery, power electronics, resource circulation, etc. and developing technology for evaluation and reduction of environmental risks.

Solar hydrogen production technology using seawater



We aim at a practical application of artificial photosynthesis, which can produce low-cost hydrogen using abundant sunlight and seawater.

Atmospheric observations for evaluating urban CO_2 emissions

We are developing an analytical method to separate out the contributions from the consumption of gas and liquid fuels and biospheric activities by using the observed CO_2 flux, O_2 and CO_2 concentrations in an urban area.

Demonstration field for renewable energy

Toward a circular society

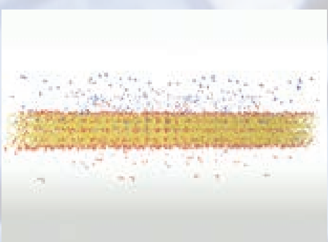
Response to energy and environmental limitations

One of the key ideas to overcome social issues caused by a mass-consumption society is resource circulation: a grand cycle of resource consumption and recovery by utilizing waste as a resource. To accelerate the structural shift toward a resource-circulating society, we develop technologies and evaluation tools for efficient utilization of resources.

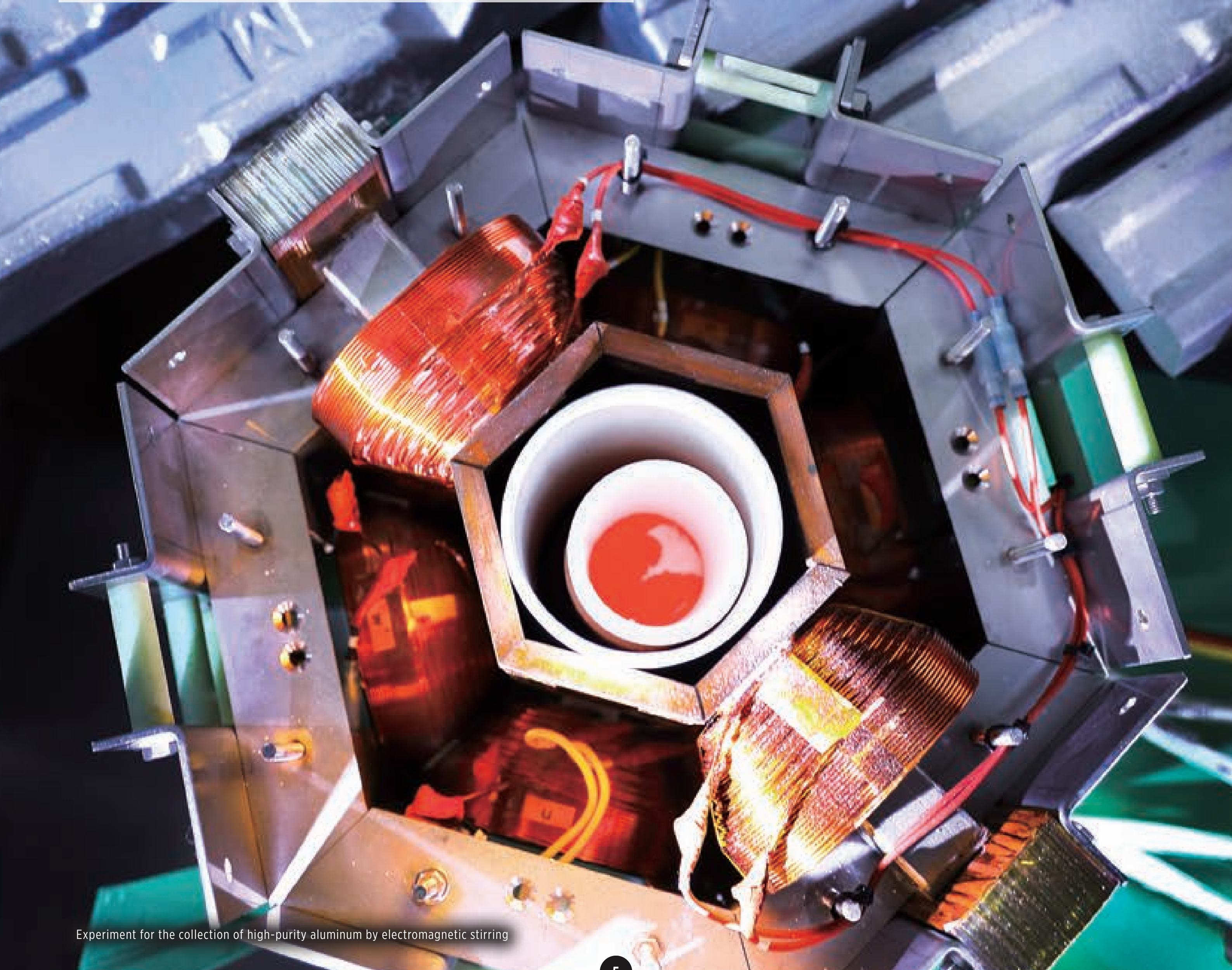
Development of nitrogen circular technologies

