National Institute of

Advanced Industrial Science and Technology

AIST

Since it was established as an independent administrative agency in 2001, the National Institute of Advanced Industrial Science and Technology (AIST) has been active in contributing to the advancement of industrial technology, the creation of new industries, and the establishment of intellectual infrastructure in order to improve people's lives.

Presently after 19 years since its establishment, AIST is strongly expected to solve various social challenges faced by the country, such as energy and environmental constraints, low birthrate and an aging population, disasters, pandemics, or issues that are difficult to be solved by a single organization or one research area. In the light of such circumstances, utilizing AIST's comprehensive strength, we pursue further collaboration and integration of our diverse research areas and researchers to meet the needs of society and country. Furthermore, we have formulated the fifth Medium- to Long-term Plan in 2020 to multiply industry–academia–government collaboration efforts that have been made thus far to expand opportunities for implementation of research outcomes in society.

As a Designated National Research and Development Institute that creates research outcomes of the highest level in the world, AIST will continue to build on its activities and achievements in order to lead the world in solving social challenges, and to realize the creation of innovation that contributes to economic growth and strengthening of industrial competitiveness.

We look forward to your continued understanding and support.

ISHIMURA Kazuhiko
President
National Institute of Advanced Industrial Science and Technology

Research in Society, for Society—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 under the concept "in society, for society," 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.

Employees and Budget

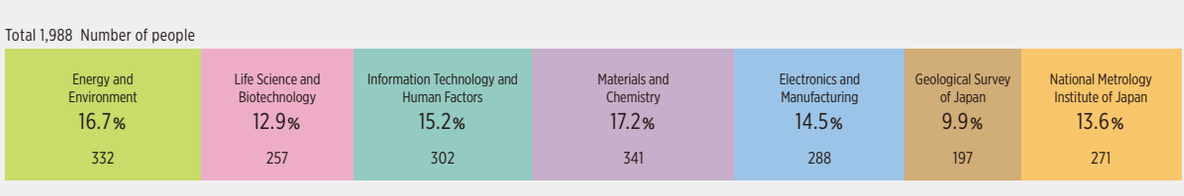
Employees (as of July 1, 2020)

Researchers	2,281
Administrative employees	694
Total number of employees	2,975
Executives (full time)	13
Visiting researchers	264
Postdoctoral researchers	202
Technical staff	1,494

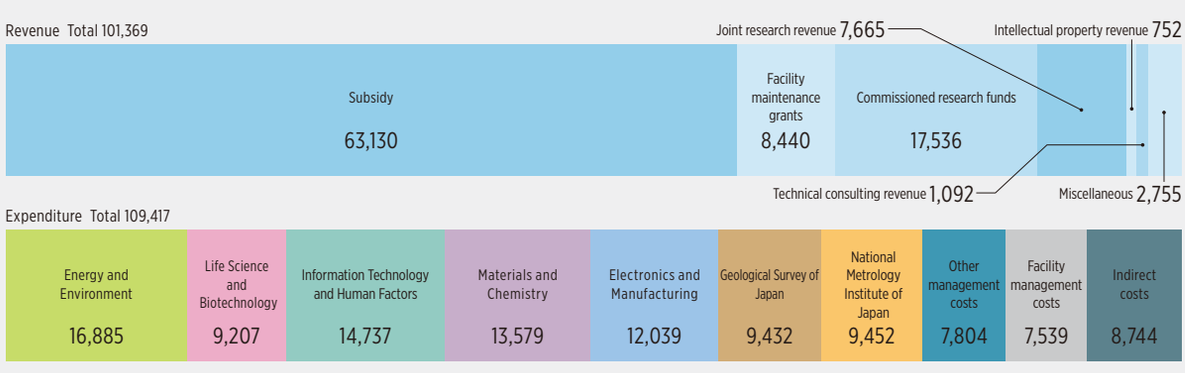
Number of researchers accepted through industry/academia/government partnerships (Total number of researchers accepted in FY 2019)

From —companies	1,689
—universities	2,347
—public organizations	899

Composition of researchers by domain (as of July 1, 2020)



Financial results for FY 2019 (unit : million yen)



