AIST *Today*

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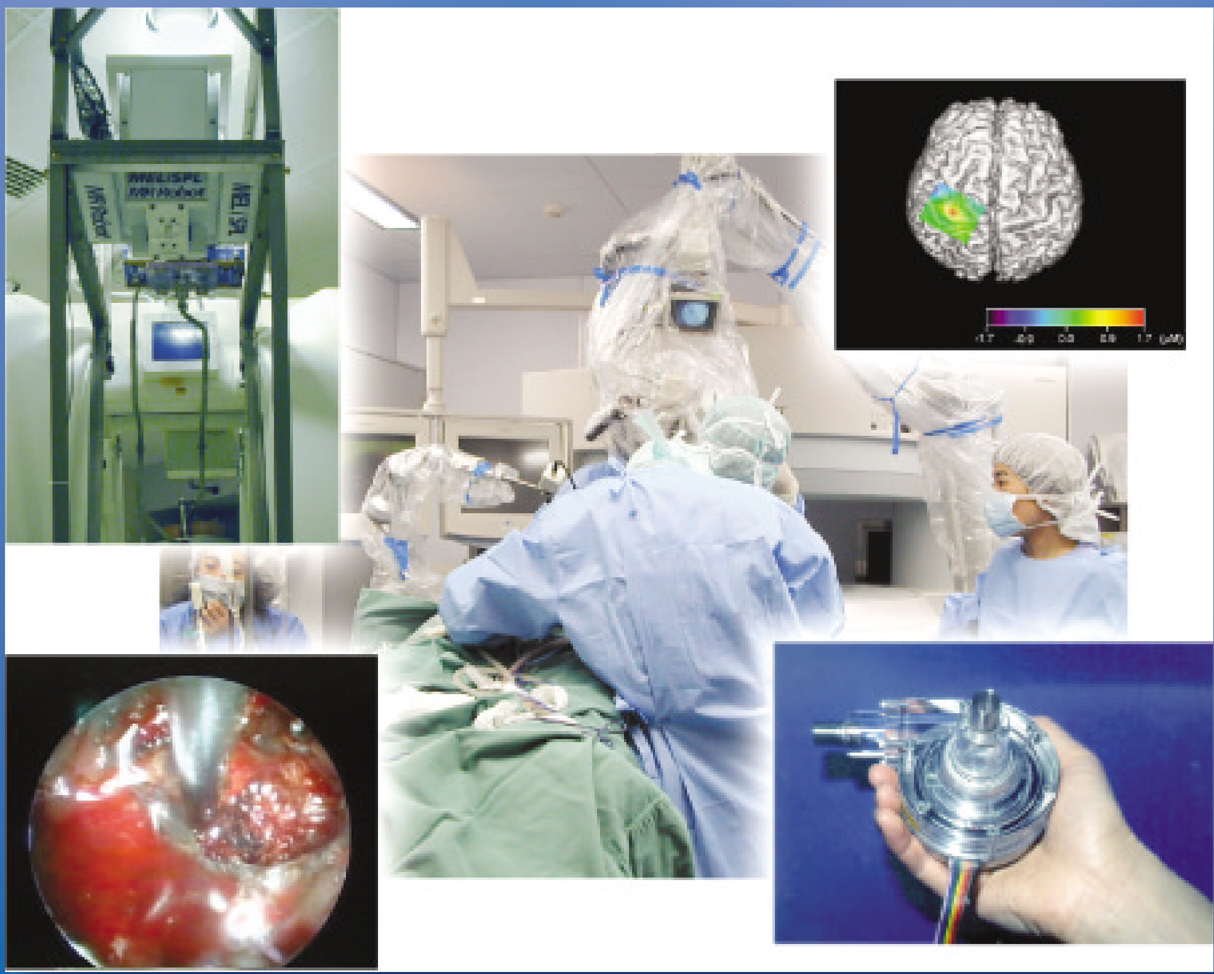
National Institute of Advanced Industrial Science and Technology (AIST)



Special Issue : Guide to AIST

National Institute of Advanced Industrial Science and Technology

President **Hiroyuki Yoshikawa**

Greetings

Upon the establishment of AIST (National Institute of Advanced Industrial Science and Technology), an independent administrative institution, I would like to say a few words by way of greeting.

The industrial technology of our country has contributed, on a large scale, to achievement of postwar advanced economic growth. However, one factor contributing to the continuing slowdown in the economy of our country after the 1990s, and which has remained at a low level for a long period of time, is the competitive power fall due to stagnation of industrial technical power. It will be an important subject for our country to improve its industrial technical power and to achieve competitive power in an increasingly globalized international society.

Furthermore, in the beginning of the 21st century, more and more is being expected of organizations and researchers engaged in science and technology. Such expectations involve, from an international point of view, solving problems common to man such as depletion of resources / energy and global environmental issues, and, from a domestic point of view, creating new industries regardless of mature existing industries.

When AIST was established, and in order to precisely meet the expectations of our country and its people, the organization was designed so that effective and efficient research and development would be performed with mobility, openness, creativity, fusion, reliability and continuity in mind.

With the purpose of achieving policy objectives, AIST's target is firmly aligned with fundamental / pioneering research and political needs, performing research and development systematically and synthetically, which leads to the improvement of science and technology in our country.

With such independent administrative institutionalization, there are no longer numerous restrictions which used to be imposed on conventional national research organizations, and flexible organization operation becomes possible at the discretion of the head of the organization. From now on, human resources and research funds will be invested in important research fields preponderantly and flexibly.

Simultaneously, being able to perform self-sustaining operations means that it will become a fundamental duty of research institutes and researchers to explain research details and results to society. For this reason, strict self-valuation will be performed and the results will be reflected in operations. Moreover, not only research results shall be dispatched and distributed but our research and development activities will also be promoted to reflect the social voice.

In addition, interactions with external research organizations will be actively promoted, and AIST will work together, especially with the industrial sector, from the research implementation stage through to the practical use of research results. For this reason, a research environment shall be created, for instance, by introducing a system to take in researchers from nongovernmental companies and making precise arrangements with regards to intellectual property rights. Such an environment will help to foster researchers full of can-do spirit, and who could establish venture companies based on their research results.

Lastly, excellent research leaders from in and outside the country will be invited, and AIST will perform higher-level activities as an internationally open institute. AIST also aims to mobilize human resources throughout society and to make researches more efficient, by opening a route that allows interaction between research institutes, companies and universities, and to build a new research-and-development system framework for our country.

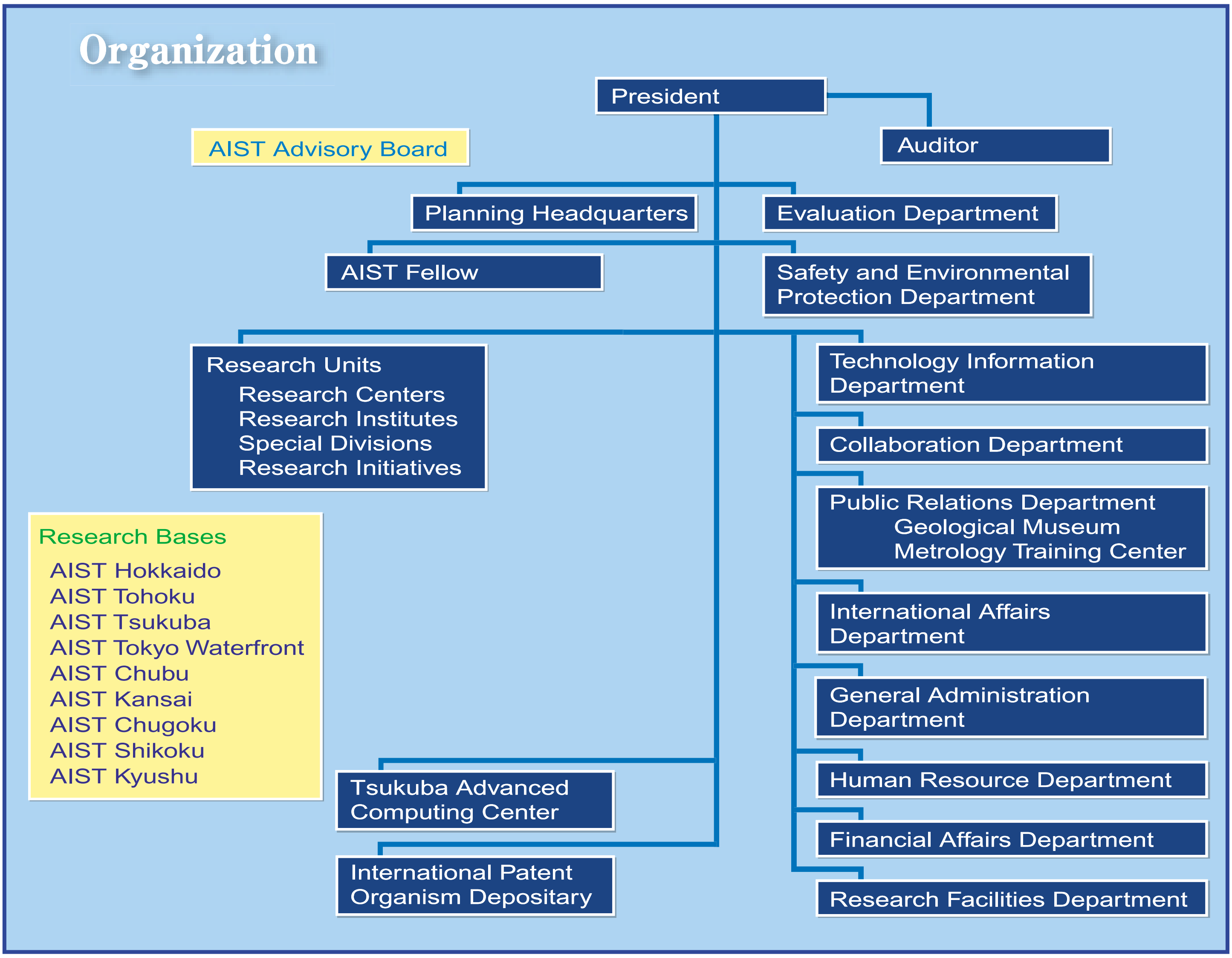
It would be our great pleasure, as a ‘creative researcher organization to lead and propose science and technology for society’ if we could contribute to bolstering competitiveness in the ‘industries’ which hold the future of this country.

AIST Tsukuba

Basic policy of AIST

Through a fusion of the research activities by a wide-range of research groups, and an exhibition of creativity, AIST generates new technologies, new industries, etc., contributes to the economic development of our country, and to improvements in the lives of our people. For this reason, the following research will be carried out, the results of which AIST endeavors to dispatch and distribute.

(a) Research and development on industrial infrastructure technology, such as measurement standards, geological surveys, and the construction of the base technologies connected with techno infrastructure maintenance in Japan.
(b) Research on energy, environmental technology, etc. which requires the country itself to search for solutions.
(c) Research which should promote innovation by activities in the broad-spectrum, and the fusion of various fields, with a view towards the reinforcement of international industrial competitive strength and the creation of new industries.



AIST consists of a research implementation section, which comprises the heart of research and development, a research related section which serves as the interface between AIST and external organizations and contributes to effective / efficient research and development, and a management section responsible for research and development management operations.

The Tsukuba central research base, research operations located in Hokkaido, Tohoku, Chubu, Kansai, Chugoku, Shikoku and Kyushu, and the newly implemented Tokyo Waterfront research base, allows AIST to operate a nationwide research-and-development network.

Our research management and research related sections have established, under the top-down management of the president of the board, a "Planning Headquarters" to serve as a controller of the whole corporation, a "Collaboration Department" to vigorously promote research exchange with external organizations, a "Technology Information Department" to propose national industrial technical strategies, based on leading-edge technical and research-and-development trends, an "International Affairs Department" to engage in international developments

Research Units List

Research Center

Research Center for Deep Geological Environments	Advanced Semiconductor Research Center
Active Fault Research Center	Cyber Assist Research Center
Research Center for Chemical Risk Management	Research Center for Advanced Manufacturing on Nanoscale Science and Engineering
Research Center for Developing Fluorinated Greenhouse Gas Alternatives	Digital Manufacturing Research Center
Research Center for Life Cycle Assessment	Macromolecular Technology Research Center
Power Electronics Research Center	Photoreaction Control Research Center
Computational Biology Research Center	Research Center for Advanced Carbon Materials
Biological Information Research Center	Synergy Materials Research Center
Tissue Engineering Research Center	Supercritical Fluid Research Center
Gene Discovery Research Center	Smart Structure Research Center
Human Stress Signal Research Center	Nanoarchitectonics Research Center
Correlated Electron Research Center	

Research Institute

Metrology Institute of Japan	Photonics Research Institute
Institute of Geoscience	Research Institute of Biological Resources
Institute for Geo-Resources and Environment	Institute of Molecular and Cell Biology
Institute for Marine Resources and Environment	Institute for Human Science and Biomedical Engineering
Institute for Energy Utilization	Neuroscience Research Institute
Energy Electronics Institute	Institute for Materials & Chemical Process
Institute for Environmental Management Technology	Ceramics Research Institute
Research Institute for Green Technology	Institute for Structural and Engineering Materials
Information Technology Research Institute	Institute of Mechanical Systems Engineering
Intelligent Systems Institute	Nanotechnology Research Institute
Nanoelectronics Research Institute	Research Institute for Computational Sciences

Special Division

Special Division for Human Life Technology	Special Division of Green Life Technology

Research Initiative

Research Initiative for Green Chemical Process	Laboratory for Advanced Optical Technology
Research Initiative for Thin Film Silicon Solar Cells	Microgravity Materials Laboratory
Digital Human Laboratory	Laboratory of Purified Materials
Life Electronics Laboratory	

such as research collaboration and the establishment / operation of overseas bases, and a "Public Relations Department" to serve as the center for the dispatch and diffusion of research results. A self-sustaining organization has been established, which meets domestic and international expectations through research planning, implementation and diffusion relevant to industrial technology.