We develop ammonia recycle technologies using adsorbents consisting of Prussian blue-type complexes.

Development of CO_2 separation and recovery technology



We develop zeolite membranes based on a computational approach for energy-efficient CO_2 separation.



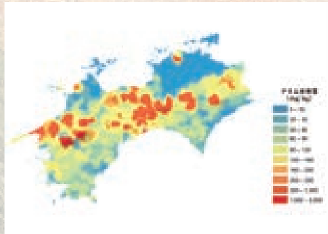
Experiment for the collection of high-purity aluminum by electromagnetic stirring

Toward harmonization of industrial utilization and environmental preservation

Response to energy and environmental limitations

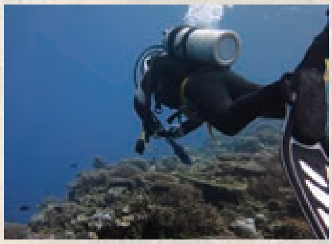
Development of resources, energy and land tend to be contradictory to environmental preservation. However, both can be harmonized and are necessary in preparation for improvement of the quality of our lives. We contribute to the preparation for our future lives by integrating the development of basic environmental information such as databases and the research of environmental impact measurement, evaluation, and restoration technologies.

Distribution of chromium in subsurface soils in the Shikoku area



We visualize risks of hazardous heavy metals in soils in the "Geochemical and Risk Assessment Map of Subsurface Soils" of the Shikoku area, and contribute to risk assessment of the soils generated by natural disasters.

Technical development of environmental impact assessment at coastal areas



We contribute to technical development of environmental impact assessment using physiological responses by environmental changes of coral at Okinawa coastal areas.

Survey of river water around suspended or abandoned mines

Cyber-physical system technologies for improving labor productivity

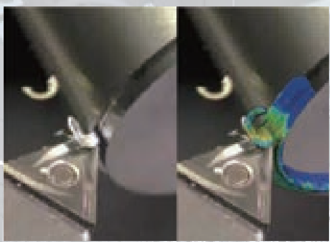
Measures for declining birthrate and aging population

A decrease in labor population requires us to improve labor productivity and facilitate skill development and transfer in all industrial fields in Japan. The development and utilization of cyber-physical systems (CPS) in which humans and machines can corporate will solve these social challenges. We are developing fundamental technologies that can create values in a CPS society, and will implement these technologies in our society with industrial collaboration.

R&D of human–machine cooperative technology for remote-working

The robots utilize constructed cyber space as memory and work autonomously in a logistics-simulated place.

Data assimilation by a deep neural network facilitates technology transfer



A cyber-physical production system that has learned the machining process from skilled technicians determines the optimal machining conditions by predicting the physical parameters necessary to reproduce the machining process in a cyber space.

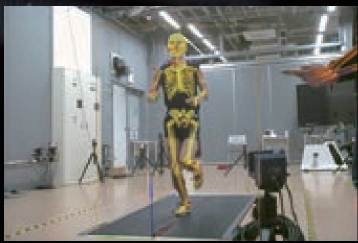
Connected factory demonstration environment at CPS building

Integrating healthcare technology and services into daily life

Measures for declining birthrate and aging population

To extend healthy life expectancy, we are conducting research and development of technologies and services that monitor the health condition of each person in daily life and provide intervention adapted to the individual. In this way, we aim to realize a world that everyone can live in good health without worry.

System for estimating health inhibition factors



We are developing a system that estimates the risk of falls from a map and walking data

Health monitoring technology that can be used in everyday life

We are developing technologies to monitor physical and mental conditions and evaluate health risks in everyday life without the user feeling the sensors and being aware of the technology.