Research domains

Department of Energy and Environment

Energy Process Research Institute
Research Institute of Electrochemical Energy
Research Institute for Energy Conservation
Environmental Management Research Institute
Research Institute of Science for Safety and Sustainability
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
CNT-Application Research Center
Research Center for Computational Design of Advanced Functional Materials
Magnetic Powder Metallurgy Research Center

Department of Electronics and Manufacturing

Device Technology Research Institute
Research Institute for Advanced Electronics and Photonics
Advanced Manufacturing Research Institute
Advanced Coating Technology Research Center
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

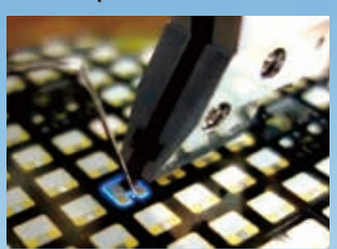
Research Institute for Engineering Measurement
Research Institute for Physical Measurement
Research Institute for Material and Chemical Measurement
Research Institute for Measurement and Analytical Instrumentation
Center for Quality Management of Metrology

Department of Energy and Environment

Advanced technologies to drive green innovation

We aim to achieve a zero-emission society through mass introduction of renewable energy, promotion of energy-saving technologies, highly efficient energy storage, effective use of resources, and development of technologies to assess and reduce environmental risks.

Advanced power electronics



We are developing power electronics technology that brings innovation to control of electric power using new materials.

Recycling technology for recovery of high-purity rare metals

We are developing technology to efficiently recover rare metals from disposed electric and electronic devices (urban mines).

Demonstration field for renewable energy

Department of Life Science and Biotechnology

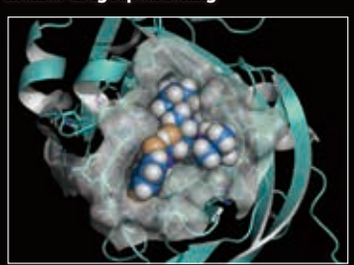
Realizing a healthy, active, ageless society, and helping create a sustainable society

The Department of Life Science and Biotechnology is developing high-quality, highly functional, and high-precision technologies for diagnosis and therapy to improve the quality of life, technologies for advanced standards supporting medical systems and technologies for utilization of biological resources to realize a bioeconomy-based society, and standard technologies supporting bioproduction and technologies for advanced high-precision bio-analysis.