In order to respond precisely to the particularities of the various research fields, research missions, diversity of research-and-development phases, etc., the Research Implementation Department, which forms the core of the research institute, has set up various kinds of research organizations.

● Research Center

The Research Center promotes pioneering and strategic projects by giving priority in investing research resources such as budget and human resources. The Research Center impacts the industrial world, academic circles and society, and has clear missions. The Research Center, as a mobile organization established for a specified period of time, will be operated by top-down management.

Moreover, talented people, with leadership in their fields, shall be appointed to the Center from inside and outside the country.

● Research Institute

In order to carry out its tasks and materialize mid & long-term strategies, the Research Institute makes it a rule to set research themes from the bottom up based on each researcher's proposition, and is operated with a certain continuance. As well as being positioned as a place to develop technical potential, the Research Institute is also organized from the standpoint of the exhibition of organization ability by clarifying tasks to meet needs and displaying a sense of technical affinity, and furthermore, from the standpoint of new technology field developments by a fusion of research fields.

● Special Division

From the viewpoint of aiming at field fusion-like new research development utilizing large-scale industrial research accumulated in the Kansai region, the Special Division is placed as an experimental organization to enable research and development activities in various phases – from basic research through to the practical application of research, all to be carried out in a unifying and mobile way.

● Research Initiative

The Research Initiative is positioned as a research unit to promote research projects, with mobility, for a specified period of time, in relation to themes with a high possibility of interfiled fusion and to themes concerning sudden administrative needs.

Research Center for Deep Geological Environments

According to the electronic power supply policy of the Government, high-level radioactive waste from the nuclear power plants must be buried deep underground for several decades. To dispose of the waste safely, information about deep geological environments of the Japanese islands is necessary. Required information includes: underground geological characteristics, dynamic geological processes, and the long-term stability of geological environments. To provide technical, neutral, and reliable information, the center, as a core of the national geological survey, will make an extensive investigation of deep geological environments.

Field survey on geology

Research Center for Developing Fluorinated Greenhouse Gas Alternatives

CFC (chlorofluorocarbon) compounds have been widely used in various industries due to their outstanding properties. However, these compounds cause the depletion of the ozone layer and global warming. The development of alternative technologies is needed.

To protect the ozone layer, a wide variety of CFC alternatives have been proposed and introduced into the market under the Montreal Protocol, but as for the global warming, three fluorinated gases such as HFC (hydrofluorocarbon), PFC (perfluorocarbon) and SF_6 (sulfur hexafluoride), were classified as greenhouse gases to be reduced under the Kyoto Protocol. Since then the development of alternative technologies has become an important issue.

In this research center, we will study and propose new alternatives to fluorinated greenhouse gases. Our approach will include the scientific evaluation of the effect of fluorinated compounds on global warming and an investigation of the neccessary properties of possible candidates. The collective search for, recovery, disposal and re-use of fluorinated greenhouse gases will be conducted in parallel with our other research.

Research Center for Life Cycle Assessment

Life Cycle Assessment (LCA) is a method to assess the environmental affects of goods or services. For example, when we assess the life cycle environmental influence of a car, we should take account of not only the pollution by exhaust gas but also environmental affects by manufacturing and scrapping of the car, production of its materials, and so on. LCA considers assessed goods or services from the cradle to the grave. Many manufacturing companies have started to adopt this method to evaluate the environmental performance of industrial products.

Through our research activities, Research Center for Life Cycle Assessment is targeting to promote the construction of environmentally acceptable societies and the life of less environmental impacts.

Active Fault Research Center

"Active faults" refer to faults that have a possibility of producing large earthquakes. There are many active faults in Japan.

Active Fault Research Center conducts the following research to reduce seismic hazards.

1. Study of active faults

We survey 98 major active faults in Japan and estimate the probability and magnitude of future earthquakes for each fault. We also study large active faults overseas to advance the evaluation method of earthquakes on domestic large active faults such as the Median Tectonic Line or Itoigawa-Shizuoka T. L..

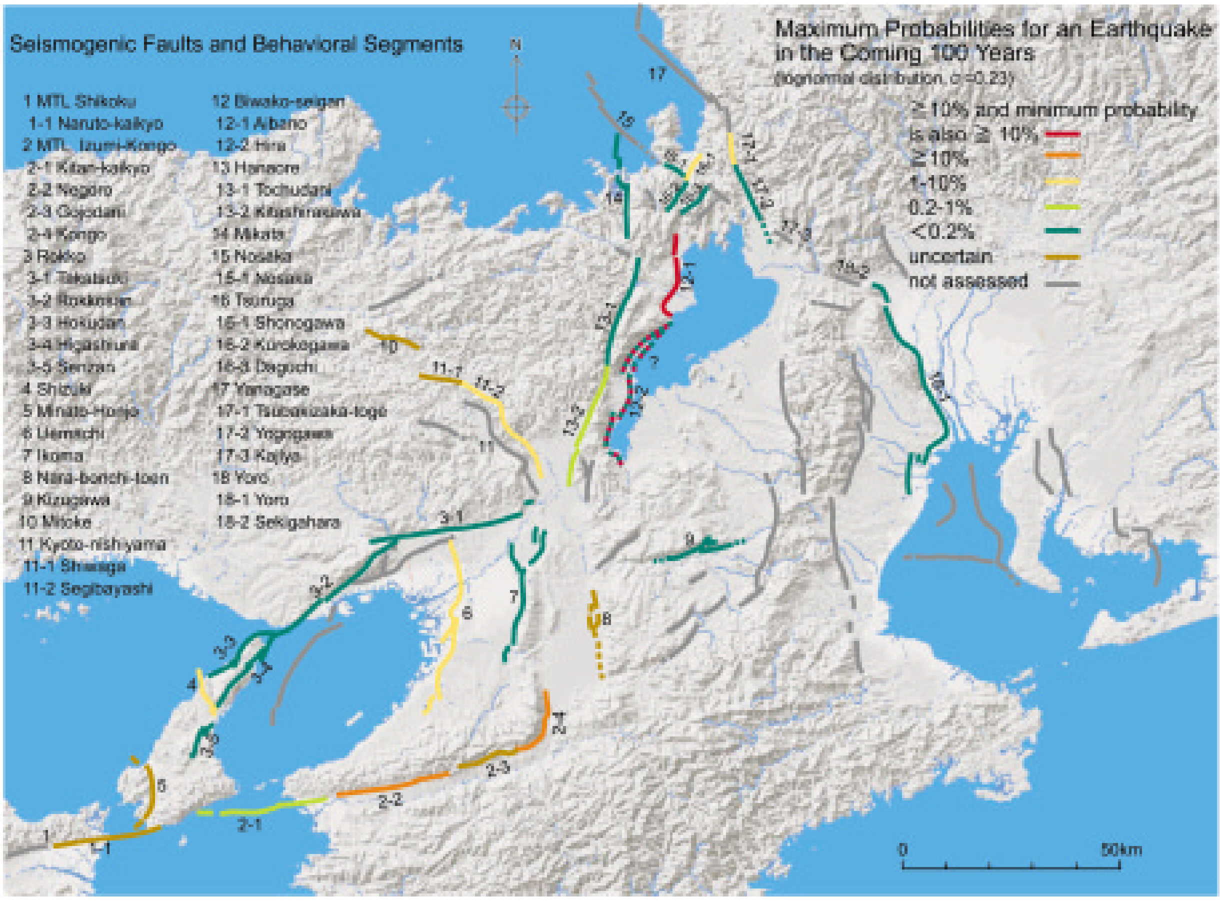
2. Assessing earthquake hazards

Combining information on geologic structures and active faults, we estimate seismic hazards. We also study tsunami deposits preserved in geologic layers and make computer simulations of tsunamis.

3. Public outreach

We annually publish Interim Reports on active fault studies. We also publish active fault strip maps and 1:500,000-scale seismotectonic maps. We plan to publish maps showing possible hazards from future earthquakes and tsunamis.

Information on these publications will be also available on our web site.



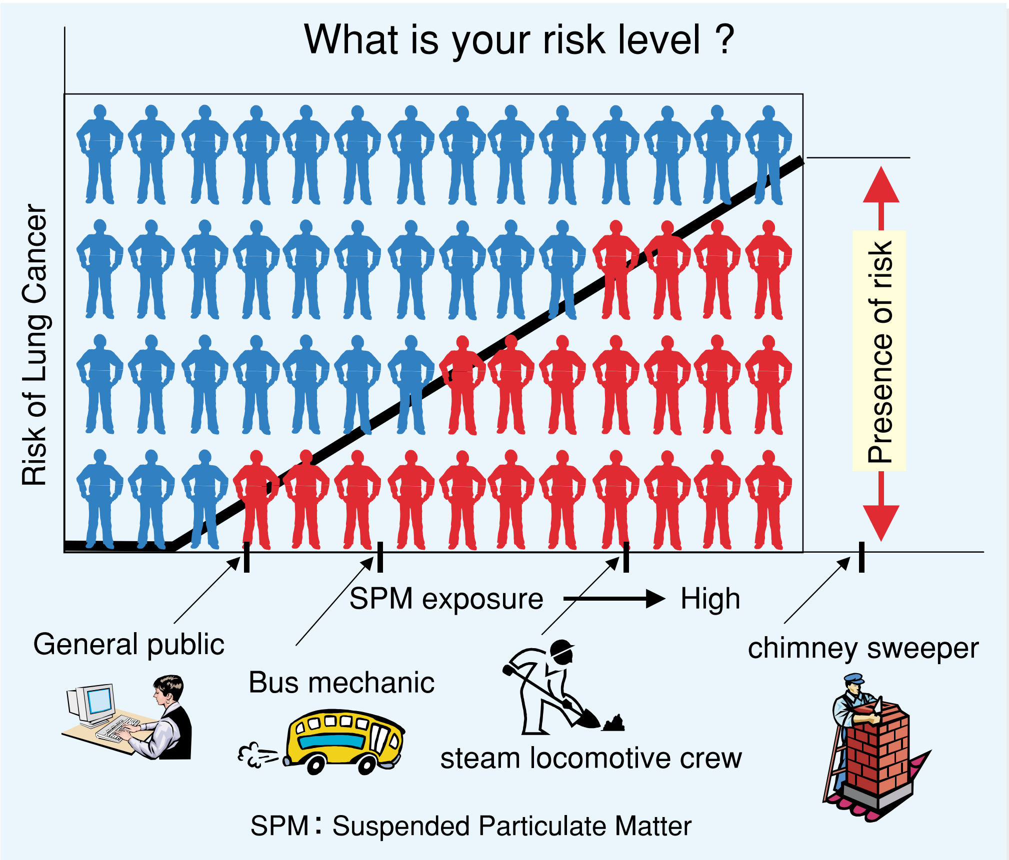
Active faults in the Kinki-Tokai district and their maximum earthquake probabilities in the 21st century

Research Center for Chemical Risk Management

In order to enjoy the advantage of chemical substances as much as possible without losing public acceptance, we must manage those chemicals on the basis of scientifically sound risk assessment. We focus on the following four research topics.

