National Astronomical Observatory of Japan
National Institute for Fusion Science
National Institute for Basic Biology
National Institute for Physiological Sciences
Institute for Molecular Science
Okazaki Research Facilities

NINS

National Institutes of Natural Sciences

SINCE APRIL 2004

2007–2008

inter-university research institutes

National Institutes of Natural Sciences

http://www.nins.jp/

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Message from the President

Aiming for Further Progress in the Natural Sciences

Inter-university Research Institutes
National Institutes of Natural Sciences
President
Yoshiro SHIMURA

The National Institutes of Natural Sciences (NINS), as an inter-university research institute corporation comprised of the National Astronomical Observatory of Japan, the National Institute for Fusion Science, the National Institute for Basic Biology, the National Institute for Physiological Sciences and the Institute for Molecular Science, was launched in April 2004 as a new model for cooperative research endeavors. An inter-university research institute is a type of world-class organization unique to Japan. In response to the research community, it has been organized as a core base to provide a center for collaboration and external use by researchers across Japan. As an inter-university research institute, in addition to promoting pioneering research in key academic areas, it is anticipated that NINS will serve as a center for cultivating future academic disciplines. Ultimately, rather than "scientific and technological research aimed at solving problems", NINS' approach of "academic research aimed at excavating and exploring problems" will become mainstream.

Since its establishment, NINS has aimed at contributing to the further development of natural science. Each institute promotes cutting-edge and interdisciplinary research that makes use of related research fields of expertise. NINS has also been actively involved in cooperation and collaboration with universities and their affiliated research institutes. Furthermore, as a research center of natural science in Japan, through initiatives in exploring and cultivating novel research fields and tasks in natural sciences, NINS is also enhancing human resources in each field through measures such as the education of graduate students.

In particular, with respect to research, NINS aims at improving its role and function by further promoting the area-specific research undertaken by each institute. At the same time, taking advantage of being part of a single corporation, researchers from the five institutes can collaborate to find novel fields and reveal new problems in natural science. At present, researchers from each of the five institutes are exploring "Imaging Science", which has been selected as a common theme, and are developing alliance-oriented activities among the different fields of the institutes.

In addition, as an interdisciplinary research center of natural science, NINS plans to further strengthen the collaboration between Japan and organizations in Europe, the U.S. and East Asian countries. NINS is well positioned to implement the formation of international research centers in which outstanding researchers are organized on a global scale. To practically work towards these goals, NINS has established the International Strategy Headquarters to carry out its international affairs. In this context, NINS has already concluded agreements concerning international joint research with the European Molecular Biology Laboratory (EMBL), the European Southern Observatory (ESO) and the National Science Foundation (NSF) as the first steps towards forming an international research center.

In summary, considering the advances in the past three years and the achievements in research that already have been realized, our vision is looking towards tomorrow. In various areas of the natural sciences, including astronomy, energy science, life sciences and material science, we are implementing the highest standards of research in the world. At the same time, we are overcoming the barriers that exist between different fields and are nurturing new cutting-edge and integrated research areas. Our aims are to create new concepts of academic learning and to contribute to society.

We are grateful for your continuous support of our vision.

What is an Inter-University Research Institute?

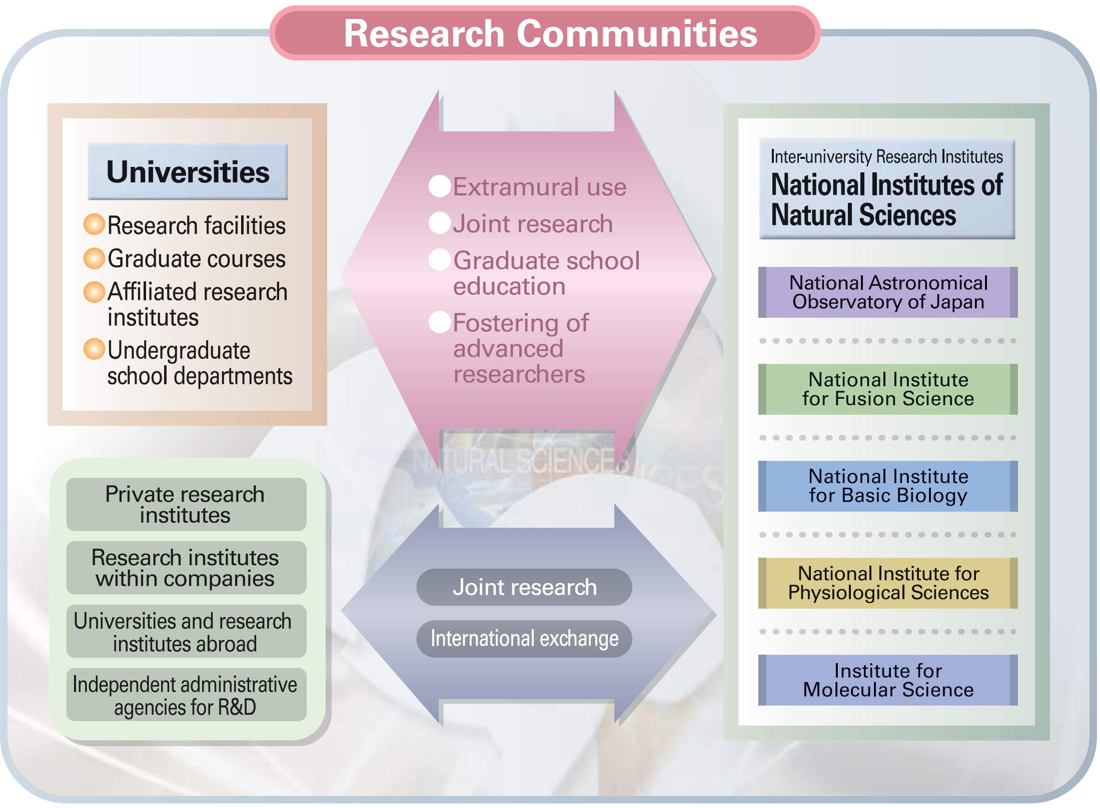
World's Leading Research Institutes in Japan

The National Institutes of Natural Sciences (NINS) consists of five inter-university research institutes: the National Astronomical Observatory of Japan (NAOJ), the National Institute for Fusion Science (NIFS), the National Institute for Basic Biology (NIBB), the National Institute for Physiological Sciences (NIPS) and the Institute for Molecular Science (IMS). In addition to playing a leading role in its respective research field, each institute enjoys a reciprocal cooperative relationship with NINS with the common goal of creating an interdisciplinary and international research base.