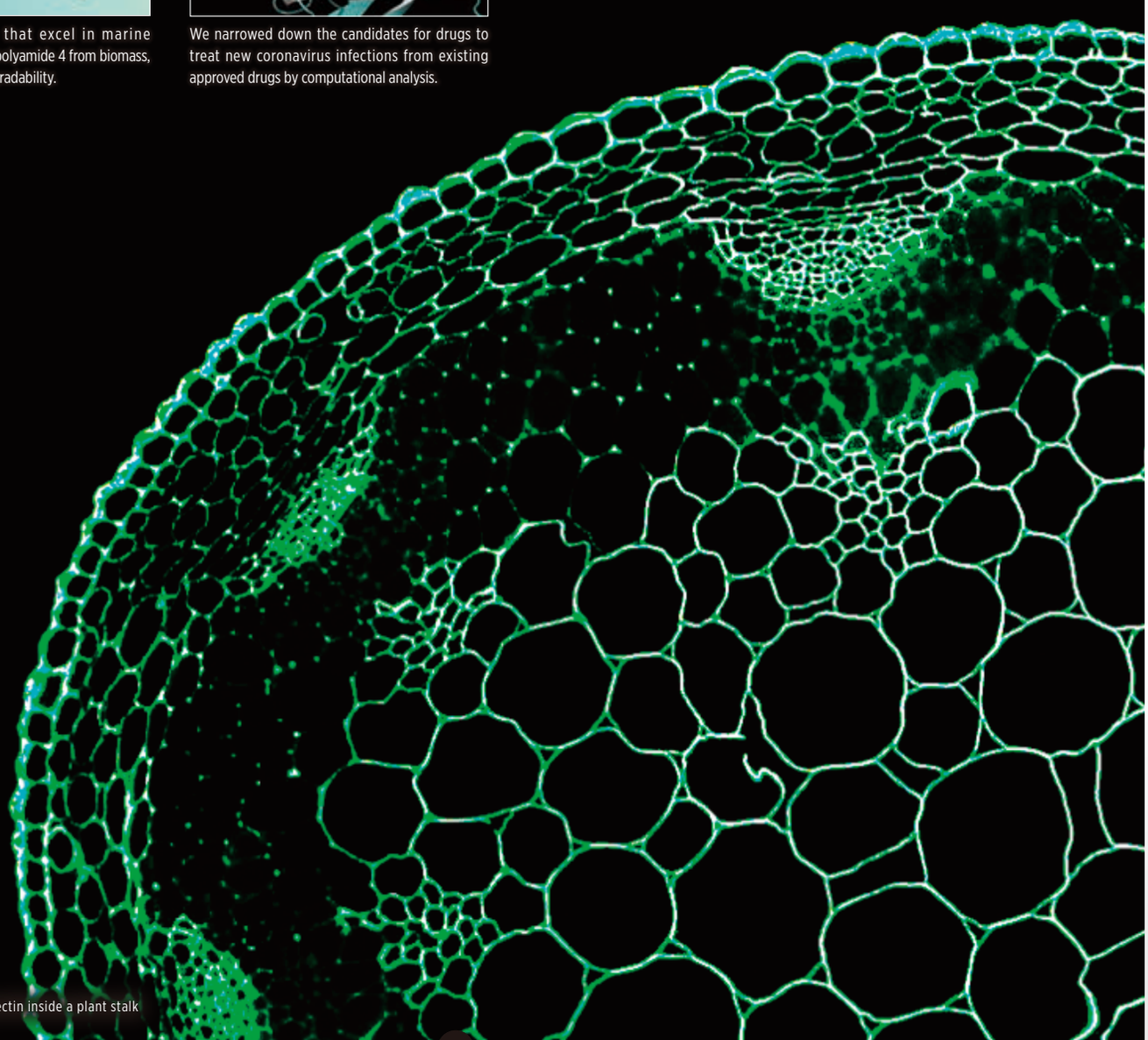
Development and evaluation of marine biodegradable plastics

We develop plastics that excel in marine biodegradability such as polyamide 4 from biomass, and evaluate their biodegradability.

***In silico* drug repositioning**



We narrowed down the candidates for drugs to treat new coronavirus infections from existing approved drugs by computational analysis.



Fluorescence image of pectin inside a plant stalk

Department of Information Technology and Human Factors

Information technology prospering together with humanity

To realize a safe, comfortable, and prosperous future society, the key is a strong integration of intellectual information between the cyberspace of information and the physical space of humans and society. The Department of Information Technology and Human Factors conducts research and development of human-friendly information technology that aims at strengthening industrial competitiveness and realizing a comfortable, rich society. We contribute to the development of a healthy society through the interaction of information technology and human factors.

Human Augmentation Technology

We conduct research to augment human functions by integrating human instrumentation, VR, and robotics. One example is augmented teleworking that supports new work styles, such as remote education.

AI Bridging Cloud Infrastructure (ABCI)

This is one of the first large-scale open AI computing infrastructure, with the world's top-level computational power. ABCI accelerates business and research activities by providing knowledge on large-scale computation and the cloud services necessary for implementing AI.

HRP-5P: A prototype humanoid robot

Department of Materials and Chemistry

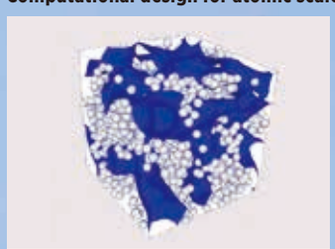
Toward a sustainable resource-circulating society

The Department of Materials and Chemistry conducts the development of resource utilization technology and the system evaluation technology to realize the resource-circulating society. In addition, we promote data-driven materials research to shorten the development period of materials, and contribute to strengthening industrial competitiveness.

Development of nitrogen cycling technology

We develop technologies for recovery and reuse of ammonia by adsorbents consisting of Prussian blue-type complexes.

Computational design for atomic scale material structuring



We promote high-performance materials development in terms of atomic scale material structuring computationally designed on the basis of the structure-function knowledge obtained from computational modeling and simulations.

