NINS

National Institutes of Natural Sciences

SINCE APRIL 2004

2009–2010

- 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

Inter-University Research Institute Corporation
National Institutes of Natural Sciences
http://www.nins.jp/

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SINCE APRIL 2004

Message from the President

Inter-University Research Institute Corporation
National Institutes of Natural Sciences
President
Yoshiro SHIMURA

Aiming for Further Progress in the Natural Sciences

The National Institutes of Natural Sciences (NINS) is 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. 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, NINS' approach of "academic research aimed at excavating and exploring problems" is its main goal, rather than scientific and technological research aimed at solving problems.

NINS aims at contributing to the further development of natural science in the five institutes, promoting 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 for natural science in Japan, through initiatives in exploring and uncovering problems in 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. To concretely put these aims into practice, from two research fields, NINS has established the new Center for Novel Science Initiatives, made up of the Brain Science Division and the Imaging Science Division. Through collaboration and cooperation with the research community, both within and outside our institutes, NINS is undertaking research in these areas.

In addition, as an interdisciplinary research center for 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), the National Science Foundation (NSF), and Princeton University as the first steps towards forming an international research center.

In conclusion, as NINS completes its first six-year foundation phase, it will continue to develop the results of its research endeavors. 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 research aresas. 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.

Yoshiro Shimura

What is an Inter-University Research Institute?

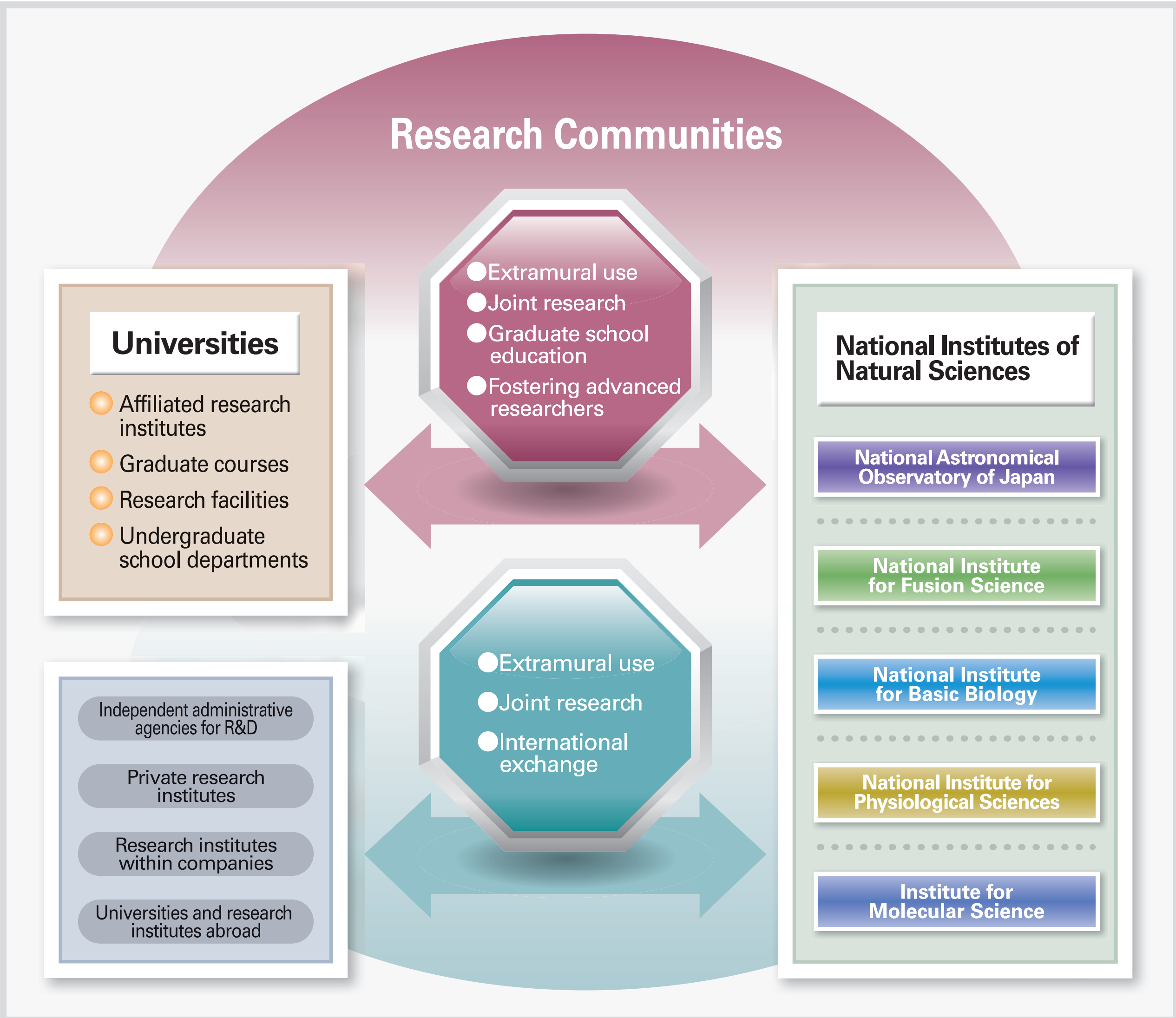
The World's Leading Research Institutes in Japan

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 has a collaborative 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.