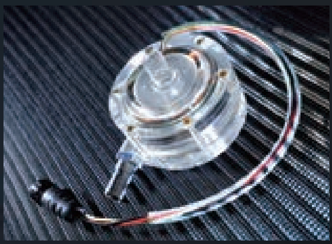
Experiment for estimating health conditions

Toward realization of universal medical access

Measures for declining birthrate and aging population

We aim to realize a "society of lifelong engagement" by means of a medical system, namely "universal medical access," that guarantees access to high-quality medical care and long-term care for anyone, at any time, and anywhere, whatever their circumstances.

Development of long-term extracorporeal ventricular assistive devices (VADs)



To save the lives of patients with severe heart failure, this project aims to develop long-term extracorporeal VADs with excellent blood compatibility, long-term durability, and capability to detect abnormal conditions.

Development of a rapid testing device for metastatic cancer

To reduce the number of deaths from metastatic cancer, this project aims to develop devices that allow a simple operation to rapidly and quantitatively detect rare CTCs present in the bloodstream, with no omissions.

Remote automated diagnostic platform

Infrastructural inspections and materials for a safe future

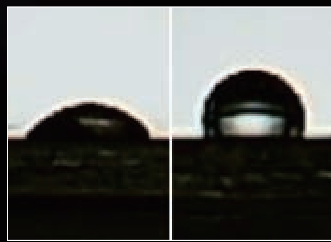
Contribution to resilient land and prevention of disasters

Development of automated and reliable inspection technology for securing infrastructure is crucial in Japan because the number of aging infrastructures will grow rapidly in the next 10 years. Furthermore, new materials for prolonging the life of infrastructure are also demanded. We will establish new inspection and material technologies by combining various techniques being developed in AIST and will achieve sustainable infrastructures through the technology.

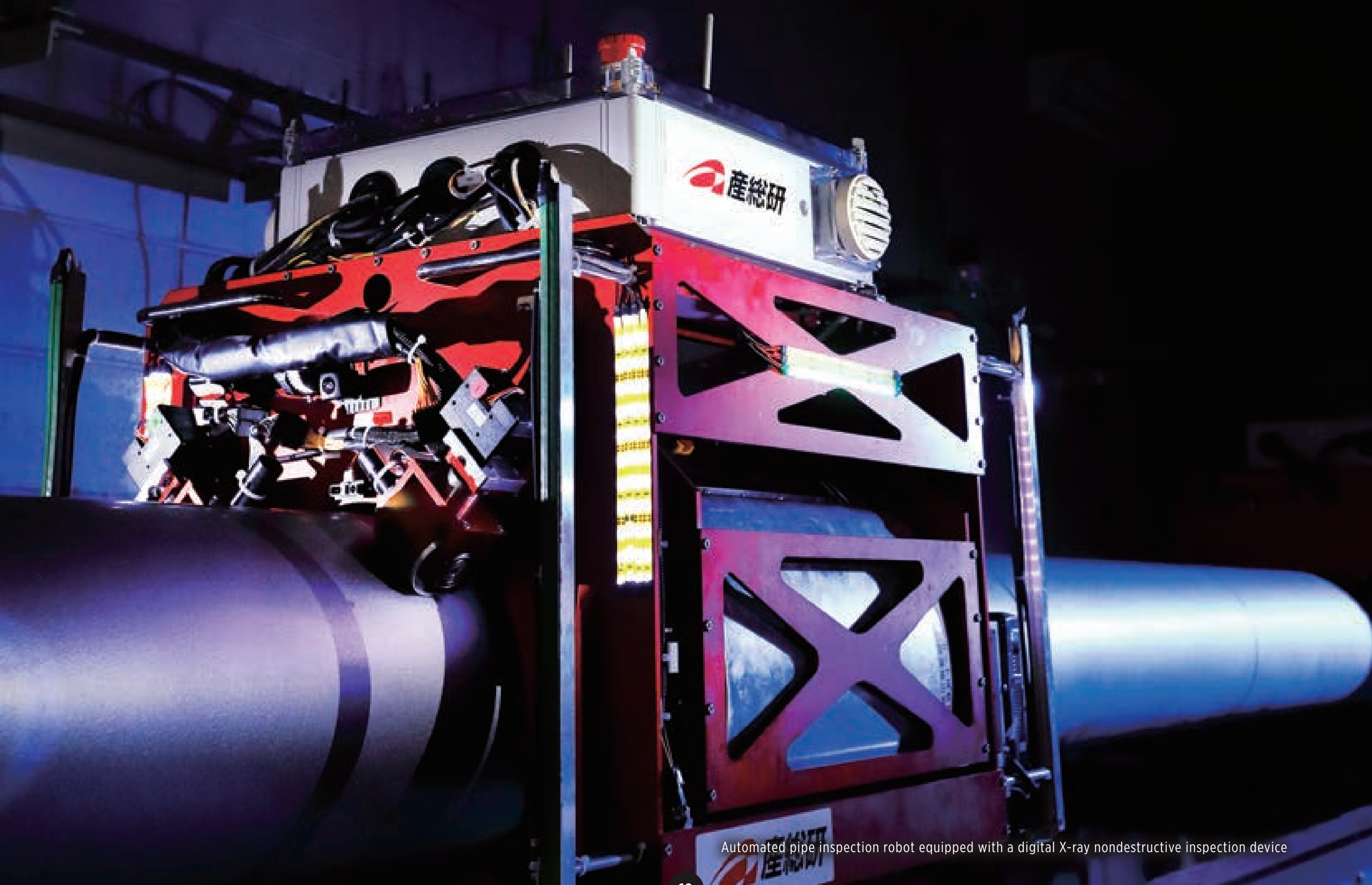
Deformation measurement of bridges from digital images