Silicone oil

Department of Electronics and Manufacturing

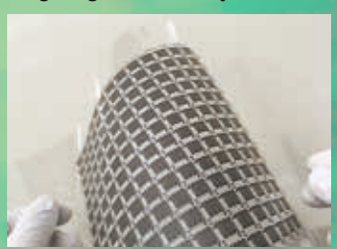
Creating innovative devices for future values

Cyber Physical Systems (CPS), which utilize information gained from collecting and analyzing data in real and cyber spaces, respectively, for social and industrial activities, play a growing role in modern society. We develop hardware technologies that serve as the bases of CPS and implement them into society by collaborating with our industrial partners.

Minimal Fab that enables high-mix low-volume production of microdevices

This is a cleanroom-free fabrication system for customized devices using half inch wafers.

Temperature sensor array sheet with a high degree of accuracy



Two-dimensional temperature distribution is measurable by the sensor array printed on a flexible film using originally developed conductive ink.

Semiconductor wafer

Geological Survey of Japan

Geological information supporting a safe and comfortable society

Geological information is essential for keeping our society safe and secure, and is particularly required in Japan, which is located on an active tectonic belt. With its abundant knowledge and experience in earth science, the Geological Survey of Japan (GSJ) pursues R&D on a wide range of areas to solve social issues: mitigation of geological disaster, protection of environment, sustainable utilization of natural resources and energies, and others. GSJ aims to achieve an earth-friendly and sustainable society through its research and survey to conserve and utilize our geoenvironment.

Bird's eye view of Geological Map of Fuji Volcano (2nd ed.)

Geological Map of Fuji Volcano was completely revised for the first time in about 50 years.

Advanced Integrated Sensors Towing system (AISTs)

GSJ conducts marine geological surveys at the vast sea area surrounding Japan. A deep-towed high-resolution survey package is being developed to accelerate marine use.

Field survey of alternating sand and mud layers at a sea cliff

National Metrology Institute of Japan

Measurement standards support the spectrum from daily life to advanced industry

Development of the measurement standards such as length, time, and mass is a significant mission of AIST. The National Metrology Institute of Japan (NMIJ) develops and maintains measurement standards of the seven base units of the International System of Units (SI) and numerous combinations of these base units, and disseminate these standards to society. NMIJ strives to advance measurement technologies associated with the measurement standards, and undertakes the development of infrastructure underpinning cutting-edge manufacturing as well as the safety and security of our society. Furthermore, we disseminate measurement standards, conduct legal metrology services, and provide training for metrology experts.

Diagnostic technologies for infrastructure

We develop new structural diagnostic technologies, such as visualization of bridge deflection distribution using advanced moiré methodology.

Reference materials supporting a safe and secure life

We develop and supply various reference materials to ensure reliability of chemical analysis, such as analysis of hazardous compounds in food and clinical examinations for medical diagnostics.

Cryogenic optical lattice clock for the redefinition of the unit of the second

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

From Fukushima, 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 theme: integration of AI and zero emission, life science, and manufacturing technologies

We promote open innovation as a base for international integration research (of life science and manufacturing etc.) to realize a smart society applying AI and zero emission technologies.

Cyber Physical Systems Research Facility

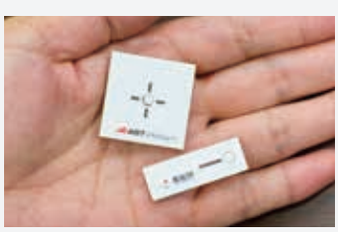
AIST Kansai
Research themes: battery technology, biomedical technology, human-centric materials

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

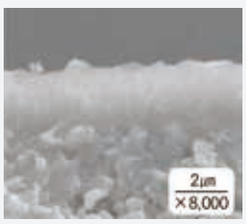
We promote research and development of technologies for measurement and visualization of health conditions, removal of health risk factors from living environments, and functionality assessment of food ingredients for promotion of health.



Development of a chip for simple hemodiagnosis

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

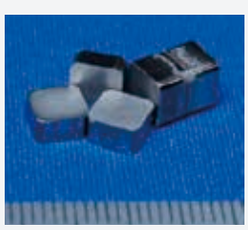
AIST Kashiwa Research theme: AI and ergonomics

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

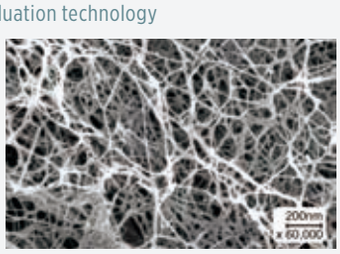
We promote research and development of various industrial components of high performance and high biocompatibility needed in future mobility development that is human, society, and environment-friendly.