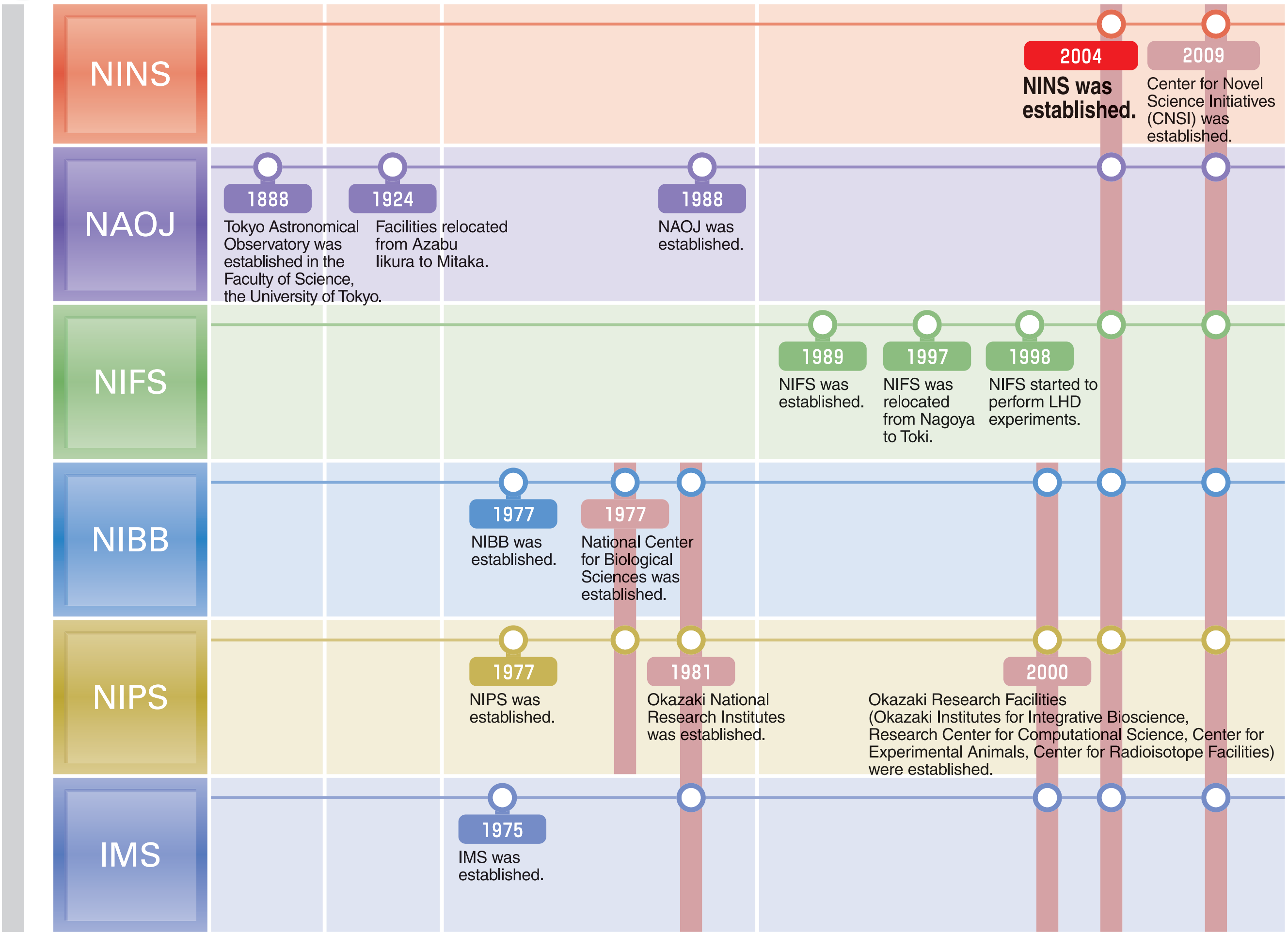
An inter-university research institute not only promotes pioneering studies on important research issues, but also provides opportunities for cutting-edge researchers throughout Japan to gather and engage in activities aimed at exploring future academic fields and creating new principles. New concepts 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 institute 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.