Research topics

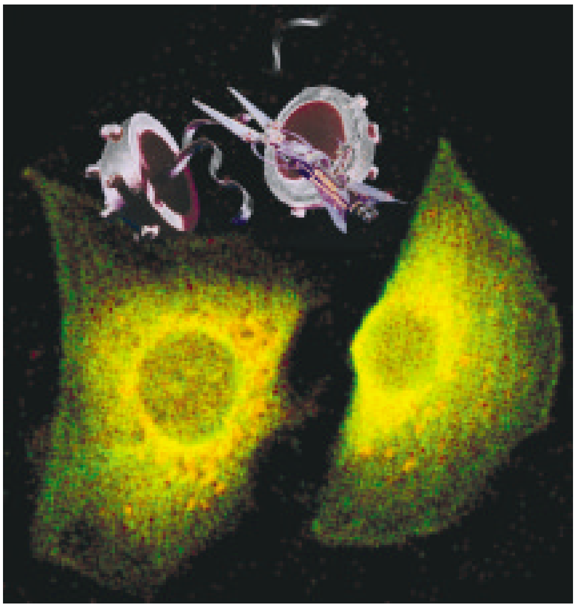
1. Development of methodology for exposure assessment of chemicals
We develop the methodology for estimating concentrations of chemical substances in environmental media and the behavior model of chemical substances in human body. We also develop the methodology for assessing ecological risk of persistent chemicals.
2. Searching chemicals with significant risk
We screen the chemicals with little risk information and find the chemicals with significant risk by integrating the information from monitoring, source identification method and epidemiological studies.
3. Development of methodology for quantification of risk
We derive dose-response relationships of chemicals based on toxicological and epidemiological information. We also quantify and compare their risk levels by developing appropriate endpoints for both fatal and nonfatal ones.
4. Development of methodology for risk management and risk communication
We incorporate uncertainty and variability into risk assessment and develop the methodology of socio-economic analysis such as cost benefit analysis and cost effectiveness analysis.



Gene Discovery Research Center

As human, animal and plant genome projects progress, the cutting-edge of life science research in the 21st century will focus on gaining comprehensive understanding of the inter-connected functions of genes, proteins and other biological substances, and their roles in complex biological phenomena and diseases. Newly gained knowledge will propel development of approaches for prevention and cure of severe diseases, and the creation of valuable new industrial, pharmaceutical, and agricultural applications.

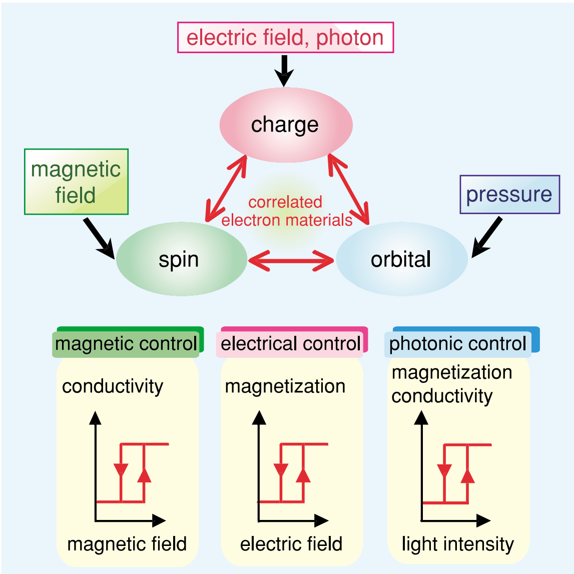
The mission of this Center is to discover and explore the new functional genes involved in important biological phenomena from cell regulation to aging; to precisely understand their structure-function relationships and roles in the context of networks of other genes, proteins, and associated biological substances, and by these discoveries contribute to medicine, industry, and society as a whole.



Research foci include, (1) development of novel nucleic acid-based tools for gene discovery, (2) exploration of biological networks and the structure-function relationship of their components, genes, proteins and associated biological substances, (3) delineation of cellular regulatory mechanisms, (4) determination of genetic and molecular mechanisms responsible for age-regulation of the blood coagulation system, (5) development of novel gene delivery systems and gene therapy methods.

Correlated Electron Research Center

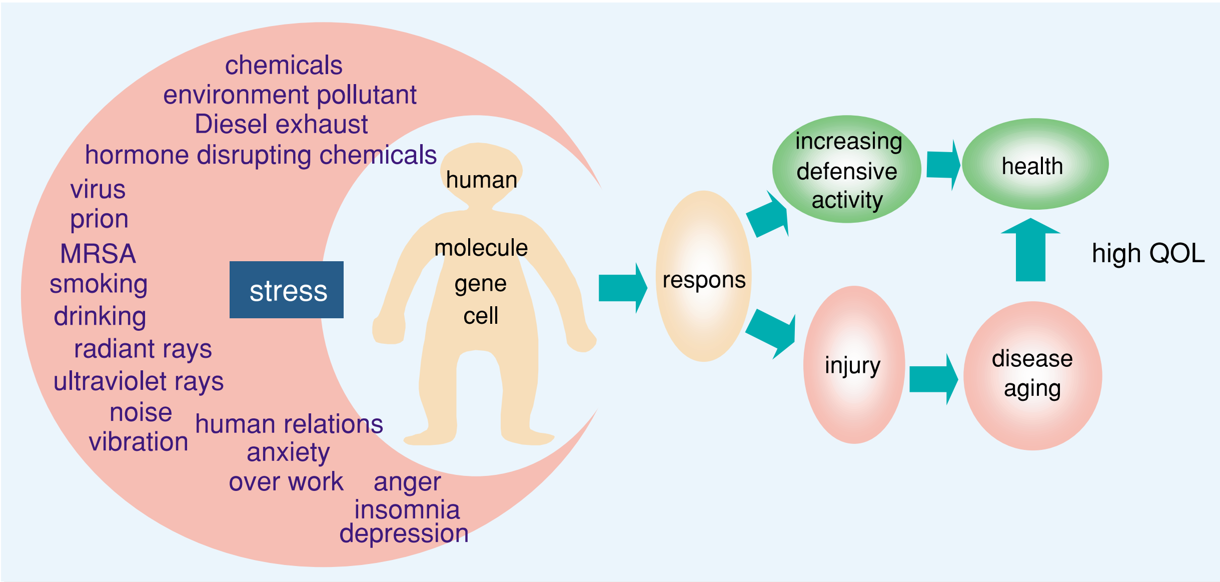
Correlated Electron Research Center (CERC) aims at exploring new quantum-functional materials and developing new quantum-devices on the basis of emerging physical science on correlated electron system. The term “correlated electrons” represents the sate of matter where many electrons are strongly interacting with each other, forming the liquid-, solid-, and liquid-crystal-like state of electrons. Those electronic phases can be switched by external stimuli, which causes drastic changes in magnetic, electrical, and optical properties. Such a phase switching can be as fast as one picosecond or less. Correlated electron (CE) technology will utilize this gigantic phase-response of electrons as the out-put functionality.



Human Stress Signal Research Center

It is said that this is the age of stress. We are exposed to various chemical, biological, physical, and social stressors, such as toxic chemicals (including dioxin and endocrine disrupting chemicals) air pollutants (diesel exhaust gas and particles) viruses, radiation, ultraviolet light, noise, overwork, anxiety, insomnia, depression and technostress. There is now increasing evidence that shows the involvement of such stress in a variety of disorders, diseases, and aging. It is a matter of the utmost importance to study the biological effects of such stress and develop means to cope with them.

This Research Center aims to uncover the biological response to such stress by molecular, cellular and tissue levels and develop a sensitive and specific lab-chip to detect stress-markers and also devices to measure, in situ, the extent of stress to humans. It is hoped that this Research Center will take the initiative for promoting stress-bioscience interdisciplinarily and internationally.



Digital Manufacturing Research Center

One of the main features of the Japanese manufacturing industry is the strong production ability, the combination of manufacturing skill and manufacturing technology development, especially those of small and medium enterprises (SMEs). Based on the recognition that Japan is losing this core competence, technological research and development programs are recommended by which manufacturing skills owned by skilled engineers are strengthened by information technology, to create additional values. The research center focuses on the material processing technology, the standing business activity for the SMEs. The objectives are to enhance the competitiveness and to create new industrial business models by analyzing, modeling the skills and digitalizing them. A common software platform for the digitalized skills is being developed concurrently so user SMEs can customize and develop them freely in their own way. The research is being done in close connection with tri-sectors and all of the research results are open to the public via the Internet as manufacturing information infrastructure.

Cyber Assist Research Center

AIST Tokyo Waterfront http://www.carc.aist.go.jp

Goal

Cyber Assist Research Center is a forum for collaboration of industry and academia to embody a future information technology integrating device, infrastructure, software, and services.

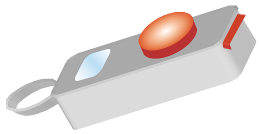
Our final goal is to develop a mobile terminal called My-Button, the infrastructure communicating with it, and prototype services based on them. Those services will provide you with appropriate information in accordance with your situation while protecting your privacy. This is essential for everybody to enjoy the merits of information technology.

Cyber

"Cyber" is often used to mean the virtual logical space created by the Internet and the computers plugged therein, but we use this term in its original sense of cybernetics (the field of study on control and communication). Namely, cyber space stands for a sensor-actuator network plus control systems plugged to it. "Cyber assist" is to assist you with a communication network involving intelligent sensors built into the town.

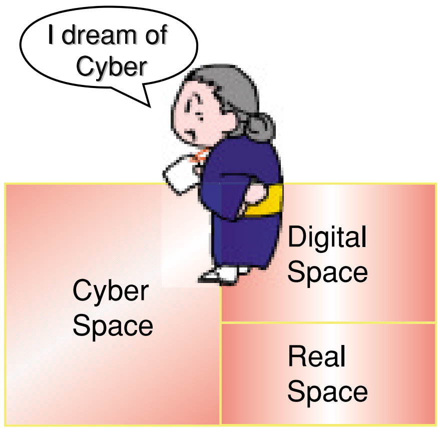
Situated Assist

We consider semantic annotation of information content with anchors to physical locations. Interactive information services based on meaning and context are realized by referring to rich contextual information containing your location and needs, and using semantically annotated information content including the user model.



My-Button

Anytime, anywhere, you get anything you want with just one press of the button. The above is a key ring type model. Others may look like badges and buttons.



Cyber space is the integration of digital and real spaces

Privacy Protection

The present Internet and telephones communicate based on addresses and phone numbers, which identify individuals. Services are provided along the same line and paid via credit-card numbers. Who got which service cannot be concealed. Legal protection cannot be perfect.

Location-based communication is an entirely new communication method we are developing. Your physical location will be the target of services without identifying you. You pay for it by digital cash, which also avoids your identification. This is to reintroduce in the cyber space the real cash, the great anonymous medium of transaction.

● Research Center for Advanced Manufacturing on Nanoscale Science and Engineering

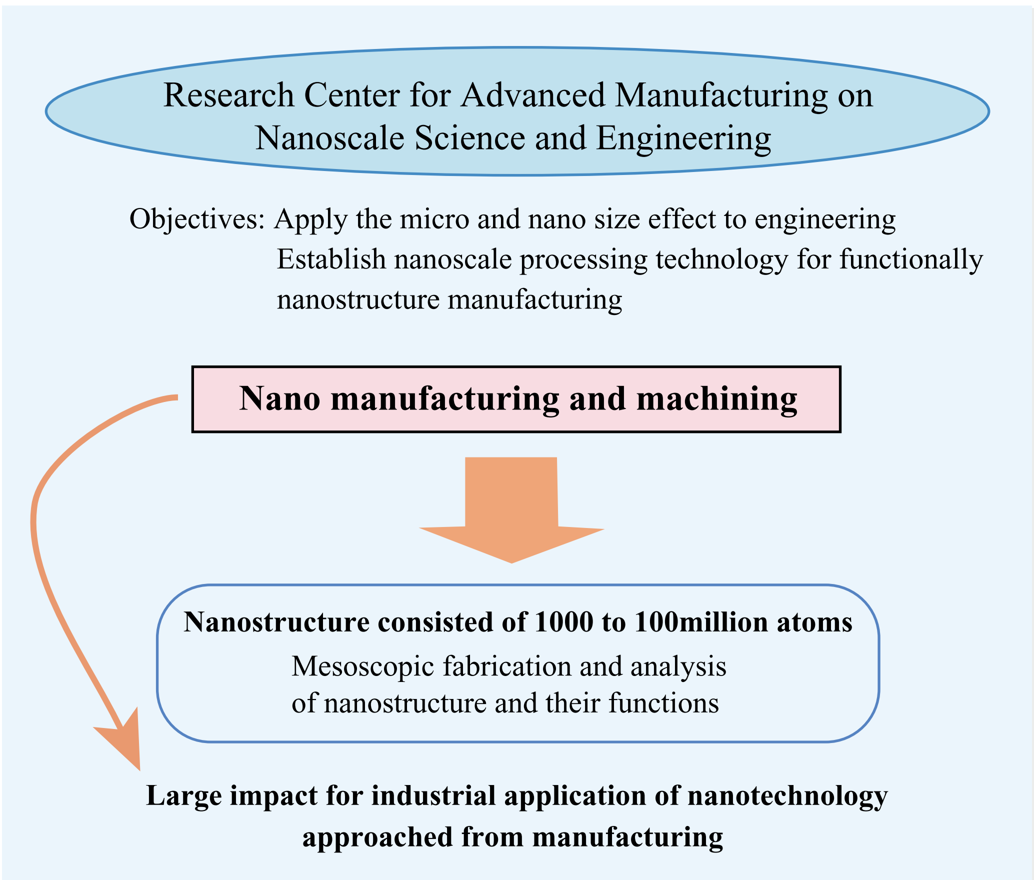
- Advanced nanoscale manufacturing and its applications for optical devices and energy conversion engineering -

Advanced nanoscale manufacturing as a novel ultra-fine processing technology will be established for engineering applications utilizing microscopic structure, size and surface effects and quantum effects. Nanoscale manufacturing ("nano-manufacturing") aims at the technical innovation in manufacturing as followed. 1) The investigation and analysis of nanoscale effects, that is, control the function of devices that are based on nanoparticles and molecular engineering. 2) The realization of nanoscale effects for the advanced devices by means of nanoscale manufacturing.