Deflection of bridges can be precisely measured by analyzing digital images. We also develop novel diagnosis technology that can reduce time and labor by integrating information technology such as AI and robots into inspection.

Antifouling and weatherproofing infrastructure by TiO_2 coating



By reflecting the results of material evaluation on the process, we accelerate the development of new structural materials with functions for prolonging the life of the infrastructure such as TiO_2 hydrophobic coatings.



Automated pipe inspection robot equipped with a digital X-ray nondestructive inspection device

Regional research bases operated throughout the country

AIST has regional research bases with unique strengths located throughout the country. They respond to needs of regional companies, and contribute to regional vitalization by collaboration with companies and research organizations such as universities in the region.

AIST Hokkaido Research theme: bio-manufacturing

We promote research and development of new bioproduction technology using the abilities of living organisms such as developing a substance production platform using plants and microorganisms.

Closed-type transgenic plant factory

Fukushima Renewable Energy Institute, AIST (FREA)
Research theme: renewable energy

We promote R&D of renewable energy internationally and contribute to reconstruction through developing new industrial clusters in areas affected by the Great East Japan Earthquake.

Anechoic chamber of the Smart System Research Facility

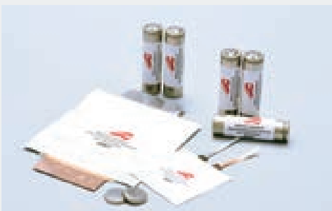
AIST Tokyo Waterfront
Research themes: digital technology, AI, zero emissions, biotechnology

We play the role of an open innovation platform as an international joint research center for the realization of a green and digital society.

Cyber Physical Systems Research Facility

AIST Kansai
Research themes: battery technology, biomedical technology, human-centric materials

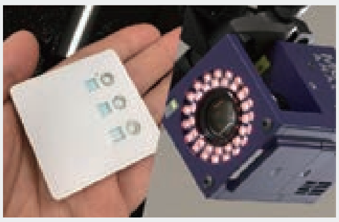
We transfer our research achievements of batteries, medical care, materials, and information fields, for development of industries and a better life for people.



A prototype of a lithium-ion battery

AIST Shikoku Research theme: health care

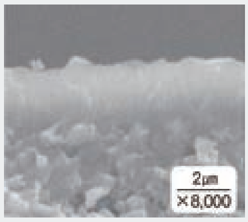
We aim at the realization of a healthy, happy, long-life society through research and development of technologies for measurement, visualization, maintenance and improvement of health condition.



Simplified hemodiagnosis chip and measuring device of body functions

AIST Tohoku Research theme: resource recycling technologies

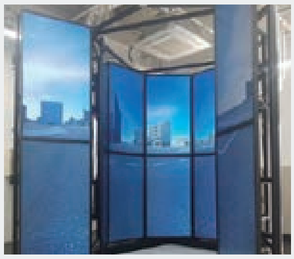
We sophisticate industrial chemical processes including synthesis and separation and develop high-performance functional materials, as well as utilize mathematics in material designs, and play a major role in social implementation of resource recycling technologies.