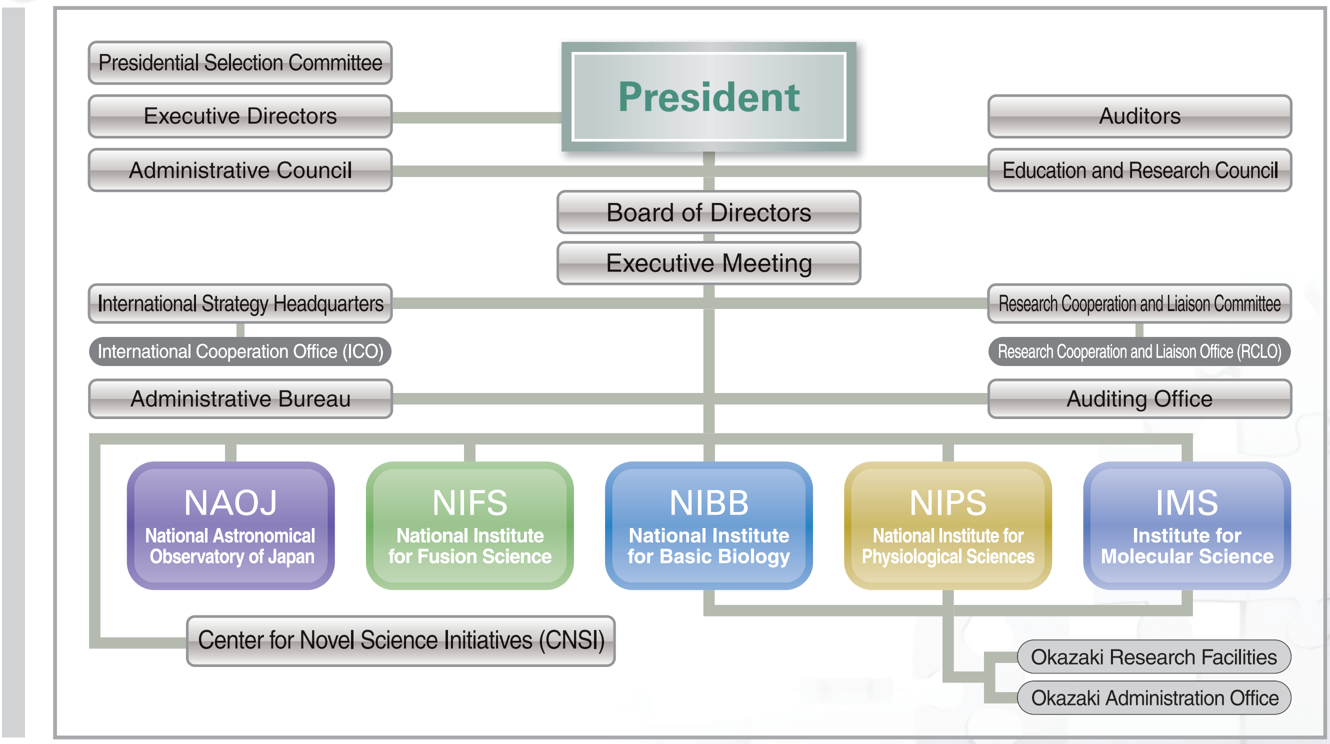


History & Organization

History

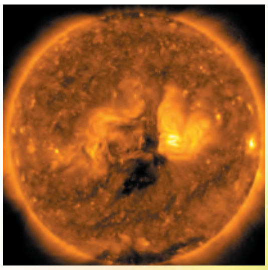


Organization



NAOJ National Astronomical Observatory of Japan

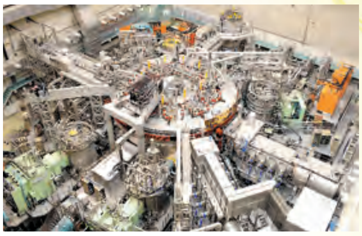
NAOJ is the national center of astronomical research in Japan. It aims at developing astronomy and related sciences by promoting the open use of its state-of-the-art observation facilities such as the Subaru Telescope, organizing various joint-research programs, and encouraging versatile international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



X-ray image of the sun taken by the *Hinode* observational satellite

NIFS National Institute for Fusion Science

NIFS conducts collaborative research into the basic sciences of high-temperature plasmas and reactor engineering. Our researchers from all over the world use computer simulations and experiments with the Large Helical Device (LHD) as their leading projects in order to realize “a sun on the earth,” controlled fusion, which is a new, safe, and environmentally friendly energy source.



The LHD maintains high temperature plasmas in steady state.

NIBB National Institute for Basic Biology

The earth is filled with living organisms exhibiting various forms and demonstrating shapes and behaviors adapted to 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.

The Medaka Bioresource Facility provides various strains and mutants of medaka to researchers world wide.

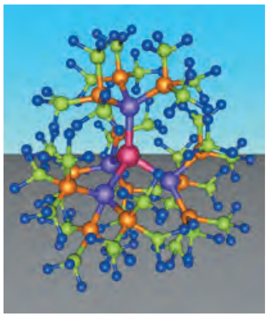
NIPS National Institute for Physiological Sciences

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. Particularly, at present, we mainly focus on brain science as the main part of "body and mind" research. Furthermore, as a center of physiological research, the institute provides facilities and research staff for collaborative studies to scientists from all over the world.

fMRI reveals that the striatum of the brain responds to both money rewards (green), and praise and social rewards (pink).

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 IMS scientists.



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

Okazaki Research Facilities

The Okazaki Research Facilities consists 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-General
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 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 for life outside the solar system.

NAOJ continuously seeks to develop new methods of observations to gain a deeper understanding of the objects and phenomena in the universe such as the Earth, solar system objects, stars, galaxies, clusters of galaxies, and the expanding universe. We hope to play a key role in establishing a new paradigm of nature.

ALMA

ALMA (Atacama Large Millimeter/submillimeter Array) is a partnership project among Europe, North America, and East Asia (Japan and Taiwan) in cooperation with the Republic of Chile to build an international radio astronomical facility on the 5,000-meter Chilean plateau. NAOJ is leading the construction and operation of ALMA. By combining signals obtained by 80 antennas, ALMA will unveil mysteries in the universe such as the formation of galaxies that are 13 billion light years away from us, the formation of stars and planets, and the synthesis of organic molecules. Full operations is planned to start in 2012.

12-meter antennas of ALMA-Japan constructed at the ALMA Operations Support Facility in Chile

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 protoplanetary systems.