The definite research themes are the development of advanced tool and machine, and ultra-fine manufacturing technique for nanoscale processing. As results of this research, advanced optical devices and energy conversion devices will be developed.

This research center will attempt to realize the "engineering application of the microscopic effects" through the development of the advanced processing methods including the analysis of nanoscale effects.

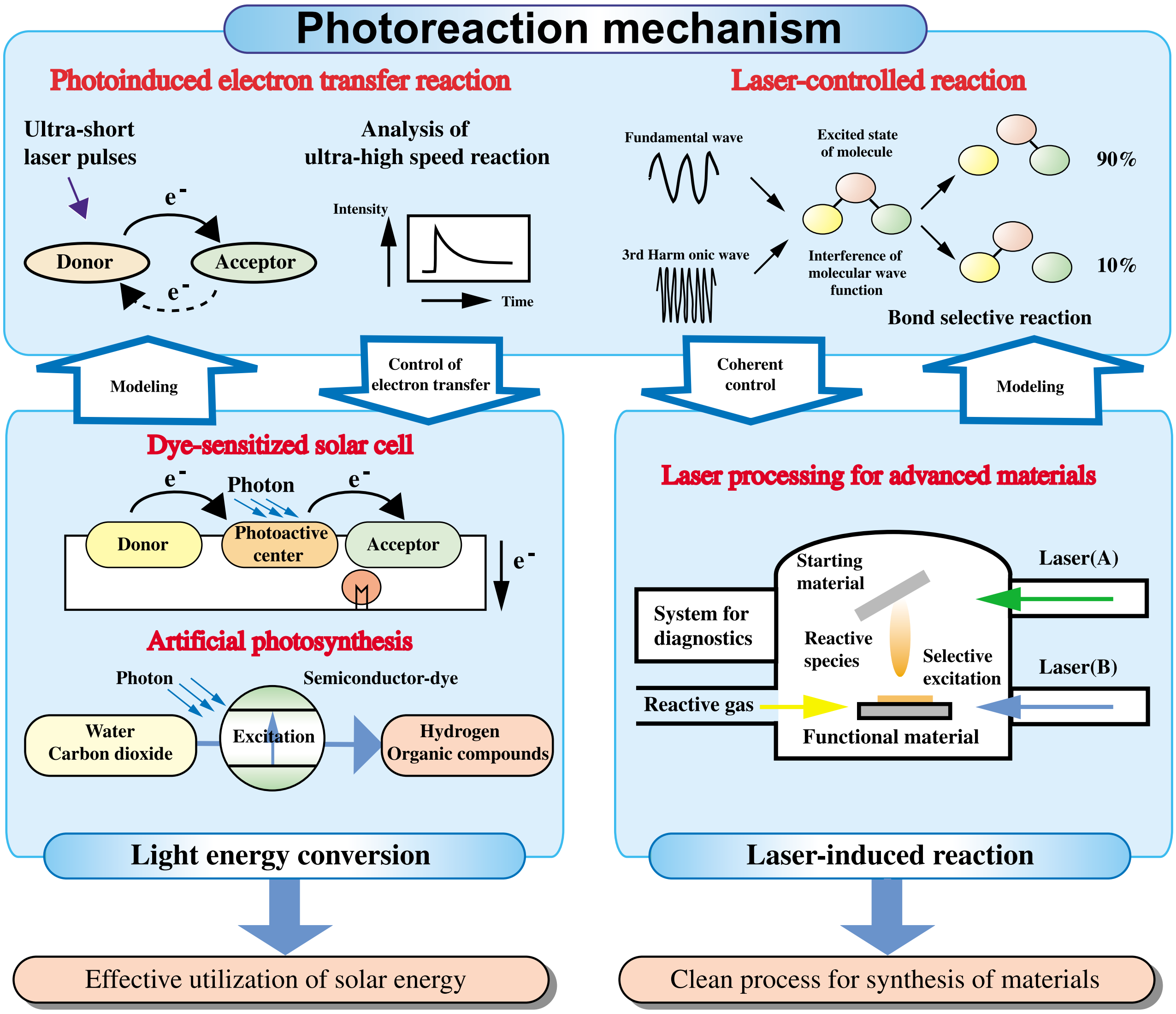
Fabrication Technology of Uniform Nanoscale Particles for Novel Electronic Devices.



Main objectives and concept of the research center

Photoreaction Control Research Center

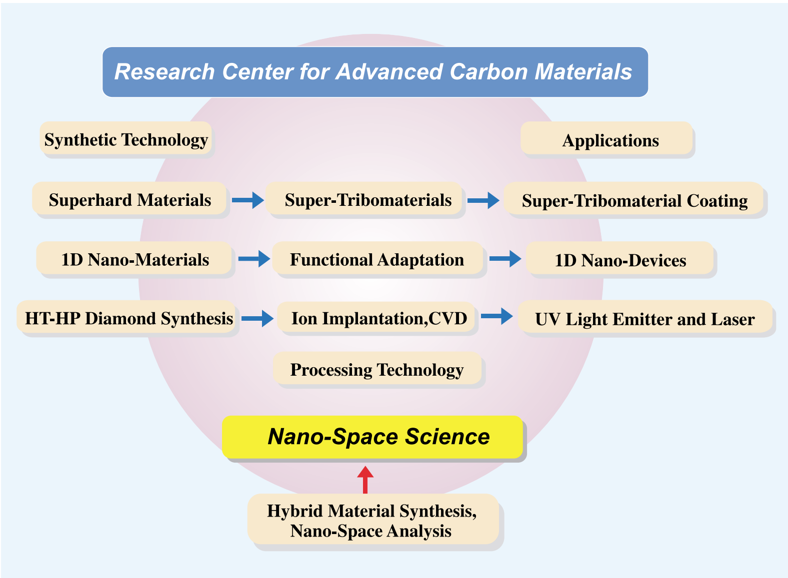
As the 21st century is called "Photon-age", a highly controlled photoreaction technology is expected to contribute to the solution of the serious global problems of energy shortage and environmental destruction. The center is aiming at the establishment of new technologies, such as highly efficient utilization of solar light energy, which is inexhaustible and clean energy source, and laser chemical processing, which provides the desired product without environmental pollution, by systematic researches from fundamental to practical steps. Our center is also aiming to become the Center of Excellence (COE) in this research field by contributing to our industries as well as disseminating our research results to the world.



Research Center for Advanced Carbon Materials

Because of the variety of chemical bonds formed by carbon atoms, carbon based materials can form different structures with various properties, ranging from the diamond to the electron emitters that are carbon nanotubes (CNT). Compared to materials with similar proprieties, carbon materials are superior in many cases.

The aim of the Research Center for Advanced Carbon Materials is to investigate the application possibilities of carbon materials; to obtain a new knowledge concerned with the structure and the function of nano-scale materials as, for example, the nano-spaces that are seen in CNT; to develop new carbon materials whose properties surpass those of current materials; to reveal new applications in various fields of applications like UV light emitters and super-tribomaterials.



Macromolecular Technology Research Center

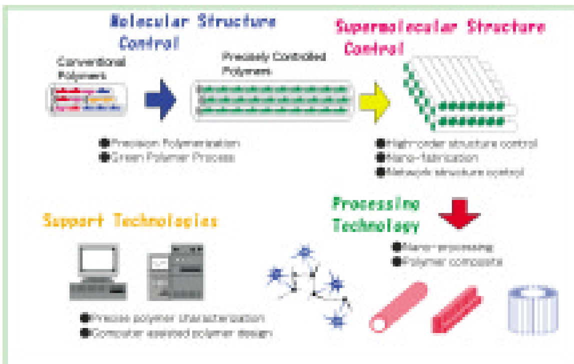
- Environmentally benign frontier polymeric materials -

The Macromolecular Technology Research Center (MTRC) aims to develop basic concepts and generic technology for manufacturing high performance and environmentally benign novel polymeric materials with tailor-made properties by controlling their structure precisely at molecular and supermolecular level.

Outline of Research

MTRC's main targets are as follows;

1. High-performance Polymers.
2. Tailor-made Polymeric Materials.
3. Green Polymer Process.



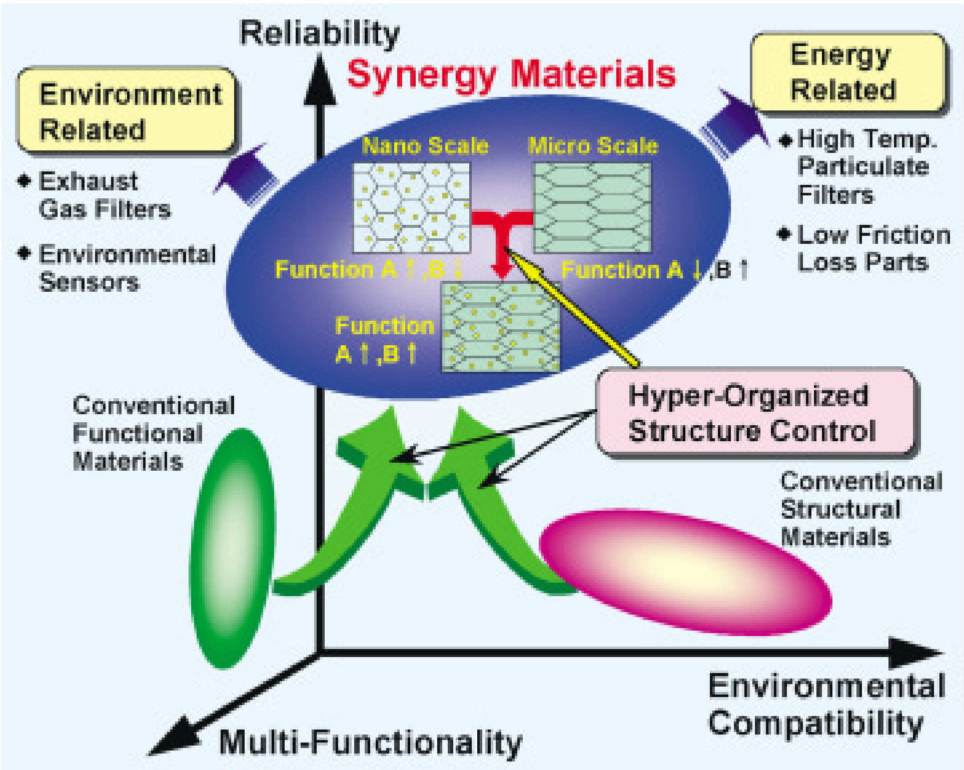
Precisely structure controlled polymers

Synergy Materials Research Center

Serious environmental problems press for the establishment of environment-friendly technologies with low consumption of energy and resources. Industrial application of these technologies, on the other hand, calls for new developments in the materials science field, as materials will be used under increasingly severe operating conditions. It is imperative, then, to create novel materials with outstanding combinations of thermal, electrical, chemical and mechanical properties, exhibiting totally new and/or markedly improved functions, as well as with a high degree of reliability and stability.

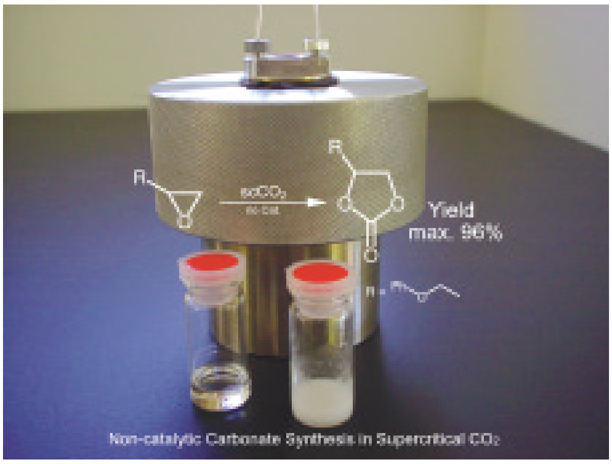
Synergy is the word commonly used to describe the positive outcome from a mutually beneficial relationship between diverse agents. However, in the case of materials, a good function or property is usually achieved at the expense of another function or property. In general, a material consists of many kinds of structural elements, such as crystalline grains, pores and grain boundaries whose different morphologies and distribution determine the structure. Therefore, simultaneous control of different structural elements at diverse scale levels enables us to attain compatibility of antagonistic properties and a synergistic effect of functions for a given material. This concept will be referred hereinafter as “Hyper-Organized Structure Control”.