An inter-university research institute is a "research institute operated by the research community," a type of world-class organization unique to Japan. The inter-university research institute was organized as a core base to provide a place for joint research and extramural use by researchers across Japan. One such institution originated as the Research Institute for Fundamental Physics (Yukawa Hall) in Kyoto University, which was opened to the community in 1953 in response to requests from theoretical physicists throughout Japan.

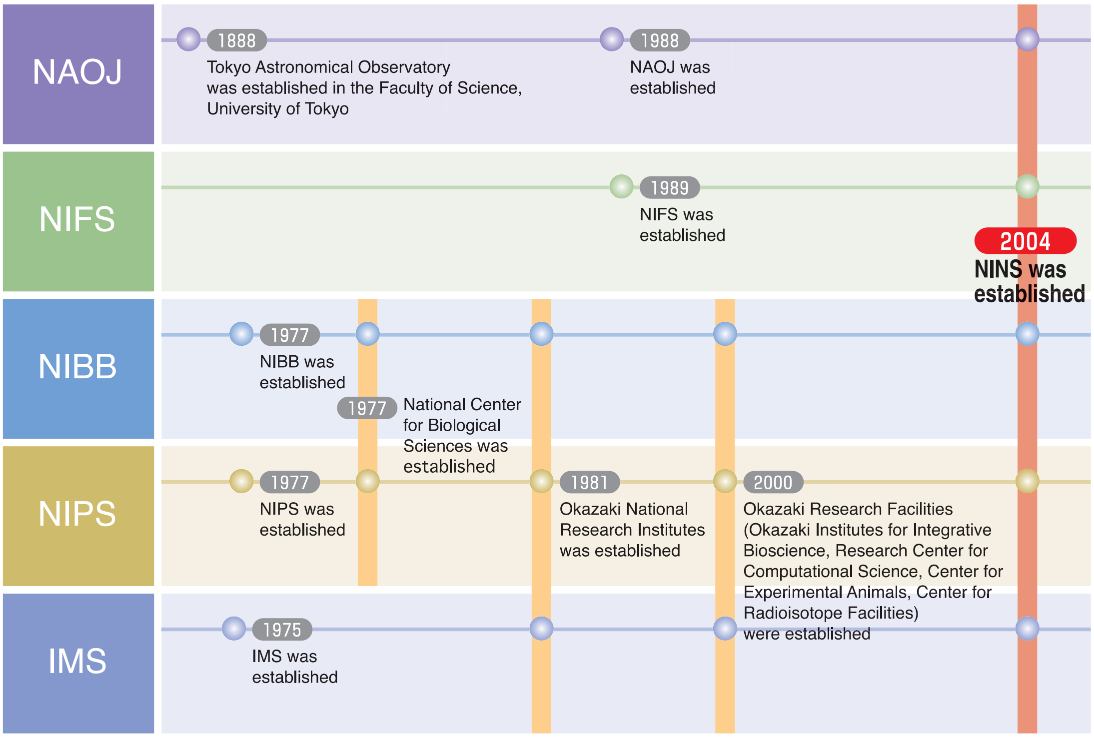
The inter-university research institute not only promotes pioneering studies on important research issues, but also provides opportunities for cutting-edge researchers throughout Japan to gather and engage in activities aimed at exploring future academic fields and creating new principles. New concepts of extramural use such as "joint usage of large-scale facilities" and "improvement of the intellectual foundation of academic materials" were later added to the original concept. While the research community's own management policy has been firmly maintained, many inter-university research institutes that do not belong to a specific university have been created.

While maintaining its uniqueness and diversity, each institution makes a great contribution to the development of academic research in Japan as a Center of Excellence in its respective research field. Together, they also serve as an international core base to promote cooperation and exchange with research institutes and researchers abroad.

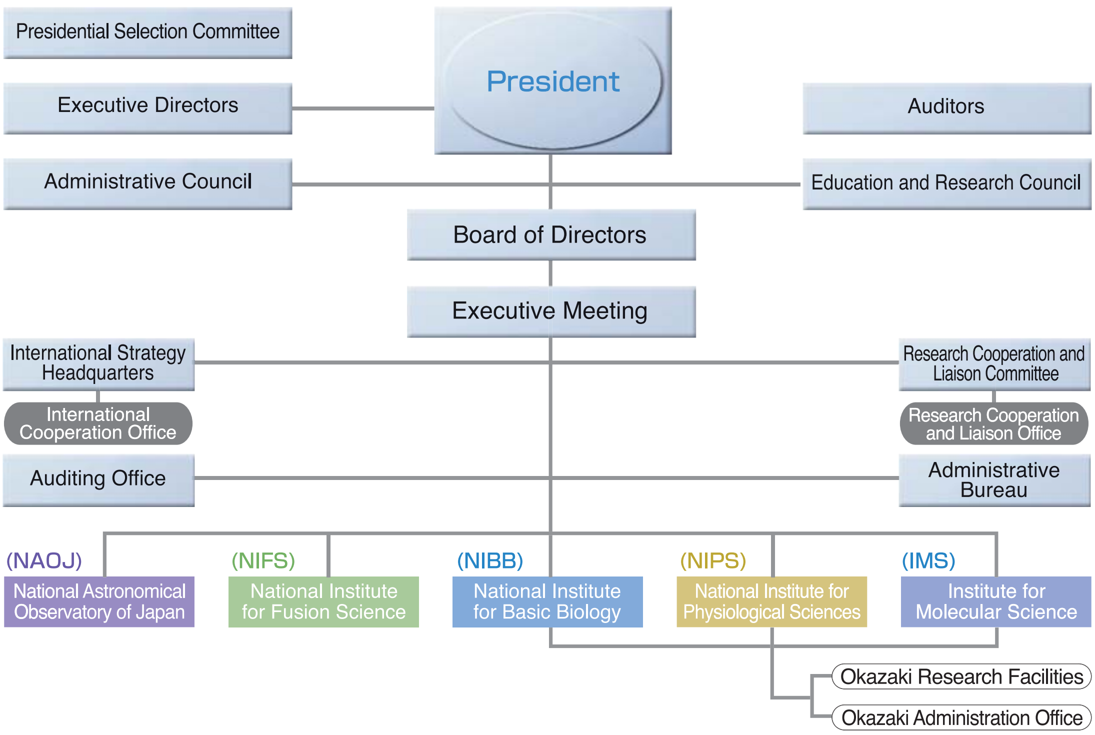


History & Organization

History



Organization



National Astronomical Observatory of Japan

NAOJ

NAOJ is the national center of astronomical research in Japan. It aims at developing astronomy and related sciences by promoting the open use of its state-of-the-art observation facilities such as the Subaru Telescope, organizing various joint-research programs and encouraging versatile international cooperation.