The uniquely shaped enclosure of the Subaru Telescope located at the top of Mauna Kea of Hawai'i Island (Altitude: 4,200-meters)

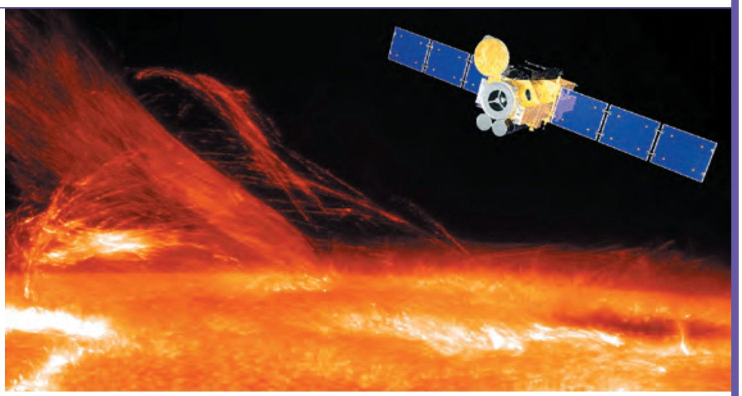
Nobeyama Radio Observatory (NRO)

The NRO boasts a 45-meter antenna with the highest sensitivity in the millimeter wavelength. The radio telescopes excel in discovering interstellar molecules and black holes as well as revealing the evolution and structure of the universe. In Chile, the ASTE 10-meter telescope plays a world-leading role in submillimeter observations.

45-meter antenna (left) and ASTE 10-meter telescope (right)

Hinode, a solar observational satellite

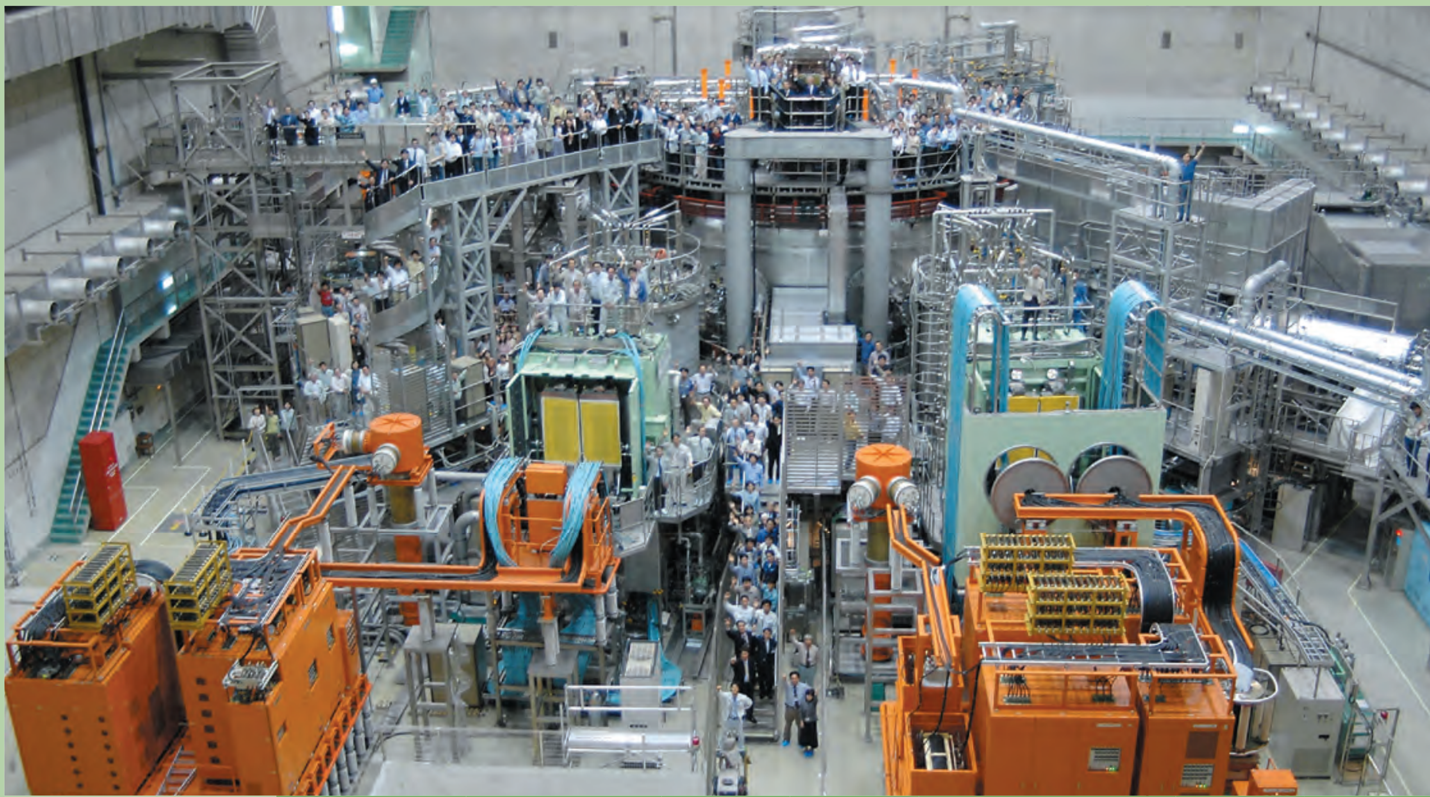
The *Hinode* (Solar-B), launched on September 22, 2006, is a highly sophisticated observational satellite. Its optical and x-ray telescopes and extreme-UV imaging spectrometer can obtain detailed images and spectra of the sun from the photosphere to the upper corona. NAOJ aims to uncover the formation of the corona and the origin of solar magnetic fields and coronal activities as well as to understand the processes of stellar plasma.