The Synergy Materials Research Center aims to create a new family of novel materials, through the application of this concept, to contribute to the solution of environmental problems. The Research Center focuses on the development of four types of materials: permeable materials, tribological materials, environment purifying materials and environmental sensors. Standardization of processing and evaluation of materials is essential to enhance industrial application for those materials. The research center is also involved with standardization- related research. An outline of each research topic will be introduced in the following section.



Scope of synergy materials

Supercritical Fluid Research Center



The purpose of Supercritical Fluid Research Center is to develop new super- critical fluid (SCF) technologies for "green chemical processes" or environmentally benign processes. This achievement is based on the elucidation of micro- and/or macroscopic properties of SCFs. Generally, physical properties of SCFs, such as density and viscosity, lie between those of liquid and gas states. Because of these unique features, there has been enormous interest in the use of SCFs as solvents for chemical reactions. The physicochemical characteristics change greatly with variations in temperature and pressure, and the control of these properties may lead to a significant improvement in reaction rate and/or selectivity.

It is expected that the behavior of solute-solvent clustering on a chemical reaction in SCFs would be elucidated effectively by the development of a spectroscopic system at this research center. Results on SCF technology generated at the research center, will further contribute to the industrial companies who take part in the New Sun Shine SCF Project, in terms of developing new industrial technologies.

Nanoarchitectonics Research Center

The exploitation of nanotechnology in the fabrication of nanostructured materials and devices is expected to enable developments such as micro-robot therapy, a complete circulated society and even artificial life in the distant future.

The Nanoarchitectonics Research Center, in close collaboration with the Graduate School of Frontier Sciences, the University of Tokyo, aims to establish "bottom-up" nanoscale technologies based on molecular self-assembly, hierarchical atomic nanostructure construction and atomic level measurement techniques. Typical nanostructured parts and materials would include lipid nanotubes, molecular wires, cluster solids, nano-particles, molecular switches and molecular motors. Bringing together the disciplines of chemistry, physics, biology, materials science and analytical chemistry, this research center takes an interdisciplinary approach to the creation of integrated small objects, such as nano-sensors or nano-chips, on the 1 to 100 nanometer scale. In addition, measurement techniques with extremely high sensitivity and spatial resolution are being developed for the detection and analysis of single molecules that this requires.

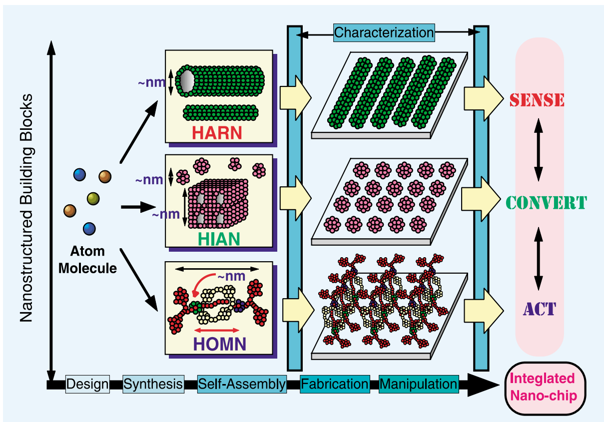


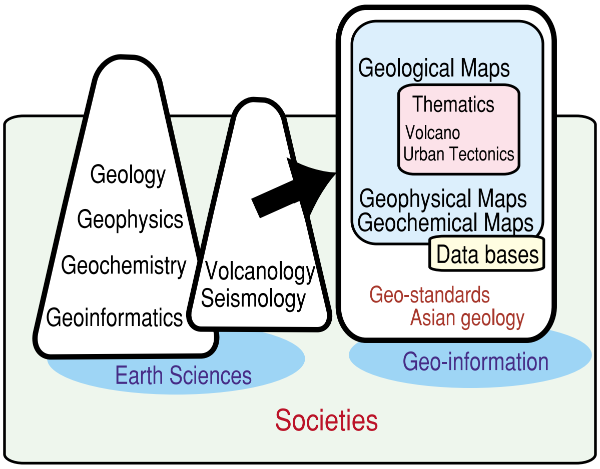
Figure highly ordered structures on surfaces using nanostructured building blocks

Institute of Geoscience

The Institute of Geoscience is one of the core units of the Geological Survey of Japan, AIST, METI. It is responsible for geological, geophysical and geochemical research that provides geoscience information and expertise for the sustainable development of the nation and a better life for the people.

The Geological Survey of Japan (GSJ), established in 1882, has been responsible for national missions in the goescience field. Japan is an industrialized country in a unique geological setting, that is, one of the most active island arc systems in the world. The GSJ has continuously provided systematic geologic information to society.

The need for geoscientific information is increasing for industrial development plans, preservation of the geological environment and mitigation of geologic hazards. We will maintain the GSJ's basic research function in co-operation with related research institutes in AIST. We will strive for higher quality and easier access of geo-information for global standardization.



Missions of institute

Institute for Geo-Resources and Environment

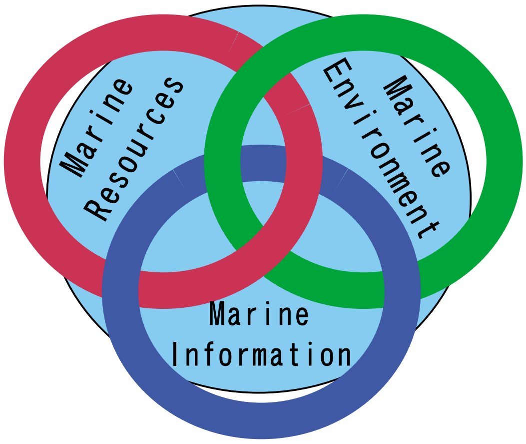
At the Institute for Geo-Resources and Environment, one of our missions is to contribute to national society and industries through field surveys and research on planning and evaluation of exploration, development and utilization of underground resources, such as geothermal and fuel resources and inorganic resources, for stable supply of basic energy and mineral resources of human life.

The other is to contribute sustenance of safety and environment through research on environmental forecast and assessment, environmental sustenance plan, and safety operation in relation to the development and utilization of underground spaces.

The institute makes above- mentioned broad research by combination specialties of earth science and engineering groups.

Institute for Marine Resources and Environment

The ocean, covering 70 percent of the earth's surface, contains a vast amount of useful natural resources and plays an important role for the stabilization of the global environment. It is important to understand the nature of the ocean and to make use of its resources and energy with less environmental damage. This institute covers marine sciences including geological and environmental studies and a wide range of marine-related technologies, such as utilization of marine spaces, development of marine resources, environmental mitigation, protection against natural disasters etc.

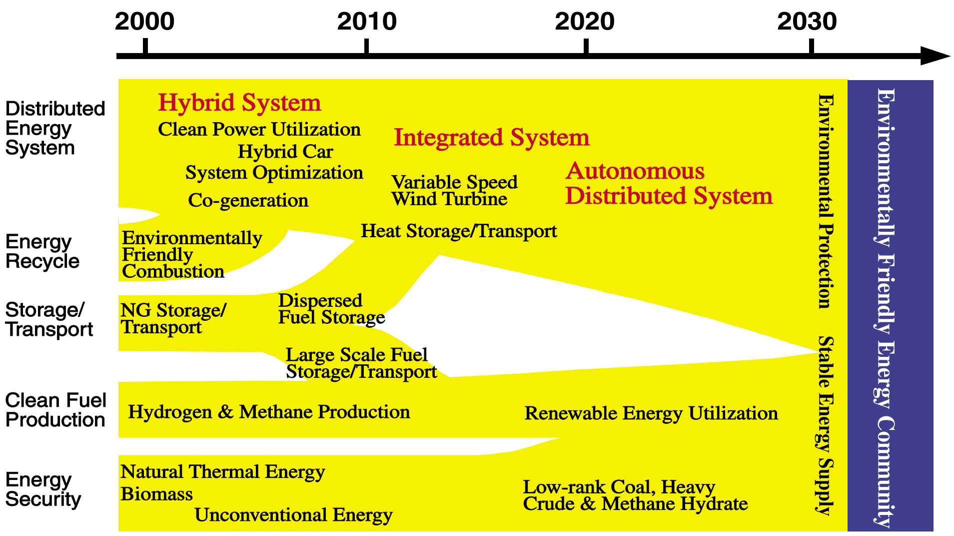


Institute for Energy Utilization

Advanced technologies for reduction of greenhouse gas emission and energy security will become more important for the growth of industries and the comfort of society.

The Institute for Energy Utilization will be following these research topics:

1. Distributed energy system for the efficient utilization of power and heat to improve total energy efficiency.
2. Energy recovery technologies for organic wastes and unutilized exhaust heat.
3. Innovative technologies for energy transportation and storage.
4. Hydrogen and methane production.
5. Wind power generation, solar energy utilization technologies.
6. Efficient utilization technologies for biomass and super-heavy hydrocarbon resources.



R & D strategy of energy utilization technology

Institute for Environmental Management Technology

Our life consumes much energy and many resources, which results in various environmental issues. To realize a cleaner environment, technologies controlling environmental pollutants and preventing their diffusion to the environment, technologies purifying environmental pollutants, and technologies for environmental assessment as well as evaluation of energy utilization and environmental technologies shall be developed.

Measurements of Pollutants

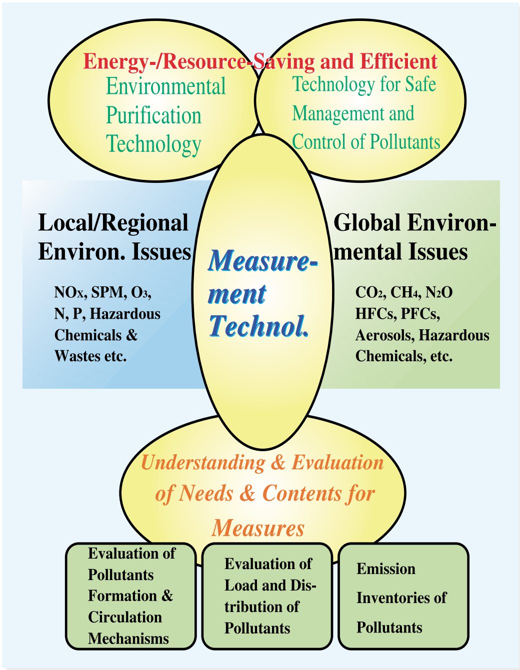
Development of technologies to measure trace chemicals rapidly and precisely shall be performed. The measurement systems will be used to control emission sources and to diagnose the environment.

Evaluation and Prediction of Environmental Impacts

Models capable of assess the distribution, accumulation and circulation mechanisms of NO_X, SPM, hazardous chemicals, CO_2 and others in the environment will be developed.

Cleaning of the Environment

Energy- and resources-saving technologies that can suppress the emission of pollutants into the environment, as well as purify and/or remediate contaminated environments (air, water, soils, ocean) will be developed.



Integrated R & D managing and controlling the local to global environment

Research Institute for Green Technology

For human beings to survive in the 21st century, it is essential to convert the present mass-production and mass-consumption society into an environmental-friendly recycling-based sustainable society that harmonizes with the global environment. Under these circumstances, the Research Institute for Green Technology is doing research work to develop various environmentally benign technologies in order to realize an economical society, make an efficient use of natural resources while reducing/recycling wastes, control/minimize the risks of chemical substances, and reduce global environmental pollution. The Institute hopes to become a unique research center by doing research in a systematical way on environment-related technologies in the field of ecological materials, eco-processes and environmental catalysis.

Information Technology Research Institute

Information Technology has pervades our everyday life and has become one of the most important and influential technologies. We contribute to establishing the following generic information technologies which enable everyone to utilize digital information network conveniently and safely, anytime anywhere, in order to create and share enormous amount of information and knowledge freely at a very high speed:

Information network technology

The technology which enables us to execute various activities on the digital information network safely, without stress, anytime anywhere.