NAOJ

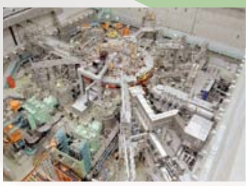
A Type Sc galaxy NGC2403. At a distance of 10 million light years, this spiral galaxy is characterized by open spiral arms and a small nucleus, and has an abundance of neutral hydrogen gas

National Institute for Fusion Science

NIFS

NIFS implements collaborative research into the basic sciences of high-temperature plasmas and reactor engineering. Researchers use computer simulations and experiments with the Large Helical Device as their leading projects in order to realize “a sun on the earth”, controlled nuclear fusion, which is a new, safe and environmentally friendly energy source.

NIFS



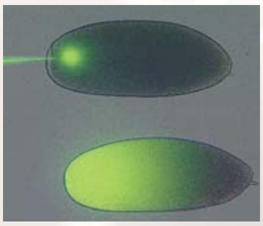
The Large Helical Device (LHD) maintains high temperature plasmas in steady state

National Institute for Basic Biology

NIBB

The earth is filled with living organisms exhibiting various forms and demonstrating shapes and behaviors fitted for diverse environments. NIBB, in collaboration with outside researchers, studies the essential phenomena underlying the characteristics and abilities that animals and plants have acquired over the long course of evolution.

NIBB



Investigating the mechanism underlying the development of fruit fly eggs (0.5 mm in length) using microinjection techniques

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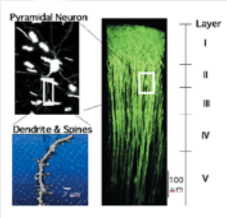
NIPS

National Institute for Physiological Sciences

NIPS' goals are to reveal the mechanisms by which the human body functions. This is the basis of medical science and links to clarifying the pathophysiology of various diseases. Furthermore, as a center of physiological research, the institute provides facilities and research staff for collaborative studies to domestic and foreign scientists.

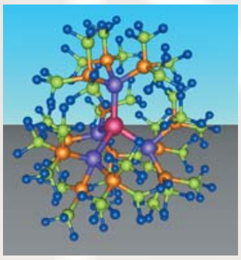


Multi-photon laser microscopic *in vivo* imaging of cortical neurons and fine structures

IMS

Institute for Molecular Science

The aim of IMS is to investigate fundamental properties of molecules and molecular assemblies through both experimental and theoretical methods. Since its inception, IMS has made its facilities available to the worldwide scientific community, a policy which has fostered many joint programs involving the IMS scientists.



A nanometer-scale dendrimer (tree-like molecule) with novel functions

Okazaki Research Facilities

Okazaki Research Facilities

The Okazaki Research Facilities consist of four centers: the Okazaki Institute for Integrative Bioscience, the Research Center for Computational Science, the Center for Experimental Animals, and the Center for Radioisotope Facilities. These facilities are intended for the common use of NIBB, NIPS and IMS.

NAOJ

National Astronomical Observatory of Japan

Director
Shoken MIYAMA

Astronomy is one of the oldest yet most active sciences. This fact alone means that humans possess the fundamental desire to seek their origins and the reason for their existence through the understanding of the universe. Since the establishment of the big-bang theory of the creation of the universe in the 20th century, astronomers have been striving to describe the dynamics of the evolution of the universe from material production, the generation of stars and planets, and the creation of life forms up to the birth of human beings. The 21st century will be the era for us to search the planets and life forms in other systems.

NAOJ strives to play a key role in establishing a new paradigm to understand the universe, the Earth, and life as a whole. For this purpose, we conduct observations of various objects from the Earth up to the universe itself, theoretically consider the fundamental laws behind the observed phenomena, as well as execute the technological development to support these activities.

ALMA

ALMA (Atacama Large Millimeter/submillimeter Array) is a partnership project among Japan, Europe and North America in cooperation with the Republic of Chile to build an international radio astronomy facility on the 5,000-meter Chilean plateau. NAOJ is leading the construction and operation of ALMA on behalf of the Japanese and Taiwanese science communities. By pointing all the antennas in unison toward a single astronomical object and combining their signals, ALMA will unveil mysteries in the universe such as the formation of galaxies at a distance of 13 billion light years, the formation of stars and planets, and the synthesis of molecules including organic ones. Full operations are planned in 2012.

Expected view at completion

Subaru Telescope

The Subaru Telescope is our flagship observation facility. It is an 8.2-meter optical/infrared telescope located at the top of Mauna Kea of Hawai'i Island in the U.S. Its open use since 2000 has produced a number of excellent achievements from the discovery of the farthest galaxies and the observation of proto- and baby galaxies up to the mechanisms of proto-planetary systems.

The uniquely shaped enclosure of the Subaru Telescope located at the top of Mauna Kea (Altitude: 4205 m) of Hawai'i Island

Nobeyama Radio Observatory (NRO)

Boasting a 45-meter antenna with the highest sensitivity in the millimeter wavelength and a Nobeyama Millimeter Array consisting of six 10-meter antennas, the NRO is pursuing research on a wide variety of astronomical phenomena from interstellar molecules and matter, proto-stellar disks, the Milky Way and other galaxies, up to the whole universe.

Nobeyama Millimeter Array (front) and the 45-meter antenna (rear)

Four-Dimensional Digitalized Universe (4D2U) Project

The 4D2U is a brand-new attempt to provide vivid images of the real universe to the public and professional scientists. Employing advanced techniques in virtual reality, it envisions the time evolution of 3D images based on astronomical databases and realistic simulations of astronomical events such as the birth of the Moon, the explosion of supernovae, and the creation of the grand structure of the universe.

One scene from the formation process of a spiral galaxy predicted by computer simulation, which shows how small galaxies collide and merge to form larger ones

NIFS

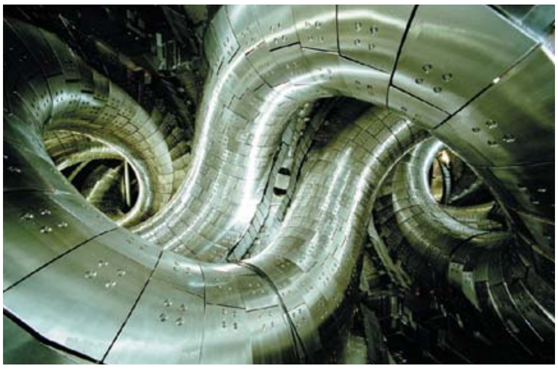
National Institute for Fusion Science

Director
Osamu MOTOJIMA

The industry-driven, high-tech world that humans have achieved in the recent era is largely built upon energy sources such as nuclear power and fossil fuels like coal, petroleum, or natural gas.
Unfortunately, those fossil fuels generate a substantial amount of CO_2 and result in aggravating problems in the global environment. Also, many issues still remain unsolved regarding nuclear power generation that utilizes atomic fission processes. On the other hand, as the global population continues to grow, energy consumption also increases proportionately. Under such circumstances, the necessity for developing new sources of energy is one of the most critical challenges that the world has to face and accomplish. Supposing that we could make nuclear fusion reactions happen on earth, that would mean that we will have secured a perpetual source of energy. As a member of the National Institutes of Natural Sciences, the National Institute for Fusion Science (NIFS) actively promotes and supports fundamental research in nuclear fusion plasmas. Initially, the institute works in cooperation with society to nurture human resources with high capabilities for the next generation, and then, we shall make our best efforts to realize power generation by nuclear fusion that produces a safe, environmentally friendly source of energy.
To accelerate its scientific progress, NIFS actively promotes coordinated research with national and international universities and research institutions.