Artistic impression of the solar physics satellite *Hinode* and an image of a dynamic chromosphere taken by the Solar Optical Telescope on *Hinode* (Copyright NAOJ/JAXA)

NIFS

National Institute for Fusion Science



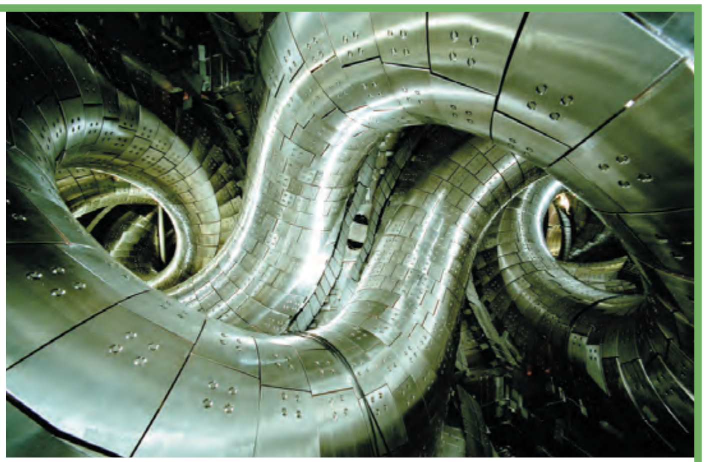
Director-General
Akio KOMORI

NIFS considers its research to actualize fusion energy as one of the major "big sciences" in Japan and strongly promotes research in this critical area. 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, heavy consumption of those fossil fuels results in generating a substantial amount of CO_2, aggravating problems in the global environment. Besides, there is a limit to our reserves. Furthermore, current nuclear power generation based on atomic fission reactions leaves serious issues, as typified by high-level radioactive wastes, still unsolved. On the other hand, as the global population continues to grow, energy consumption also increases proportionately. Under such circumstances, the development of safe, eco-friendly energy for the future is placed at the top of the agenda in the modern world. Supposing that we would actualize a fusion reaction, an energy source of the sun and stars, on the earth, it would mean that humans will have secured a perpetual source of energy, since deuterium, the fuel for a fusion reaction, is abundantly available in seawater. Also, utilizing low-radioactive materials will make major metallic materials reusable, leading to the accomplishment of cyclical-type energy in the true sense.

NIFS carries out active collaborative research with domestic and international universities, as well as research organizations. While fostering the next generation of excellent human resources, NIFS will continue to actively promote fundamental research in fusion plasmas with a view to the actualization of safe, eco-friendly fusion energy in the near future.

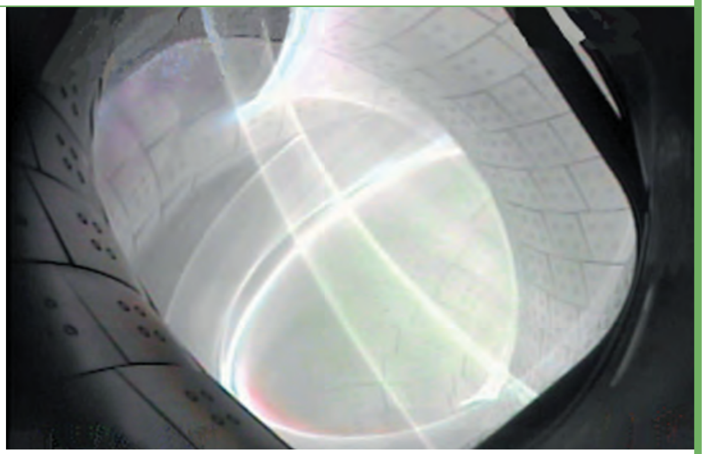
The Large Helical Device project

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 steady-state high-temperature plasma confinement research and to promote academic research aimed at the actualization of a helical-type fusion reactor in the future.


LHD vacuum vessel

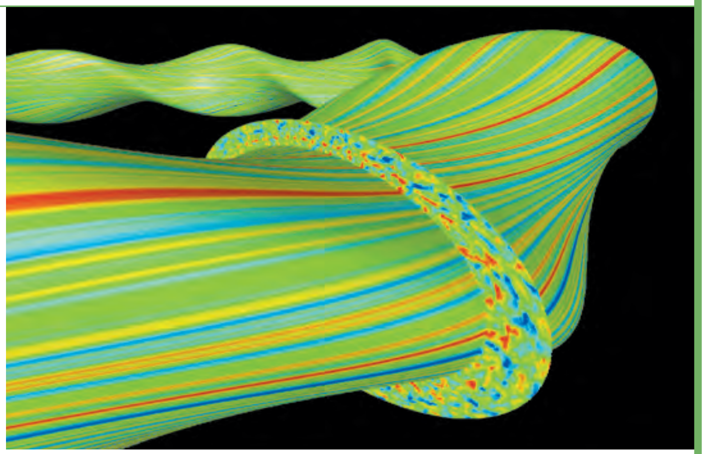
Physics of high-temperature steady-state plasmas

In order to clarify the physical mechanisms that define extremely high-temperature steady-state plasmas, experimental research in LHD are advanced in conjunction with bilateral collaboration in experimental devices in universities. Plasmas with temperatures of 100 million degrees have been produced several thousand times, providing many opportunities for a variety of scientific research.