Zeolite membrane used for energy efficient separation processes

AIST Kashiwa Research themes: AI and ergonomics

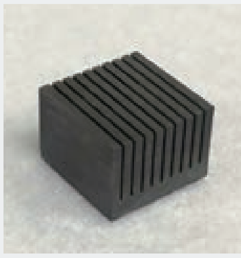
We work toward social implementation of services that help people maintain and enhance their capabilities through human augmentation technologies that boost human abilities using artificial intelligence (AI) and sensing technologies.



A service field simulator ver. 3

AIST Chubu Research theme: functional materials

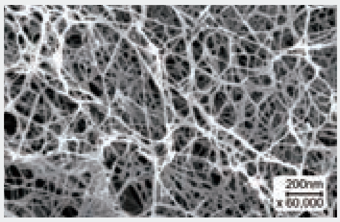
We promote research and development of functional components. Through organic interchange and collaboration aiming at social implementation of technologies, we contribute to the vitalization of industry and creation of the future from the Chubu area, which is a center of manufacturing industry.



Solid phase-change-ceramics with metal dispersion for thermal storage

AIST Chugoku
Research theme: materials evaluation technology

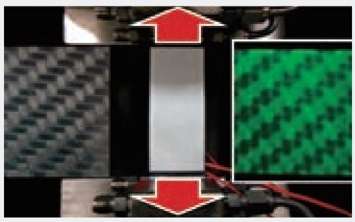
We promote research and development on the production of functional chemicals with low environmental impact, and on the evaluation technology of polymer materials.



Cellulose nanofiber

AIST Kyushu Research theme: sensing for smart manufacturing

We endorse research and development of various sensing technologies to contribute to the realization of smart manufacturing, sensor network technologies, and collected data usage technologies.



Visualization of stress distribution of CFRP

Research Bases

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☎ +81-22-237-5211 (main)

Fukushima Renewable Energy Institute, AIST
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☎ +81-24-963-1805 (main)

AIST Kashiwa
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AIST Tokyo Waterfront
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AIST Chugoku
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AIST Shikoku
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AIST Kyushu
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Research Domains

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Official Website

In addition to the latest research achievements and announcements, various kinds of information can be found on these websites.

General inquiries
https:/www.aist.go.jp/aist_e/inquiry_e/form/inquiry_form.html

Collaboration and technical consultation
https://www.aist.go.jp/aist_e/form/col_inquiry_form.html

Research achievements
https://www.aist.go.jp/aist_e/list/us_latest_research.html

Facility tours
https://www.aist.go.jp/aist_e/exhibitions/
- Science Square Tsukuba
- Geological Museum
- Life Technology Studio

Employment
https://www.aist.go.jp/aist_e/humanres/

Development and succession of human resources that create innovation

AIST has a personnel system that allows human resources of every line of work and age to flourish.

Cross-appointment system

In order to build a research system that extends beyond the boundaries of an organization, AIST, as a core institution that links research and industry, has a system for researchers who can belong to multiple institutions and are able to play active roles in research, development, and education in any institution.

Technical training

AIST accepts researchers and engineers from universities, companies, and public testing and research institutions for defined periods, and enables trainees to absorb technology under the instruction of AIST researchers. For students, we offer a broad range of support from internships to research guidance for degrees in the framework of the technical training program.

Research assistant program (RA)

AIST hires graduate students of high ability so that they can focus on research for their degrees with less financial worries. RAs can participate in R&D projects that AIST conducts and may use the results in their theses.

RA doing research with an AIST researcher

AIST Innovation School

The AIST Innovation School was started in 2008 to develop young research talent, and over 500 trainees have completed the course. Through the 2 courses that meet the needs of postdoctoral fellows and graduate students, while deepening their scientific and technological knowledge, the school aims to develop human resources with broader perspective and communication and cooperative skills to work with specialists of different fields.

AIST Design School

At the AIST Design School, one can learn to be a co-creative leader while focusing on exploring actual social issues with methods such as design thinking, system thinking, and foresight approach, etc.
We aim to foster human resources that can co-create with several stakeholders and pursue projects for society with views of the future by providing a place where staff members of companies and AIST can learn together.

AIST Design School Workshop in KAOSPILOT.