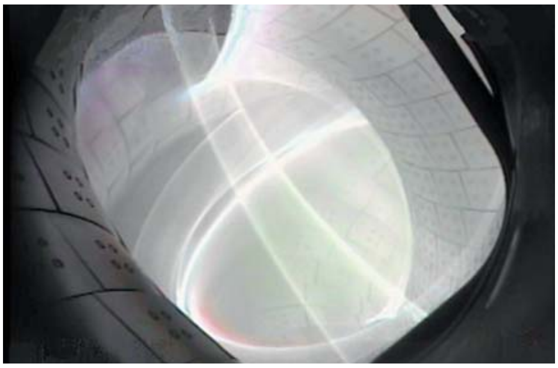
The Large Helical Device Project

The Large Helical Device (LHD) project employs the world's largest superconducting helical coils based on the heliotron magnetic configuration that was originally developed in Japan. The objectives are to conduct high-temperature plasma confinement research in a steady state and to explore scientific issues related to helical reactors.


The LHD Vacuum Vessel

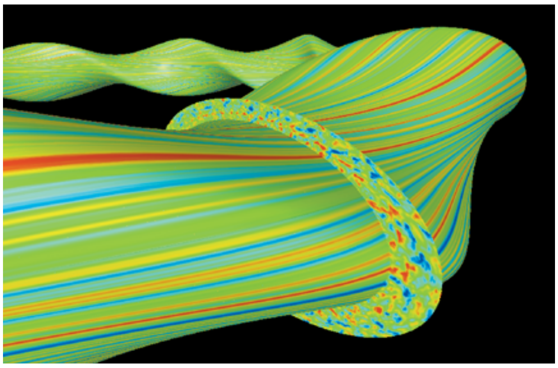
Physics of high-temperature steady-state plasmas

In order to clarify the physical mechanism governing high-temperature steady-state plasmas, experimental researches in LHD are proceeding in conjunction with bilateral collaboration in experimental devices in universities. Plasmas with temperatures of 100 million degrees are produced several thousand times, allowing many opportunities for a variety of scientific researches.


LHD Plasma

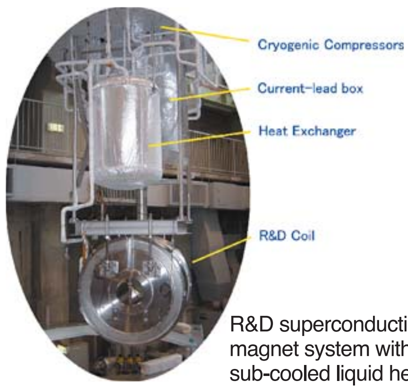
Large-Scale Simulation Research Project

Research by computer simulation is indispensable to study plasmas that have strong nonlinearities causing a variety of complexities. Using large-scale computer simulation, this project aims at systemizing plasma physics, clarifying the physical mechanism of various phenomena in fusion and related plasmas. Complexity science is also explored to support such systemization.


Simulation of ion temperature gradient turbulence

Engineering research for realizing fusion reactors

A broad range of engineering studies, such as the improvement of superconducting coils, the development of low-activating materials and advanced blankets, and design studies on the future fusion reactor and investigation on safety features of a fusion system, are conducted as the inter-university research organization in the field of reactor engineering. The returns of these achievements to industries are being promoted through collaborative research activities.



R&D superconducting magnet system with sub-cooled liquid helium

NIBB

National Institute for Basic Biology

Director
Kiyoaka OKADA

Among innumerable celestial bodies in the universe, the earth appears unique in that it is filled with various living organisms. After 4 billion years of evolution, animals and plants have acquired diverse forms as well as astonishing abilities and continue their existence on earth by bearing offspring. Living organisms are believed to have evolved by increasing the genetic information inherited from their ancestors and by changing the functions of genes.

To understand the survival strategies of organisms, the NIBB studies the basic principles common to all creatures and the mechanisms that enable diversity by using model animals and plants. Increased knowledge of the adaptation mechanisms of living organisms is expected to lead to solutions to our planet's worsening environmental problems.

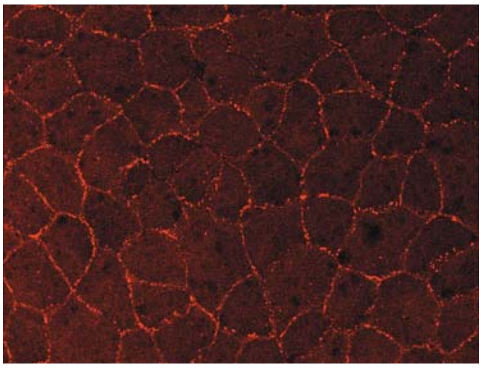
Sex determination

The mechanisms determining the sex of an individual are different among species. We found that a gene called DMY on the Y chromosome is the male-determining factor in medaka fish. DMY has a totally different structure from SRY, the sex-determining gene in mammals. This finding reinforces the usefulness of medaka in the study of the effect of environmental factors on sex determination. The NIBB has adopted medaka as an important bio-resource and is in the process of creating a research base using medaka.

A female medaka fish showing male characteristics (bottom) due to the introduction of the DMY gene

How morphogenesis is regulated

Multicellular organisms cannot survive without intercellular communication. In the morphogenesis of organisms, the signal carried by a protein called Wnt plays an important role. The mechanisms controlling the amount of Wnt protein excreted out of a cell, long unknown, were disclosed by our finding that the covalent modification of Wnt protein by a lipid molecule (palmitoleic acid) is necessary for the excretion. These results have led to an increased understanding of the common molecular mechanisms at work in various phenomena such as development, regeneration, and carcinogenesis.