Advanced computing technology

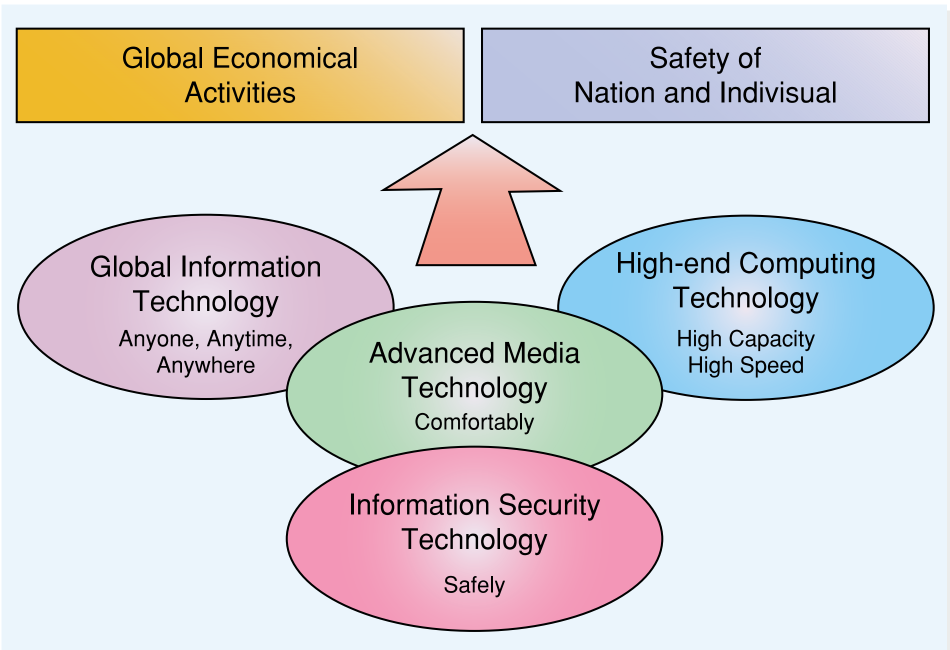
The technology for fast analyzing, processing, accumulating and searching of enormous amount of information.

Human interface technology

The technology for making the smooth and comfortable interaction between information network and humans.

In particular, considering our technical advantage and the role as a public research institute, we concentrate on the following research subjects: Global information processing technology, High-end computing technology, Advanced media technology, Information security technology.

We strategically promote the research with three research groups, global information technology group, high-end computing group, and media-interaction group.



Foci of our research

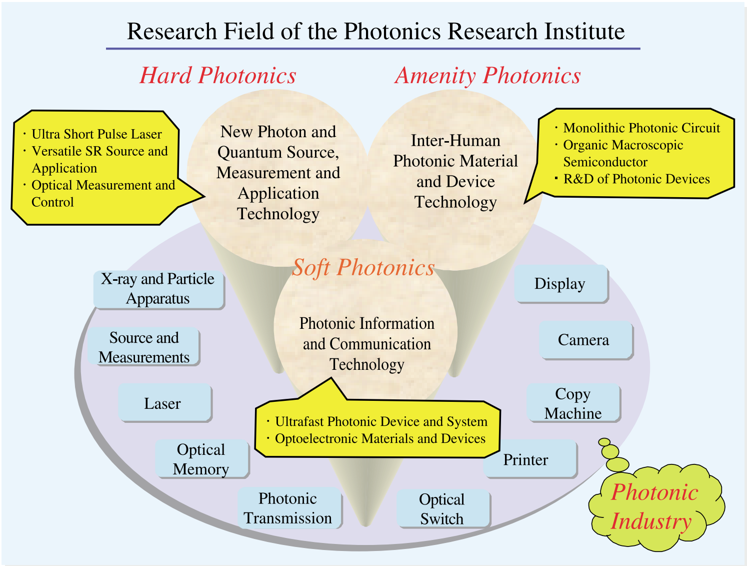
● Photonics Research Institute

Light can transmit, distribute and process digital information in high volumes and quickly. Moreover, it plays an important role for precise measurement, fine processing and diagnosis by interacting with various materials.

The Photonics Research Institute promotes research and development of photonic technology aimed at the future industrial and human technologies by taking advantage of many advanced aspects of light or photons. The research filed is composed of three major fields i.e. "Soft Photonics" where photonic communication and information processing technology is the main objective, "Amenity Photonics" where comfortable and ecologically acceptable optical human interface is the main objective, and "Hard Photonics" where development of novel light (or photon) source with superior properties and its measurement and application are the main objectives.

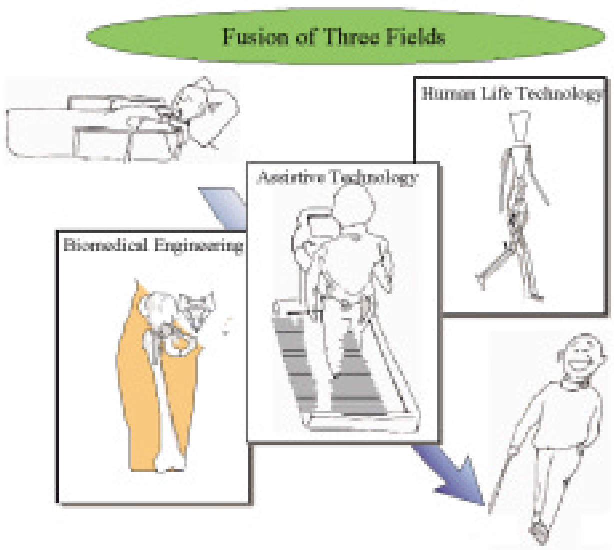
The synergetic effects among these fields would also open a new filed on the basis of various potentials of light and photon.

Photonic technology is not only a key technology for the photonic industries in the field of the information communication and processing but also gives wide basis of other technological fields. The institute promotes collaborative researches with other domestic and foreign institutes and industries.



● Institute for Human Science and Biomedical Engineering

Major problems facing this rapidly aging society often require solutions based on human science and biomedical engineering. Such problems are frequently concerned with industrial products, information and behavioral environments incompatible with human characteristics, and increasing numbers of aged, diseased or disabled people requiring long-term and costly care. In order to deal with these and related problems, we carry out cooperative research in three fields: (1) human life technology pursuing user-friendliness, (2) assistive technology pursuing independence for the disabled, and (3) biomedical engineering pursuing good health.



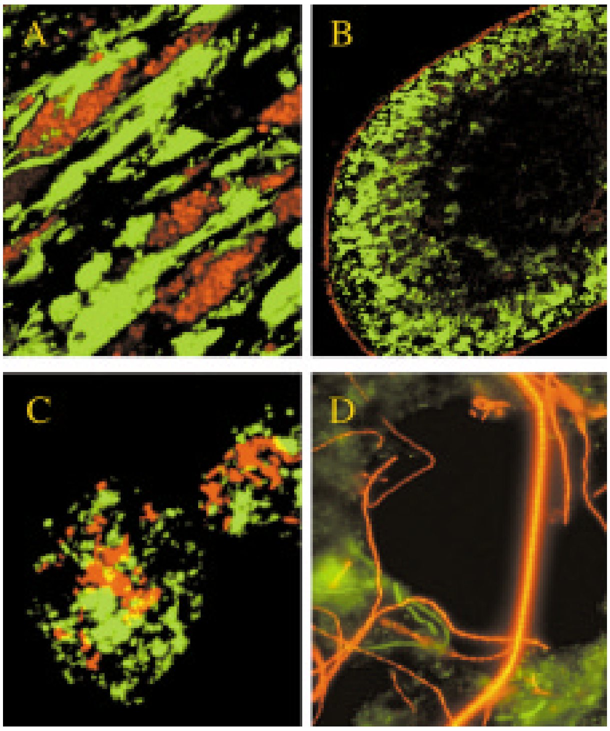
Three research fields

● Research Institute of Biological Resources

Tens to hundreds of millions of biological species are thought to exist on this planet. Many are known to benefit mankind. For instance, microorganisms have been utilized for long time to produce sake (rice wine), soy source, miso, natto and other food products in Japan. Enzymes and antibiotics, for example, are also the products of microorganisms. In addition, microorganisms are currently used for environmental technology such as wastewater treatment and garbage disposal. These useful biological functions of microorganisms and other biological species are expressed based on the genetic information written in their genomes. Recent analyses exploiting molecular biological approaches have revealed that more than 99.9 % of microorganisms on the earth are unknown. We expect there are many, which have such useful characteristics as the ability to produce useful materials or to preserve the environment.

In this institute, we carry out the research from basics to applications, focusing on the research subjects important from the points of view of advancing the exploration of biological resources, functional analyses of genes, utilization of biological and genetic resources in the post genome-sequencing era.

Through the studies, we expect to discover new biological resources and to elucidate novel genetic functions, and to develop the production technology of useful materials, a production process in harmony with environments, and environment protection technology.



Visualization of target microbes in microbial communities using fluorescence in situ hybridization A, syntrophic microbes (red) associated with methanogens (green); B, novel microbes (red) covering the surface of granular methangenic sludge (green, methanogens); C, Protozoa cell harboring endosymbiotic methanogens (red) and bacteria (green); D, Filamentous bacteria causing bulking in activated sludge

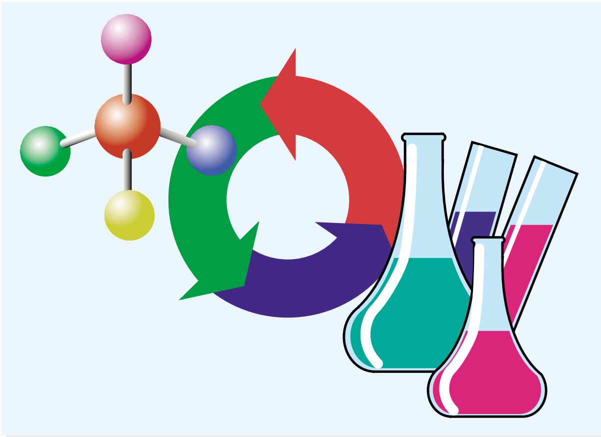
● Neuroscience Research Institute

Research in the field of neuroscience has immense scientific value, and its social and economic impacts are extensive. The unraveling of the function and structure of the brain, where the source of all human behavior originates, will lead us to understand our existence, and further promote the fundamental principles for new industrial technologies. Our country is embarking on a mission to realize a “nation built by the promotion of science and technology” and taking active part in supporting neuroscience research as one of its main scientific themes. Neuroscience is still at an early stage of its research, and has unresolved technical elements to be developed. However, we are expecting and already experiencing rapid progress in this field.

Institute for Materials & Chemical Process

The R&D on materials and reaction processes is being carried out to develop advanced technologies as well as to improve and/or establish basic and fundamental technologies for the purpose of strengthening industrial competitiveness, creating a new industry, and realizing a sustainable society.

Under this idea, we have conducted the R&D at the wide spectra from fundamental to advanced chemical technologies, promoting technical innovation in cooperation with each spectrum. Concretely, our effort is focused on the R&D of technical subjects such as new chemical conversion processes, the conversion of small inert molecules, the preparation of novel polymers, advanced inorganic materials, molecular materials, and biomimetic substances, and material safety evaluation.



Ceramics Research Institute

Ceramic industries of Japan have high competitive power and are supplying various kinds of parts and components to the world. However, its market scale is small, and the related fundamental technology such as standards and design techniques are not sufficiently developed. Materials research has been conducted aiming only to the high performance without harmonization with natural environment.

The purpose of research in our institute is to construct the infrastructures as follows:

1. Reconstruction of technology systems taking the impact on the environment into consideration.
2. Development of material integrating various functions.
3. Establishment of material design technology and of standardization of evaluation procedures.

The subjects, which are highly delicate and common in ceramics, will be systematically studied in the institute, and strong attention will be paid to the hybridization with polymers and metals. The institute will contribute to the sustainable development of both society and economy.

Institute for Structural and Engineering Materials

Overview

The prime objective of our institute is to improve technologies concerned with manufacturing, that can be environment-conscious.

Stress will also be laid on developing composites and nano-materials with highly sophisticated multiple functions that are realized by controlling their bulk and surface structures at the nanometer level through macroscopic scales.

With this reseach, we will contribute to the advancement of industry and aim at establishing fundamental technologies that contribute to developing a recycling-based sustainable society.

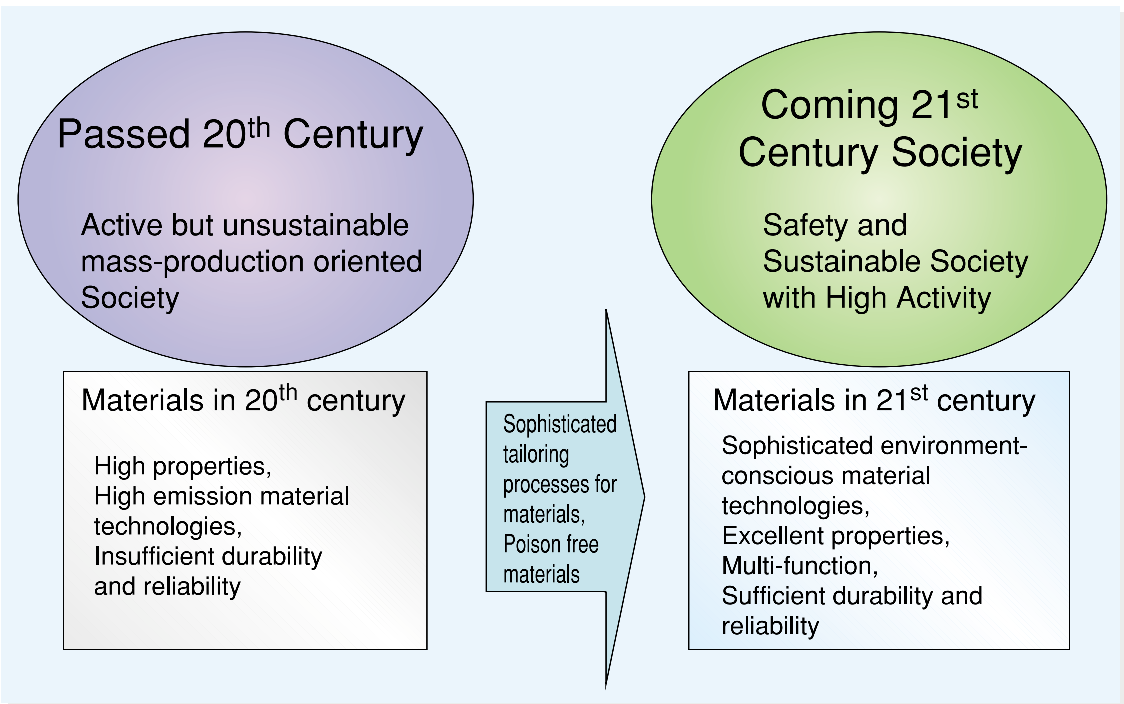
Structure and Research Activities

Our institute has over 130 researchers with the bases located at Tohoku, Chubu, Chugoku, and Kyushu Centers.