LHD plasma

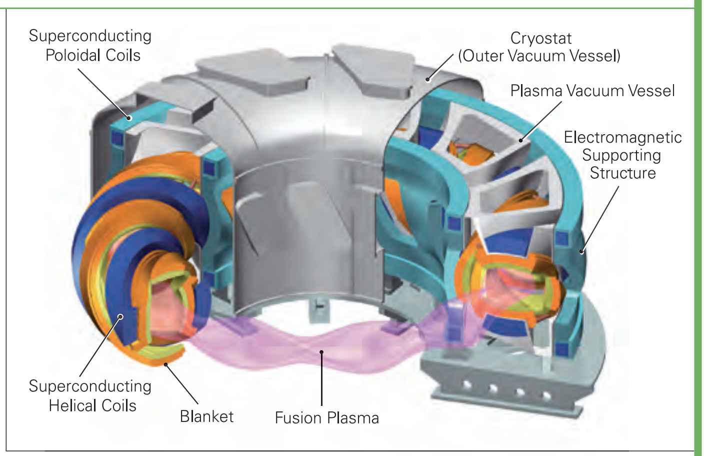
Large-scale simulation research project

Computer simulation research is indispensable in studying plasmas that have strong nonlinearities causing a variety of complexities. Using a large-scale computer simulation system, this project aims at systematizing plasma physics, clarifying the physical mechanism of various phenomena in fusion and related plasmas. Complexity science is also explored to support such systematization.


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 future fusion reactors and investigation into the safety features of a fusion system, are conducted as an inter-university research institute in the field of reactor engineering. The returns of these achievements to industries are being promoted through collaborative research activities.



LHD-type fusion energy reactor FFHR-2m

NIBB

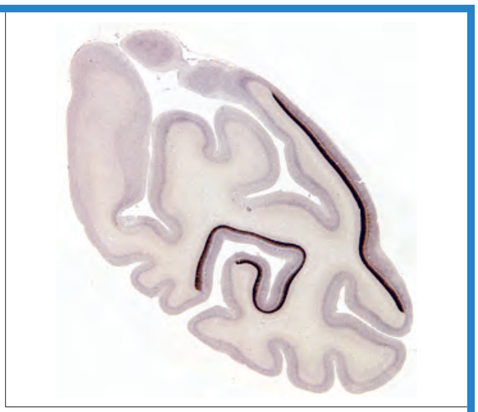
National Institute for Basic Biology

Director-General
Kiyotaka OKADA

Among innumerable celestial bodies in the universe, the earth appears unique in that it is filled with a variety of living organisms. After 4 billion years of evolution, animals and plants have acquired diverse forms as well as astonishing abilities and continue to survive on this remarkable planet through the propagation of their offspring. Living organisms are believed to have evolved by increasing the genetic information inherited from their ancestors and by changing the functions of those genes.
To understand the survival strategies of organisms, NIBB studies the basic principles common to all creatures and the mechanisms that enable diversity by using model animals and plants. We believe increased knowledge of the adaptation mechanisms of living organisms will lead to solutions to our planet's worsening environmental problems.

Brain mechanisms for clear vision

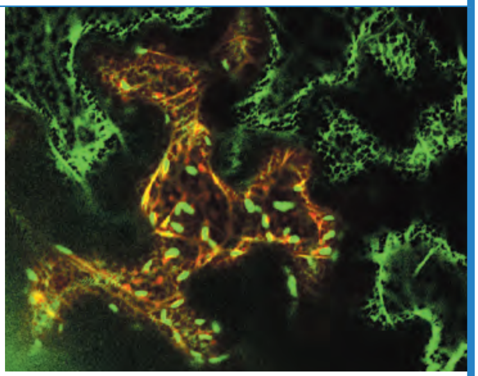
Serotonin is an important neurotransmitter, a chemical substance by which one nerve cell transmits information to another. Research has shown that a decrease of the serotonin concentration in the brain is related to depression, but the mechanisms behind this relationship are as yet unknown. Following our discovery that two serotonin receptor subtype genes are strongly expressed in the primary visual cortex, our laboratory analyzed the role of serotonin receptors in vision and found that they play an important role in both contrast adjustment and noise reduction. This research has allowed us to take our first steps toward understanding the role of serotonin in brain functions relating to vision.



Serotonin receptor gene 1B is strongly expressed in the first visual cortex of the brain (dark purple).

Formation of the ER body, a plant organelle

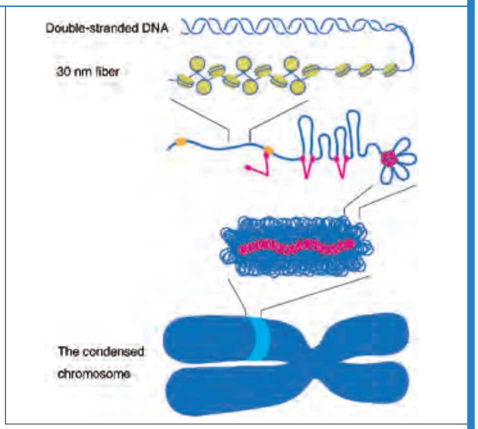
Cells contain many organelles, such as nuclei and mitochondria, which play various roles for the maintenance of life. The ER body, a recently found plant organelle, is formed as a derivative of the endoplasmic reticulum, a protein synthesis organelle, and contains a large amount of the enzyme β-glucosidase. The ER body has only been found to naturally occur in *Brassicales* plants and is thought to be important in forming defenses against diseases and insect damage. Our laboratory found a gene, NAI2, which is indispensable for ER body formation. We are currently investigating whether plants normally having no ER bodies can be induced to form them by introducing this gene, and whether these induced ER bodies can protect plants against diseases and insects.