Wnt protein excreted out of the cell

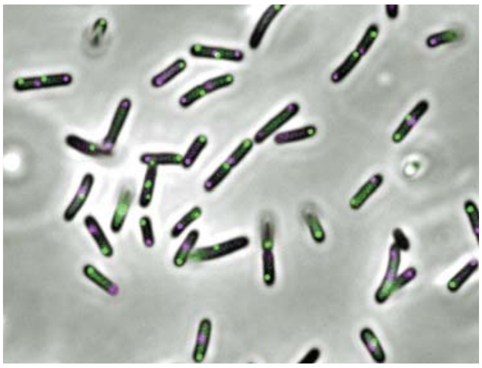
How the work of the nervous system is regulated

All mammals, including humans, have a mechanism that strictly controls the salt concentration of their body fluids. When a thirsty mouse, for example, is allowed to choose plain water or salty water, it will always choose plain water. Na_x channel, a molecule in the brain, is known to be important in sensing the salt concentration of the body fluid, and we found that this molecule is present in the glia cells and not in the nerve cells. Heretofore the role of the glia cells was obscure and they were thought to be minor players in the nervous system. Our finding, however, showed that the glia cells play an important role in the regulation of nerve cell activity. This is an important finding and has transformed established theory.

A mouse experiment involving saline levels in drinking water

The evolution of the genome structure

Every single cell in every organism bears a set of genetic information called a genome. After the long process of evolution, how does each species acquire the present characteristic form of its genome? The genome of animals and plants, for example, includes linear DNA molecules, but bacteria such as *E. coli* have a circular DNA molecule. To investigate the reasons behind such differences, we manipulated the circular genome of *E. coli* and succeeded in producing *E. coli* with a linear genome. This was the first step toward understanding the meaning of the shape of the genome and at the same time important in establishing a new technique for modifying the shape of the genome.



E. coli bacteria with linearized genome

NIPS

National Institute for Physiological Sciences

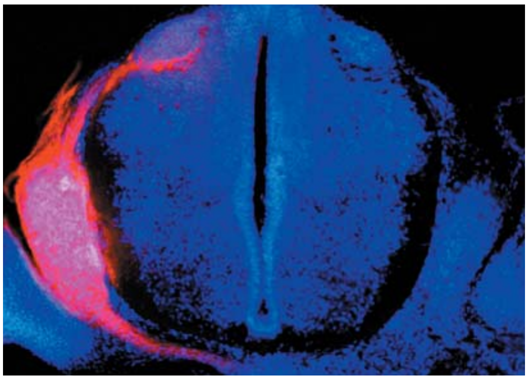
Director
Yasunobu OKADA

NIPS' mission is to conduct research at the forefront of physiological science by examining the living body at various levels of organization, thus leading to a holistic understanding of the functioning of the human body. Recent progress in life sciences has been truly remarkable, and there have been tremendous developments especially in molecular biology and genetic engineering. Non-invasive observation techniques have also become very useful for clarifying the physiological functions of the human body. Recently, NIPS has been focusing on brain science, and it is now considered to be one of the best brain institutes not only in Japan but also in the world.

A new interdisciplinary research center, the Center for Integrative Bioscience, was founded in 2000 in cooperation with the Institute for Molecular Science and the National Institute for Basic Biology. In addition, NIPS has launched a joint research project on biosensor molecules. With the key phrase "Elucidation of the Functioning of the Human Body", NIPS is performing cutting-edge research in multiple fields involving not only physiology but also biochemistry, biology, cognitive science, and medical engineering. NIPS provides its facilities and expert staff to domestic and foreign scientists for collaborative studies.

Clarifying the mechanisms underlying neural development

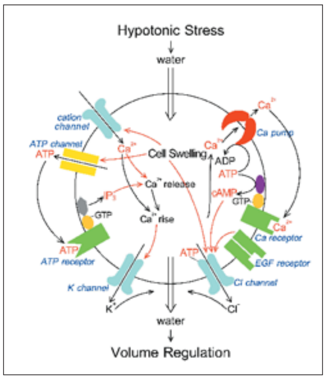
The researchers at NIPS are studying the development of neural systems and body homeostasis. For example, developing mammalian spinal cords are composed of several regions formed along the dorso-ventral axis and each region generates site-specific neurons and glial cells. Subsequently, the neural network is formed by directed axogenesis. These developmental phenomena are crucial for functional brain formation. Our research is focusing on examining the molecular mechanisms underlying cell differentiation and network formation.



This figure shows projections of primary sensory fibers in the spinal cord by labeling DRG with red fluorescent dye.

Clarifying the molecular mechanisms of cell functions

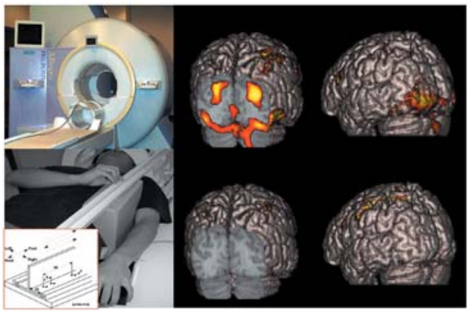
The human body is composed of over 10 trillion cells, and its survival or death is supported and determined by the functioning of these cells. NIPS is investigating the mechanisms by which cells function at the molecular level such as channels, transporters, and receptors, and the operating mechanisms of these functional molecules.



The molecular mechanism of the regulatory volume decrease (RVD). Cell swelling induces activation of volume-sensitive Cl^- channels and of mechano-sensitive Ca^{2+}-permeable cation channels, leading to the activation of Ca^{2+}-dependent K^+ channels. The resultant KCl efflux drives water efflux, thereby restoring the original cell volume. A number of other functional molecules are involved in the facilitation of the RVD mechanism.

Exploring higher brain function

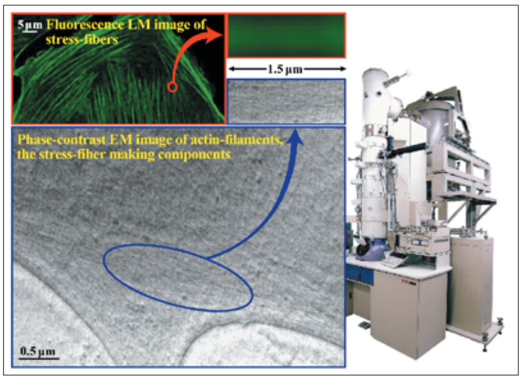
One of NIPS' research goals is to understand higher brain functions such as perception, cognition, and motor control in primates including humans. Electrophysiological techniques include single neuron recordings as well as noninvasive functional neuroimaging techniques, mainly functional MRI (fMRI) and magnetoencephalography (MEG), in combination with multimodality approaches including electroencephalography (EEG), transcranial magnetic stimulation (TMS) and near-infrared spectroscopy (NIRS).