At these centers we carry out the following four comprehensive researches:

1. Recyclable Materials Technology.
2. Durable Materials Technology.
3. Multi-functional Materials Technology.
4. State-of-the-art Basic Technology.

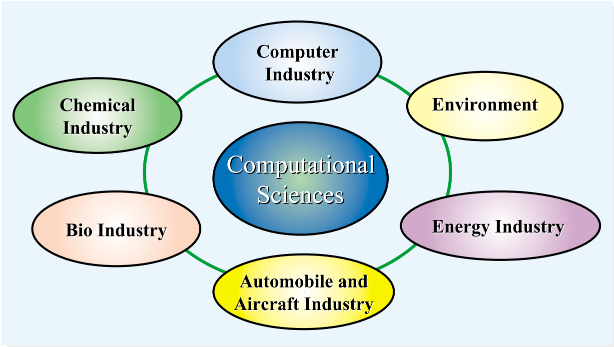
In addition to conducting the research activities, our institute also encourages cooperative studies with academia and industry.



Mission of institute

Research Institute for Computational Sciences

Everyday life is supported by advanced science and technology in many aspects, such as home electric appliances, energy, housing environment, information-communication apparatus, medical equipment and so on. Computational sciences provide the generic technology for all of them and play important roles in the area of industry in order to make our living environment safe and to save natural resources and energy. We are engaged in developing new methods in computational sciences and applying them to scientific and industrial problems.



Computational sciences which support industrial technologies

Computational Sciences

Scientific processes of analysis, prediction and design are needed to make a step farther in the advancement of technology. In order to realize such processes, many sophisticated experimental techniques have been developed. However, microscopic phenomena are not necessarily accessible to laboratory experiments. Moreover , complex origins are difficult to resolve by experiments. Therefore, computer simulations as experiments in virtual reality have acquired greater importance in many fields.

Information technology industry

Today's compact mobile phones of light weight with multiple functions were made possible by semiconductors developed in 1980's. Personal computers are changing the way of communications. Nevertheless, a more advanced LSI technique is required to realize computers with higher performance and larger memory. In 21st century, manipulation of individual atoms and molecules is required to perform atomic scale design in these technology fields and computer simulations are expected to play roles in nano- scale processing.

Chemical industry

Variety of materials such as plastics, polymers, liquid crystals and so on are products of chemical industry. It is required to minimize the consumption of natural resources and energy in the process of producing these materials. Computational science approach is becoming indispensable to the control of chemical reactions and materials structures.

Life science and engineering

It is believed that 21st century is the age of life science. As the basic technique for gene analysis has been established, one of the next targets of life science is to analyze the structure and function of protein. New industrial activities for manufacture of artificial skin, artificial blood vessel, artificial organs, which are closely linked with medical care, are emerging. Computational sciences will contribute to these activities.

Automobile and construction industry

Although a wind-tunnel test used to be a standard method for designing cars and aircrafts for reducing air drag and for safety design, it is nowadays replaced with computer simulations. Computational sciences have established their positions as generic technology and yet are expected to make further contributions to the prediction and design of complex objects possessing desired functions.

Research Institute for Computational Sciences consists of five groups covering studies from microscopic to macroscopic objects and is engaged in research and development of computer simulation techniques as generic technology of industrial activities.

Special Division for Human Life Technology

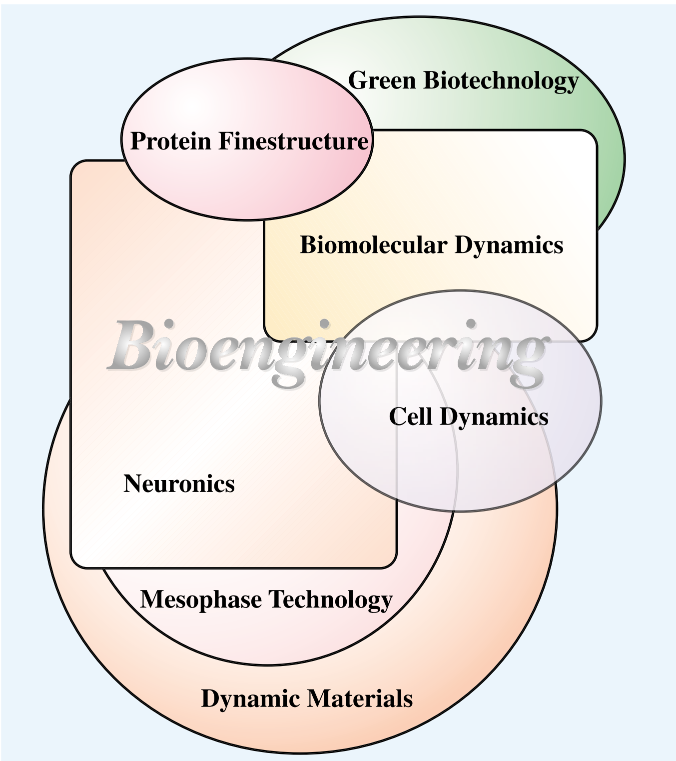
Introduction of the HLT research unit

Special Division for Human Life Technology (HLT) was specially established in AIST Kansai, as one of 54 research units in National Institute of Advanced Industrial Science and Technology (AIST). The special division functions as “the Front” of AIST in which the highly motivated groups in the institute are active in their research, building up a closer connection with the world. In the HLT unit, we are studying life science in the broad sense of the word by transdisciplinal approaches, collaborating with outside research groups in universities and corporation institutes.

The missions of the HLT unit are as follows

1. To reconstruct and modify human cellular functions, we develop the engineering for manipulation of bio-molecules and living cells including proteins and neurons, respectively.
2. To develop the equipment for the manipulation and sensing of bio-functions, we create the advanced nano-fabricated materials and systems with biocompatibility.
3. To contribute to the reconstruction of Japanese economical frame in an aging society with fewer children, we promote the research of industrial bioengineering that is expected to aid each person to live in comfort with minimum care and to increase the economically productive population.

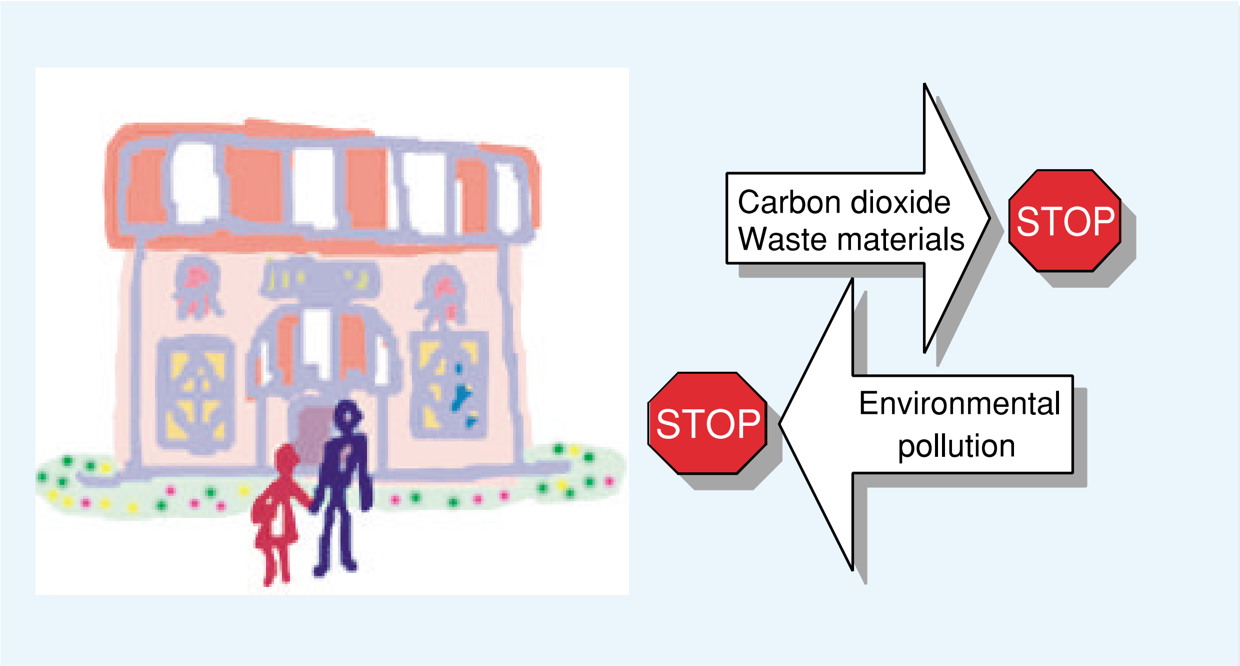
To perform our missions, the HLT unit includes the seven research groups composed of members in various research fields, such as protein engineering, molecular biology, biochemistry, biophysics, neurotechnology, organic chemistry, polymer science. Because the research in the HLT is managed to break down any barriers among groups as well as among units, we are always able to accept any collaborations consistent with the missions.



Research groups in the HLT unit

Special Division of Green Life Technology

The final goal is to develop environmentally benign technologies for sustainable society and sustainable energy systems. These technologies include the environmental protection, the pollution control, 3R (reduce, reuse and recycle) of materials, the renewable and/or clean energy systems, and so on. Most R&D for this purpose is being conducted from a viewpoint of the supplier. A special division for green life technology will, however, give priority to quality of life, amenity and convenience, based on a viewpoint of the consumer and/or demand. Trans-disciplinary research cooperation (mode-2), ranging from chemistry and biology through physics to human life science and economics, is required for "Green Life Technology".



Research Initiative for Green Chemical Process

Chemical industries cannot survive in 21st century without compatibility with the preservation of global environment. In order to ensure compatibility, chemical processes are required to be changed to "Green Chemical Processes," which includes the use of starting materials, reaction systems and processes all of low environmental loading. For example, individual factors of chemical processes such as reagents, solvents, and reactions should be designed, developed, and improved. On the other hand, functional materials or additives without poisonous halogen reagents are expected to be realized.

This Research Initiative aims at the development of highly effective catalyst systems and catalysts suitable for Green reactions. Realization of catalyst/solvent systems that can be used several times to reduce environmental loading is another target. We also conduct research to establish halogen-free chemical processes to avoid damages to the environment.

When Green processes and materials are realized, waste amount and energy consumption will be reduced. Thus environment-benign products are provided.

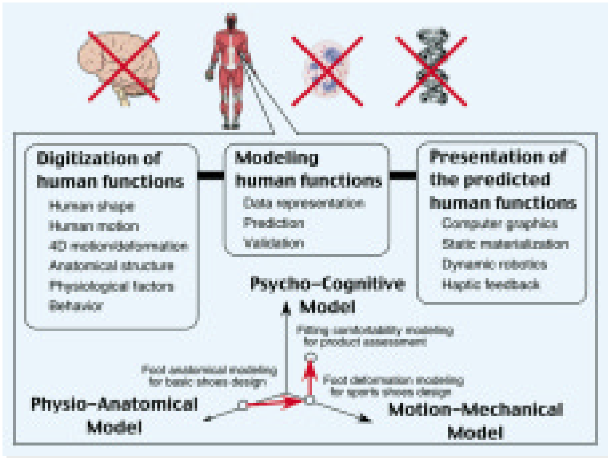
● Digital Human Laboratory

Introduction of the unit

"Digital human" means a computerized model of the human anatomical structure and function. Computer use is very common in industries and daily living. A computer is useful, and when a digital human model is in a computer, it starts to produce more fruitful and beneficial effects.