Highlights of Research Achievements

Starting as the Geological Survey of Japan in 1882, followed by the era of its forerunner, the Agency of Industrial Science and Technology, and up until now, AIST has achieved numerous instances of breakthrough research and development that have left their mark in the annals of science history. Here we introduce prime achievements spanning over 140 years from the 1880s until today.

1880s

Geological map of Japan (1 : 3,000,000)

The first complete geological map of Japan was published in 1889, a mere seven years after founding of the Geological Survey of Japan. Its history is closely linked to the development of geology, industry and mining in Japan, which began with instruction by foreign nationals at the beginning of the Meiji Period.

1920s

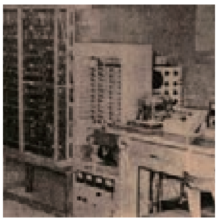
TIEL method of ammonia synthesis

The Provisional Laboratory of Nitrogen developed the first national ammonia synthesis technology using its original robust catalyst. It is the result of Japan's first large-scale project and is recognized worldwide as the "TIEL method of ammonia synthesis."

1950s

Transistor computer Mark-IV

The Electrotechnical Laboratory completed Japan's first transistor computer, the ETL Mark-III, in 1956. It was then enhanced to create the Mark-IV and Mark-IVA, leading the way for commercialization of computers in Japan.



1950s

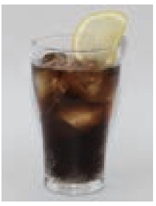
PAN based carbon fiber

In 1959, the Government Industrial Research Institute, Osaka, was the first in the world to develop lightweight and high strength carbon fiber from polyacrylonitrile (PAN) fiber, which came to be used in clothing and other products. Research aimed at its practical application was launched in the 1960s, and the material is now widely used in a multitude of products from fishing rods to airplanes.

1960s

Production process for glucose isomerase used to make soft drink sweetener

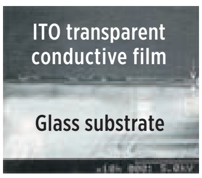
The Fermentation Research Institute developed a method for producing super sweet fructose by using glucose isomerase from glucose. It later signed license agreements with numerous companies in Japan, the US, and other countries, which resulted in its use all over the world.



1960s

Production method for transparent conductive film

The Government Industrial Research Institute, Osaka, was the first in the world to develop technology for industrial production of indium tin oxide (ITO) transparent conductive film, which is indispensable to liquid crystal displays and solar cells. This film also aided in the industrialization of liquid crystal calculators and is now the source of a huge market.



1980s

Catalytic action of gold nanoparticles

Gold was considered to have no catalytic function, but in 1982 the Government Industrial Research Institute, Osaka discovered specifically high catalytic activity of gold nanoparticles (3–4 nm) carried on metal oxide surfaces. The activity was outstanding even at low temperatures, and opened doors to commercial applications like deodorizing catalysts, detoxification of carbon monoxide, and gas sensors.

1980s

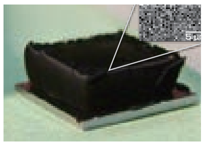
Anode alloys as the foundation for nickel metal hydride batteries

Research on the nickel metal hydride batteries used in hybrid cars began at the Government Industrial Research Institute, Osaka, in the 1970s. Around 1990, the first nickel metal hydride battery that had the same performance as lead batteries at half the weight was created. It is also garnering interest for use as a large stationary battery.

2000s

A breakthrough in single-walled carbon nanotube synthesis

A revolutionary synthetic technology for singlewalled carbon nanotubes (SWCNTs) called the "super growth method," was developed, and a synthetic efficiency 1,000 times higher than previous methods was realized. Furthermore, the synthesized SWCNTs possess various outstanding properties, such as high purity, compared to those synthesized by previous methods. Industrial mass production has been realized.



2000s

High-performance MTJ device for HDD magnetic heads

We developed high-performance magnetic tunnel junction (MTJ) devices with crystalline magnesium oxide (MgO) tunnel barrier for HDD read heads, which have more than doubled the recording density of HDD than before. Such high-performance MgOTMR read heads are used in all HDDs manufactured today.

photo courtesy of Fujitsu Limited

2010s

Planck constant measurement for the new definition of the kilogram

We developed a technology to accurately evaluate the shape of silicon spheres and succeeded in measuring the Planck constant with high accuracy. In 2019, the definition of the kilogram was revised to that based on the Planck constant determined by research institutes in five countries including AIST.