Cortical plasticity of the blind revealed by functional MRI (upper left). Areas activated by Braille tactile discrimination tasks (lower left) in a blind participant who lost his sight at 3 years of age (upper middle and right) and a sighted control subject (lower middle and right). The brain areas are superimposed on a surface-rendered, high-resolution magnetic resonance. In the blind subject, activity was seen in the occipital lobe which includes the primary visual cortex. In contrast, no activation of the occipital lobe was seen in the sighted subject. This finding indicates that the visual cortex is involved in the tactile processes of the blind.

Visualizing biological functions at a nanometer scale

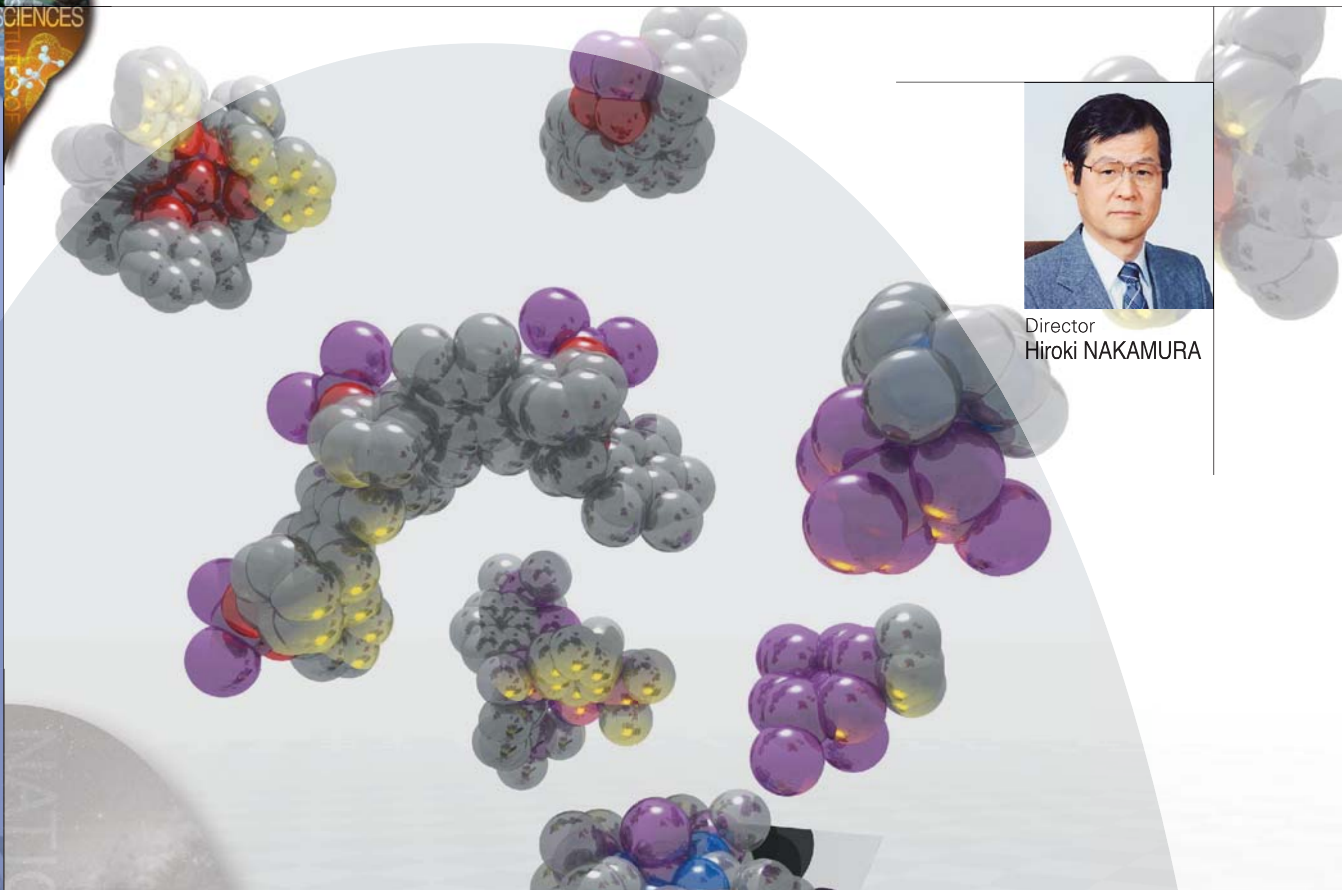
One of the goals of NIPS' researchers is to understand cellular functions with high spatial and temporal resolutions. Innovated phase-contrast electron microscopes, in conjunction with quick freezing or high-pressure freezing techniques, can visualize functional structures of the cell *in vivo* with a molecular resolution (1 nm). This is one of the central themes for post-genomic science and allows us to visualize the dynamics of intracellular proteins translated by gene information.



A 300kV phase contrast cryo-electron microscope (right). Fluorescent light microscopic image of phalloidin-stained intracellular stress fibers (upper left). Hilbert differential TEM image (300kV) of actin filaments wherein bundles correspond to stress fibers (lower left). Comparing resolution (upper middle).

IMS

Institute for Molecular Science



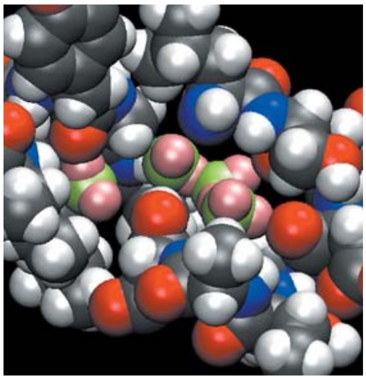
Director
Hiroki NAKAMURA

Almost all substances — including water, air, and living bodies — are made up of molecules, and their natures are closely related to the structures and functions of molecules constituting the materials. Molecular science is a fundamental discipline that gains, via experimental and theoretical investigations, deeper insights into the interactions between molecules and into chemical reactions that cause transformation of molecules. By finding novel characteristics of molecules and molecular assemblies, and by synthesizing new materials with desired properties and functionalities, molecular science provides invaluable clues to resolving future energy and environmental crises. By doing so, the research field will contribute to building new scientific and technological tools which are indispensable for realizing a sustainable society. As a Center of Excellence in molecular science, on which a wide range of research fields are based, the IMS encourages concepts and methodologies to be uniformly applied in a variety of scientific fields.

IMS's main research areas are theoretical and computational molecular science, photo-molecular science, materials molecular science, and biological molecular science. In each area, the frontiers of science are being explored by independent research groups led by professors or associate professors who take full initiative in original research activities. The IMS has also been continuing efforts to further promote molecular science over the world by supporting various collaborative research programs, in which many researchers in Japan and abroad fully utilize IMS's state-of-the-art facilities and by constructing a solid cooperative network with research centers in East Asia.