Three steps and three axes

A human body is very complex. We will not develop a computer model that has genes, cells, or a brain and nerveous system. We focus on human functions: anatomy, physiology, motion, psychology and cognition. Our main interest is in the digital representation of these functions with an accuracy sufficient for industrial applications. Our research consists of three steps: "digitization," "modeling," and "presentation" of human functions. "Modeling" means data representation and simulation in a computer, and "presentation" means a realization of the predicted results using a CG based technique, a static shape materialization technique, and dynamic robotics.



A human body has various functions. We categorize the human functions into three groups, each of which is represented by the physio-anatomical model, the motion-mechanical model, and the psycho-cognitive model. A digital human may consist of more than one model. We develop digital humans by revising them in a 3D space whose axes are the above three functional categories.

Application fields

Digital humans can be utilized for computer graphics and entertainment, ergonomics, medical training, and human computer interactions. We take an application driven approach, and develop digital humans sufficiently for practical use by collaborating with companies.

● Laboratory for Advanced Optical Technology

The data recording and retrieval capabilities of CDs and DVDs are carried out by focusing laser beam. New digital TV broadcasted since Dec. 2000 and future multi-interactive TV demand higher density storage devices. However, light cannot be focused on a pin-point even with a precise lens because of the diffraction. New DVD systems using blue laser also cannot avoid the problem.

In order to overcome the fatal problem of optics and realize super-density optical data storage, new technology using "optical near-field" has been expected.

Life Electronics Laboratory

- R & D of advanced measurement and analysis for bio- and electro-technology in post-genome science -

Main Objective

Life Electronics Laboratory is dedicated to the research and development of advanced instruments used in the highly accurate, sensitive, and efficient analyses of DNA, bio-polymers, and living things in order to investigate a genomic function and an application of genomic information.

Outline of Research

Since the research and development of electronics is becoming more important for our daily life, the group will attempt a variety of research using the accumulated results and research potential with an emphasis on post-genome science, i.e., the contrast of humanity with biotechnology. In our Life Electronics Laboratory the following main three groups are organized ; i.e.

1. Bio-Measurement Basic Technology Group.
2. Cell & Molecule's Function Evaluating Group.
3. Life-Imaging Technology New Group.

Microgravity Materials Laboratory

Microgravity (μg) provides a unique environment with homogeneous dispersion of liquid and solid substances but no thermal convection. This environment cannot be obtained in normal gravity, namely, on the ground. On the Microgravity Materials Special Group, materials are synthesized in microgravity and have a higher performance than that in normal gravity.

Microgravity environment can be obtained in space, parabolic flight and free fall by use of drop tower. In space, basic sciences such as fluid dynamics, bioscience, and materials science research is being carried out by space shuttles and small rockets. However, it is difficult to apply space environment to industrial R&D because of cost performance. On the other hand, drop tower, ground base facility, is economical facility to get microgravity environment but for very short duration with seconds level. In the Research Initiative for Microgravity Material, various high-quality crystalline materials are synthesized in a short-duration microgravity obtained by drop tower from the point of view to apply it to industrial R&D.

From the results of our research, it is found that high-quality crystalline materials such as single crystal and materials with well- controlled structure can be synthesized by rapid unidirectional solidification of homogeneous melt obtained in microgravity. We found this information first in the world. Based on the information, we are trying to synthesize high-performance magnetic materials, high-temperature thermoelectric semiconductors, compound semiconductors and dilute magnetic semiconductors supporting IT, nano-technologies and so on.

10m drop tower

Laboratory of Purified Materials

Ultra high purity (UHP) materials, purity controlled materials

The materials conventionally in use, such as iron and its alloys, include a certain amount of impurities that affect their properties. Recently, it has been found that the reduction of materials' impurities to a very low degree leads to drastic changes of the properties of these materials. For example, when an iron's impurity level is reduced to less than 10 ppm, the corrosion resistance for aqua regia of this iron becomes similar to that of gold. This means that the iron became corrosion resistant. Another example is the Fe-Cr compound, which is known to be very fragile and difficult to process. However using UHP iron and chromium to form the Fe-Cr compound leads to a significant improvement of these properties and the compound becomes very easy to press processing and has new properties such as endurance at high temperature. It is also found that by controlling certain materials impurities one can control the properties of these materials.

It is expected that the purification process will reveal new aspects of not only bulk materials but also surfaces or thin films. For example, affecting thermal properties or magnetic properties. In order to apply a material for industrial purposes, the roll of surfaces or films are in general very important as macroscopic material properties, such as corrosion or wear resistance, depend on how the materials surface behaves. So, understanding the properties of surfaces or films of UHP materials might lead to new industrial applications.

Isotopically controlled materials

Isotopes are atoms that have the same atomic number but different atomic mass. In a similar way as a small amount of impurity has a significant effect on the properties of a material, also the isotope ratio might affect the properties of materials. For example, isotopically controlled pure materials are promising as a new generation of semiconducting materials with high thermal conductivity, or as new functional materials. Therefore, it is necessary to develop a process that can create high-purity thin films without unnecessary impurities and isotopes. There are great expectations on the properties of these materials because of expected unique thermal, electrical and magnetic properties.

Geological Museum

The Geological Museum (GM) plays a unique role as the only museum in geosciences that makes educational and informational contribution to the society through the exhibitions on the research progresses of the "geological survey" of the National Institute of Advanced Industrial Science and Technology (AIST) such as the most up-to-date information on geology of Japan and surrounding areas, natural resources, earthquakes, and volcanic eruptions. People who visit the museum can understand important issues such as conservation of our environments and prevention of natural disasters and can get keys to understand how we can live with our earth.

The activity of the Geological Museum comprises the exhibition and the storage of geological specimens. The displays of the world-class specimens of rocks, minerals, and fossils, supported by explanations by color plates and schematic models, are the most important in all the exhibition rooms. More than 120,000 specimens of rocks, minerals, and fossils that have been registered and stored in the storage have been studied as research materials by scientists not only of geosciences but of chemistry, physics, biology, and medical sciences and have been utilized for the journalistic and educational purposes by the press, the publishers, elementary, junior high, and high schools, and other regional and local museums.

International Affairs Department

As a representative Japanese research organization in the field of industrial technology, we strongly advocate international collaborative research with international research organisations through strategic collaboration.

The International Affairs Department (IAD) is based on technology co-operation arrangements and other similar arrangements with 26 countries around the world. The IAD is actively engaged in various international collaborative research projects. When looking toward the future, we keep in mind the importance and growth of international expansion and thereby enrich our work through overseas dissemination of the results of our research in addition to technology transfers. By holding international workshops, dispatching and hiring foreign researchers, research exchanges, as well as hosting foreign visitors, we not only engage in technology exchanges but also successfully transmit information overseas. Hosting JICA trainees and dispatching specialists is one of our important tasks.

To ensure a pleasant living environment for our hired researchers and their families, we provide lodging facilities, language programs and other modes of support. To make our own researchers abroad feel more at ease so they can accomplish their research more fully, we collect and provide information from abroad.

Information

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◆ **International Relationship Office & International Cooperation Office**

AIST Tsukuba Central 2, Tsukuba,Ibaraki 305-8568, Japan

◆ **International Geoscience Cooperation Office**

AIST Tsukuba Central 7, Tsukuba,Ibaraki 305-8567, Japan

◆ **International Metrology Cooperation Office**

AIST Tsukuba Central 3, Tsukuba,Ibaraki 305-8563, Japan

Organization

Director of International Affairs

Counselor for International Affairs

Deputy Director of International Affairs

Coordinator for International Affairs

- Planning for International Strategies
- Strengthening Relationship with Foreign Organizations (Support for Oversea activities)
- Discovery, Planning, Coordinating and Support of International Joint Research Projects

International Relationship Office

- Planning and Coordinating on International Cooperation, and Building Worldwide Information Network
- Planning and Support of International Conferences, Global Dissemination of Research Achievements, International Public Relations, and Technology Transfer (Cooperation with Public Relations Department and Techno-Growth House (TGH))
- Arrangement of International Joint Research and Entrusted Research Projects
- Technological Cooperation and Security Measure for Visitors Overseas

International Geoscience Cooperation Office

- International Cooperation on Geological Research, and Planning, Coordinating and Conduct on International Technological Cooperation Projects
- Joint-planning and Conduct of International Conferences such as Coordinating Committee for Coastal and Offshore Geoscience Program's in East and South East Asia (CCOP), Commission for the Geological Map of the World (CGMW), and International Committee of Geological Survey

International Metrology Cooperation Office

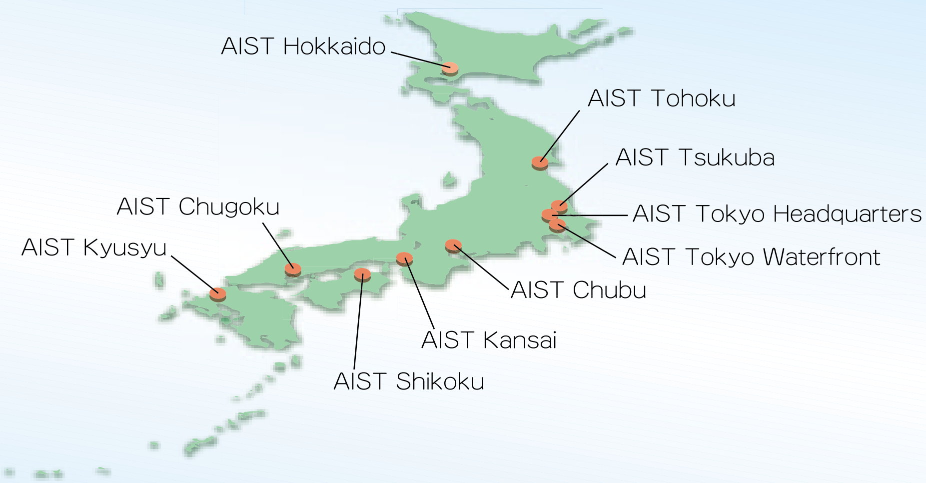
- Policy-examination, Analysis and Drawing-up of Resolutions in Mutual Recognition Agreement and in International Conferences such as General Conference for Weigh and Measure, International Conference for Legal Metrology and Consulting Committee
- Planning and Management of International Inspection and Management of International Comparison
- Planning, Coordinating, Conduct and Management of Technological Cooperation Projects on Measurement Standard

International Cooperation Office

- Recruitment of Inviting Foreign Researchers and Transferring Researchers Overseas and its Arrangement
- Affairs of Inviting Foreign Researchers and Transferring Researchers Overseas
- Support for Foreign Researchers' Daily Life(Cooperation with AIST International Center (AIC))
- Support for Host of International Conferences and Workshops(Cooperation with Public Relations Department)
- Support for Foreign Visitors' In-house Tour

Research Bases Address

Research Bases	Old Research Institute
■ **AIST Hokkaido**	■ Hokkaido National Industrial Research Institute
・AIST Hokkaido, Sapporo Kita Site	・Geological Survey of Japan, Hokkaido Branch
・AIST Hokkaido, Shiroishi Site	・National Institute for Resources and Environment, Coal Mine Safety Research Center, Hokkaido
■ **AIST Tohoku**	■ Tohoku National Industrial Research Institute
■ **AIST Tsukuba**	
・AIST Tsukuba Central 1	・Tsukuba Research Administration Office
・AIST Tsukuba Central 2	・Electrotechnical Laboratory
・AIST Tsukuba Central 3	・National Research Laboratory of Metrology
・AIST Tsukuba Central 4	・National Institute for Advanced Interdisciplinary Research
・AIST Tsukuba Central 5	・National Institute of Materials and Chemical Research
・AIST Tsukuba Central 6	・National Institute of Bioscience and Human-Technology
・AIST Tsukuba Central 7	・Geological Survey of Japan
・AIST Tsukuba East	・Mechanical Engineering Laboratory
・AIST Tsukuba West	・National Institute for Resources and Environment
■ **AIST Tokyo Headquarters**	
■ **AIST Tokyo Waterfront**	
■ **AIST Chubu**	■ National Industrial Research Institute of Nagoya
・AIST Chubu, Seto Site	・National Industrial Research Institute of Nagoya, Seto Branch
■ **AIST Kansai**	■ Osaka National Research Institute
・AIST Kansai, Amagasaki Site	・Electrotechnical Laboratory, Life Electronics Research Center
・AIST Kansai, Osaka Ogimachi Site	・National Research Laboratory of Metrology, Osaka Measurement System Center
・AIST Kansai, Osaka Otemae Site	・Geological Survey of Japan, Osaka Regional Center
■ **AIST Chugoku**	■ Chugoku National Industrial Research Institute
■ **AIST Shikoku**	■ Shikoku National Industrial Research Institute
■ **AIST Kyusyu**	■ Kyusyu National Industrial Research Institute
・AIST Kyusyu, Nogata Site	・National Institute for Resources and Environment, Coal Mine Safety Research Center, Kyusyu
・AIST Kyusyu, Oita Site	・Kyusyu National Industrial Research Institute, Oita Branch



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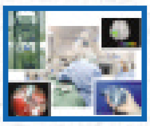

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