When the NAI2 gene is introduced into a cell (orange-colored cell) of a plant in which the NAI2 gene has been depleted and has no ER bodies, ER bodies (green particles) are formed.

Chromosomal DNA compaction

DNA, the basic blueprint for all life, is contained within the cellular nucleus. During mitosis the long thin thread of DNA is intricately folded to avoid breaking or tangling and forms the thick, short chromosome. There remain many questions regarding the mechanisms of DNA folding. Our laboratory discovered a mechanism by which an essential protein for DNA folding called "condensin" binds DNA. A complex consisting of four recruiter proteins assists the binding of condensin to a specific DNA sequence approximately 150 base pairs long (RFB). We have also realized this binding is necessary for the stable maintenance of chromosomes. This is an important milestone in solving the riddle of DNA folding.



A schematic showing how double-stranded DNA is folded and condensed into the chromosome

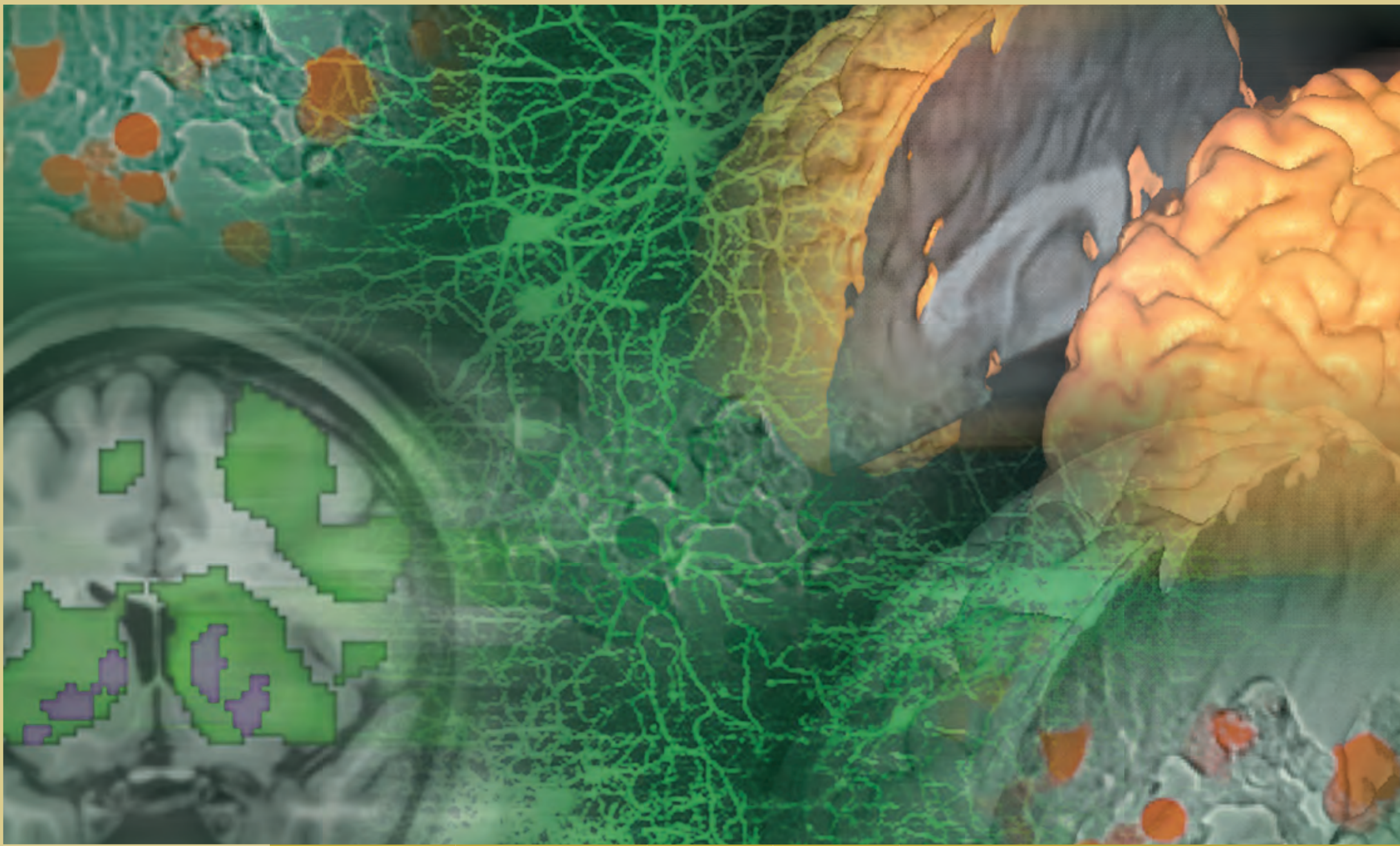
Analyzing leaf morphogenesis

Plant leaves vary in shape depending on the species. Most plants also change in leaf shape depending on age and physiological condition in a phenomenon called "heterophylly." What is the difference between the leaves of a young and old plant? A close examination using arabidopsis showed that the latter have more cells, while the volume of each cell is smaller. The analysis of mutant strains bearing large leaves earlier than the wild type revealed the function of the gene cascade relating to these leaf changes. This result will help lead us to a deeper understanding of heterophylly.