Drawing vivid figures of molecules by theory and computation

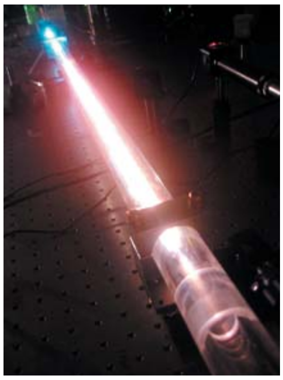
Behaviors of molecules and molecular assemblies are governed by the fundamental laws of physics, i.e., quantum mechanics and statistical mechanics. In the area of theoretical and computational molecular science, new theories and concepts are constructed on the basis of these fundamentals in physics. Large-scale calculations are carried out utilizing high-performance computers to achieve truly microscopic descriptions of various phenomena appearing in the real world and to predict the novel properties and functionalities of materials. In particular, since 2006 IMS has been contributing to the Ministry of Education's national project on Development & Application of Advanced High-Performance Supercomputer as the core center in nano-science to elucidate the microscopic mechanisms of self-organization and functionalities in bio-molecules and nano-scale assemblies.

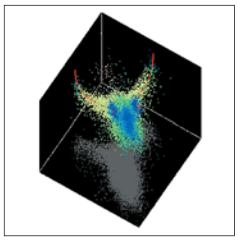


Water molecules confined in cavities in a protein, visualized by the 3D-RISM method, a novel computational methodology based on statistical mechanics.

Using light to capture lively figures of molecules

Light is one of the most valuable tools for detailed experimental examination of the characters of molecules and molecular assemblies. No field – from material science to bioscience – can proceed without utilizing light. In the area of photo-molecular science, highly active investigations are performed to develop light sources with unsurpassed performance such as a the synchrotron radiation facility, which generates intense light in a wide frequency region from X-ray to terahertz, and microchip lasers, which are quite compact but still have surprisingly high output. These light sources are utilized for studies on the properties, functionalities, and reactivities of materials. This research area establishes the foundation for a wide range of fields in science through cutting-edge research on photo-molecular science, including the real-time probing of ultrafast structural changes of molecules, direct optical microscopic imaging of nanometer-scale assemblies, and precise quantum control of molecular motion and reactions.

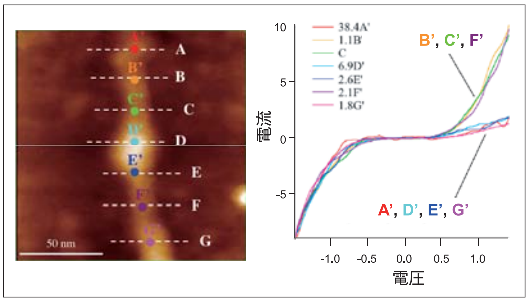




Laser facilities to generate intense ultra-short light pulses (with time duration < 10^{-14} second) and the fragment pattern observed when a molecule is dissociated explosively by the irradiation of the light.

Designing molecules at nanometer scale

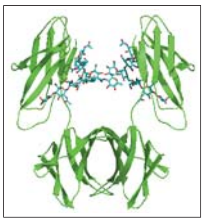
For synthesizing valuable compounds without undesirable by-products and creating new materials with novel functionalities, it is necessary to take precise control of molecules and molecular assemblies. In the area of material molecular science, active researches are in progress to develop synthetic technologies for various chemical compounds with atomic-scale precision and to construct methods for well-designed molecular assemblies. These researches are expected to lead to findings of heretofore undiscovered chemical and physical phenomena at the nanometer scale and contribute to other fields in science and technology such as information, communication, and energy-conversion processes. In addition, the Nanotechnology Support Project is underway to support various collaborative researches in the fields of nano-scale measurement and analyses, ultra-precision material processing, and advanced syntheses of molecules and materials.



Electric characteristics of a single-walled carbon nanotube adsorbed with several organic molecules, investigated at nanometer-scale spatial resolution.

Catching biological functionalities as actions of molecules

Various biological functionalities in living bodies are closely correlated to the behavior of molecules. In the area of biological molecular science, various advanced methods for research have been developed in the field of molecular science, including nuclear magnetic resonance (NMR) spectroscopy. These methods are extensively applied to studies on the structure and functionalities of proteins, which play an important role in living bodies. Active research is also underway on developments of new selective probing methods of biomolecules in living animals and plants and of novel biosensors based on nanoscale semiconductor processing.



The molecular structure of a glycoprotein is unveiled by measurements using an ultra-high magnetic field NMR apparatus.

Research Cooperation

Efforts for Forming Bases for Interdisciplinary and International Research Through Cooperation Across Fields of study

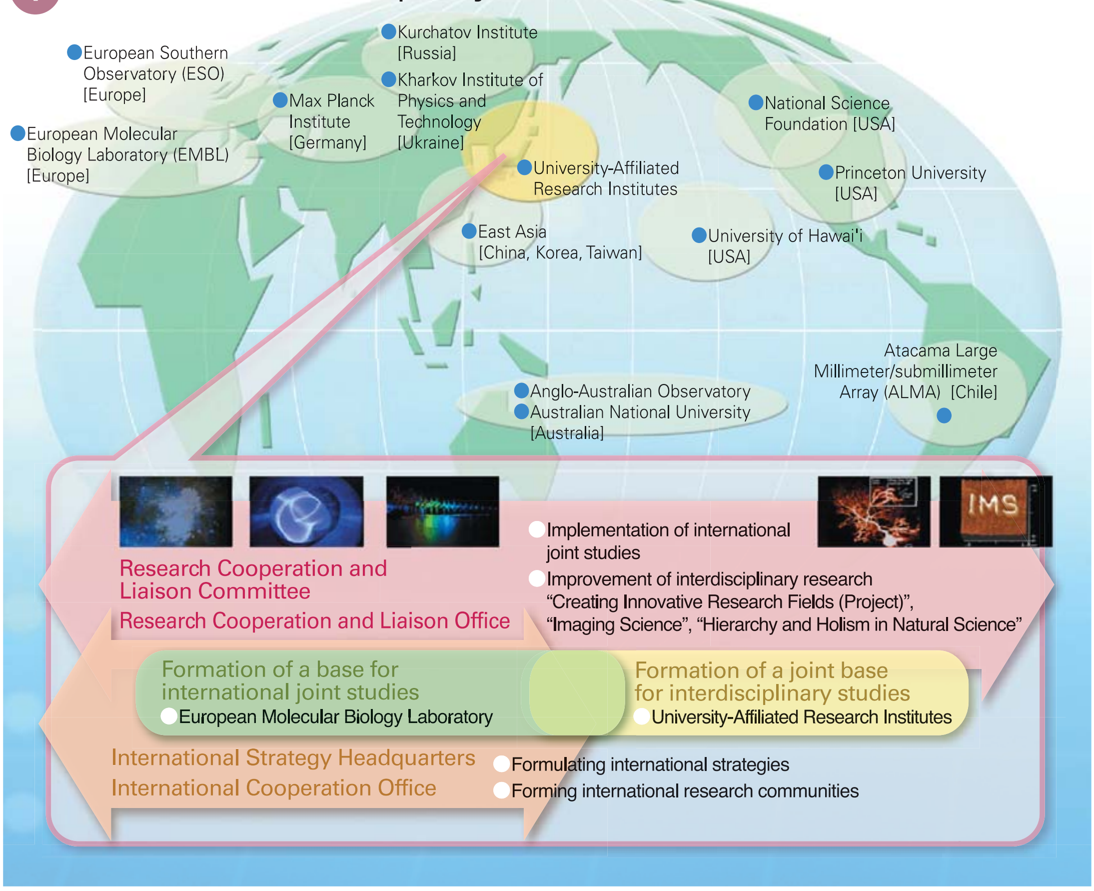
The five institutes established under the National Institutes for Natural Sciences (NINS) — NAOJ, NIFS, NIBB, NIPS and IMS — are Japan's Centers of Excellence of academic research in their respective fields.