Heat-resistant Sm-Fe-N anisotropic sintered magnet

AIST Chugoku
Research theme: materials evaluation technology

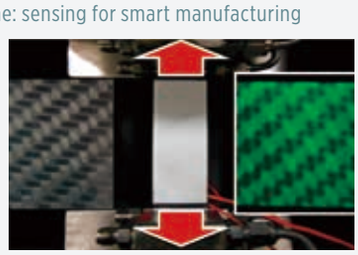
We promote research and development on the production of functional chemicals with low environmental impact, and on the evaluation technology of polymer materials.



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

AIST Tsukuba
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☎ +81-11-857-8400 (main)

AIST Tohoku
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☎ +81-22-237-5211 (main)

Fukushima Renewable Energy Institute, AIST
2-2-9 Machiike-dai, Koriyama, Fukushima 963-0298
☎ +81-24-963-1805 (main)

AIST Kashiwa
Kashiwa II Campus, University of Tokyo, 6-2-3 Kashiwanoha, Kashiwa, Chiba 277-0882
☎ +81-4-7132-8861 (main)

AIST Tokyo Waterfront
2-3-26 Aomi, Koto-ku, Tokyo 135-0064
☎ +81-3-3599-8001 (main)

AIST Chubu
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☎ +81-52-736-7000 (main)

AIST Kansai
1-8-31 Midorigaoka, Ikeda, Osaka 563-8577
☎ +81-72-751-9601 (main)

AIST Chugoku
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☎ +81-82-420-8230 (main)

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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

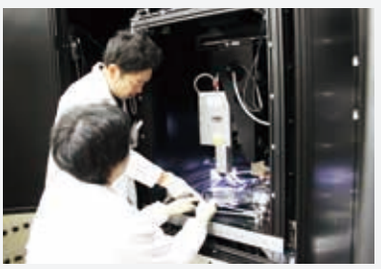
Employment
https://www.aist.go.jp/aist_e/humanres/

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 have appointments at multiple institutions and are able to play active roles in research, development, and education in any institution.



RA doing research with an AIST researcher

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.

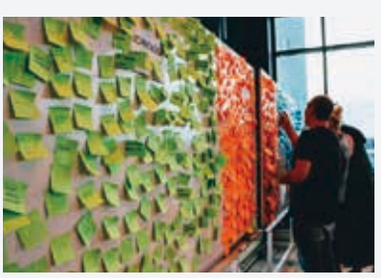
Training for MEMS manufacturing in a clean room

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.

Nanotech Career-up Alliance (Nanotech CUPAL)

Nanotech Career-up Alliance (Nanotech CUPAL) was established based on the subsidized project by MEXT "The Consortium Structuring Project to Foster Science and Technology Personnel" in FY 2014. We aim to advance the careers of young researchers in Japan and to improve their career mobility.



Workshop of AIST Design School in Northern Europe (Denmark)

AIST Design School

At the AIST Design School, one can learn methods such as design thinking, system thinking, and foresight and others. The school provides a place to learn with researchers of AIST and companies, and aims to foster human resources that can co-create with stakeholders and pursue projects for society with views of the future.

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

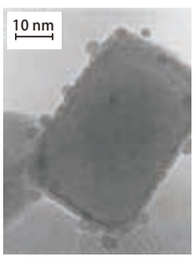
Production method for transparent conductive film

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

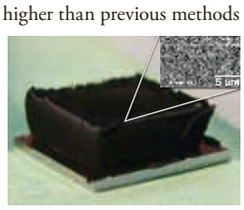
Anode alloys as the foundation for nickel metal hydride batteries

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

Energy and Environment

Life Science and Biotechnology

Information Technology and Human Factors

Materials and Chemistry

Electronics and Manufacturing

Geological Survey of Japan

National Metrology Institute of Japan

National Institute of
Advanced Industrial Science and Technology

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