These institutes, coordinating activities with each other beyond the borders of academic fields, actively cooperate as bases for interdisciplinary research with universities, university-affiliated research institutes and inter-university research institutes in the field of natural science. Together, these institutes promote the formation of new research communities. NINS also actively collaborates with institutes in the U.S., Europe and Eastern Asia for the purpose of forming a base for international research involving the coordination of reputable researchers on a global basis.

In order to promote the formation of such interdisciplinary and international bases across fields of study, NINS established the "Research Cooperation and Liaison Committee", under the authority of the President, to discuss and plan matters relating to research cooperation. It has also established the Research Cooperation and Liaison Office, which is in charge of undertaking specific plans made by the Research Cooperation and Liaison Committee, and implementing liaison activities including symposiums.

Since FY2005, the Research Cooperation and Liaison Office has determined "Imaging Science" and "Hierarchy and Holism in Natural Science" to be themes for cooperation across fields and is promoting various symposiums and other projects concerning these themes. In addition, it promotes "NINS' Creating Innovative Research Fields (Project)", which is being undertaken on a cooperative basis among various research institutes.

Formation of an Interdisciplinary and International Research Base



International Cooperation

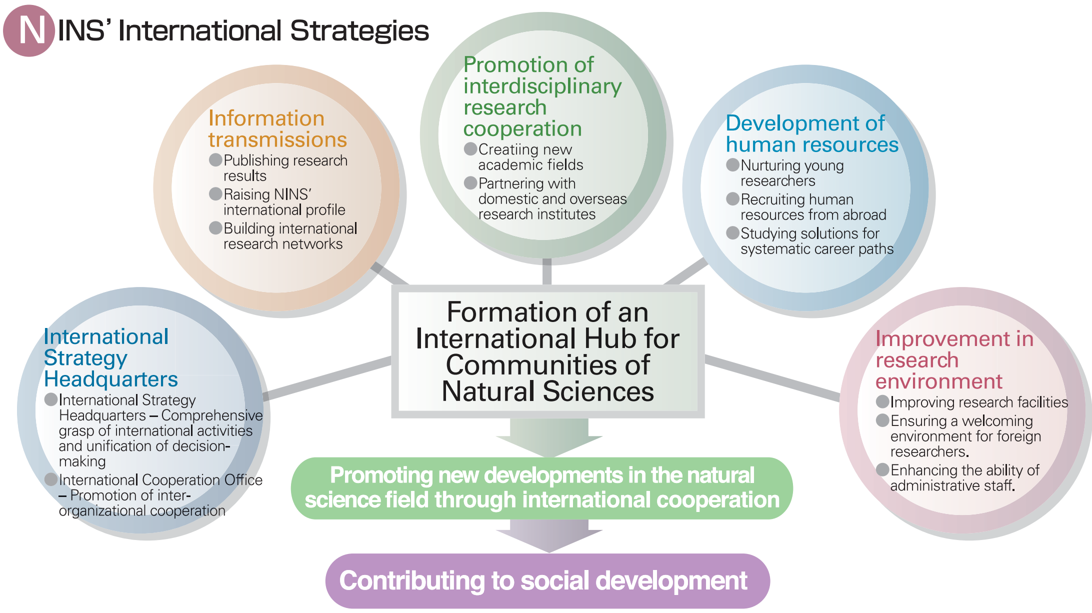
Formation of an International Hub for Communities of Natural Sciences

The creation of new research fields in natural science will become possible as competent researchers in various fields cooperate with each other beyond the borders of their academic fields and form new research communities. In order to achieve this, it is necessary to strengthen cooperation with international research communities and overseas research institutes as well as deepen mutual understanding and implement active joint research.

Working toward formation of an international research base among the five institutes, NINS has established the "International Strategy Headquarters" to unify decision-making for its international activities. It also has set up the "International Cooperation Office" for inter-organizational management of international activities and support for those activities in each institute.

The International Strategy Headquarters establishes international strategies aiming at the "Formation of an International Hub for Communities of Natural Sciences". With support and cooperation from the research community, it also promotes new approaches for the development of natural science.

NINS' International Strategies

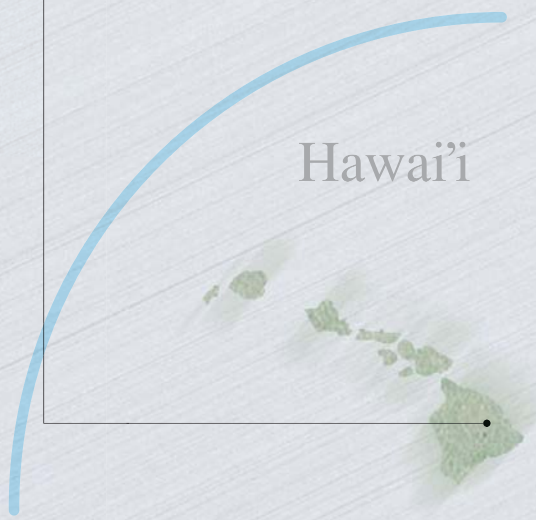


Management Structure of International Affairs

NINS

inter-university research institutes
National Institutes of Natural Sciences

Facilities



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