A series of photographs showing how the shape of the leaf changes as the arabidopsis plant ages (Seed leaf is on the far left hand; plant age progresses from left to right)

NIPS

National Institute for Physiological Sciences



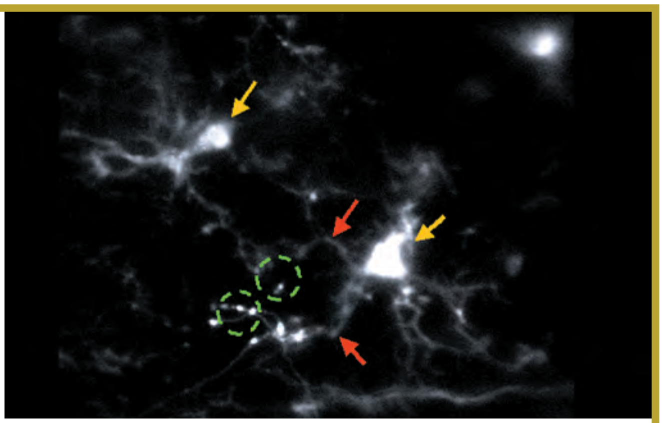
Director-General
Yasunobu OKADA

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. Recently, we established the "Center for Multidisciplinary Brain Research" to promote brain science as an interdisciplinary multidimensional science in Japan. 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

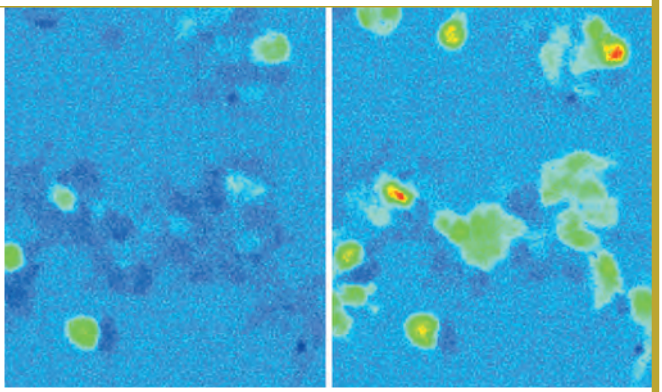
The researchers at NIPS are studying the development of neural systems and body homeostasis. For example, researchers in NIPS found that the microglia cells in the brain play an important role in surveying synapses between neurons. Once the neural circuit has been damaged, microglia cells promote its remodeling. The researchers successfully observed the process of its remodeling using a two-photon laser microscopy *in vivo*.



The picture taken by two-photon microscopy shows that microglia cells in the brain (yellow) reached their processes (red) out to synapses (green).

Clarifying the molecular mechanisms of cell functions

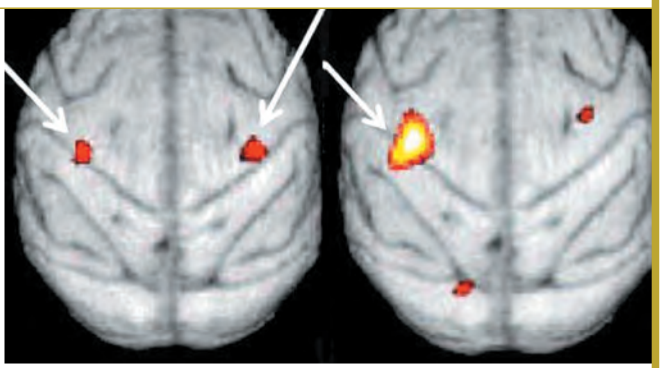
The human body is composed of over 10 trillion cells, and its survival or death is supported and determined by the functioning of these cells. NIPS is investigating the mechanisms by which cells function at the molecular level such as channels, transporters, and receptors, and the operating mechanisms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



One of our novel biomolecular sensors, *Painless*, responded to heat, increasing intracellular calcium in *Painless*-transfected cultured cells (right).

Exploring higher brain function

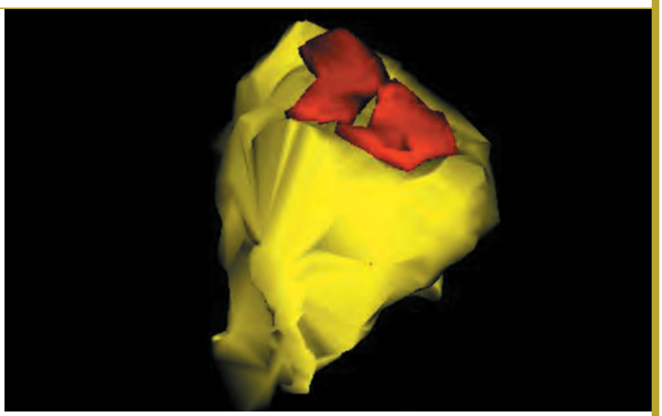
One of NIPS' research goals is to understand higher brain functions such as perception, cognition, and motor control in primates including humans. Electrophysiological techniques include single neuron recordings as well as noninvasive functional neuroimaging techniques, mainly functional MRI (fMRI) and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



Recovering brain function after a spinal cord injury. In the early stage, both sides of the motor cortex of the brain worked simultaneously (left). In the later stage, a much larger area of the brain cooperated to restore damaged function (right).

Visualizing biological functions at a nanometer scale

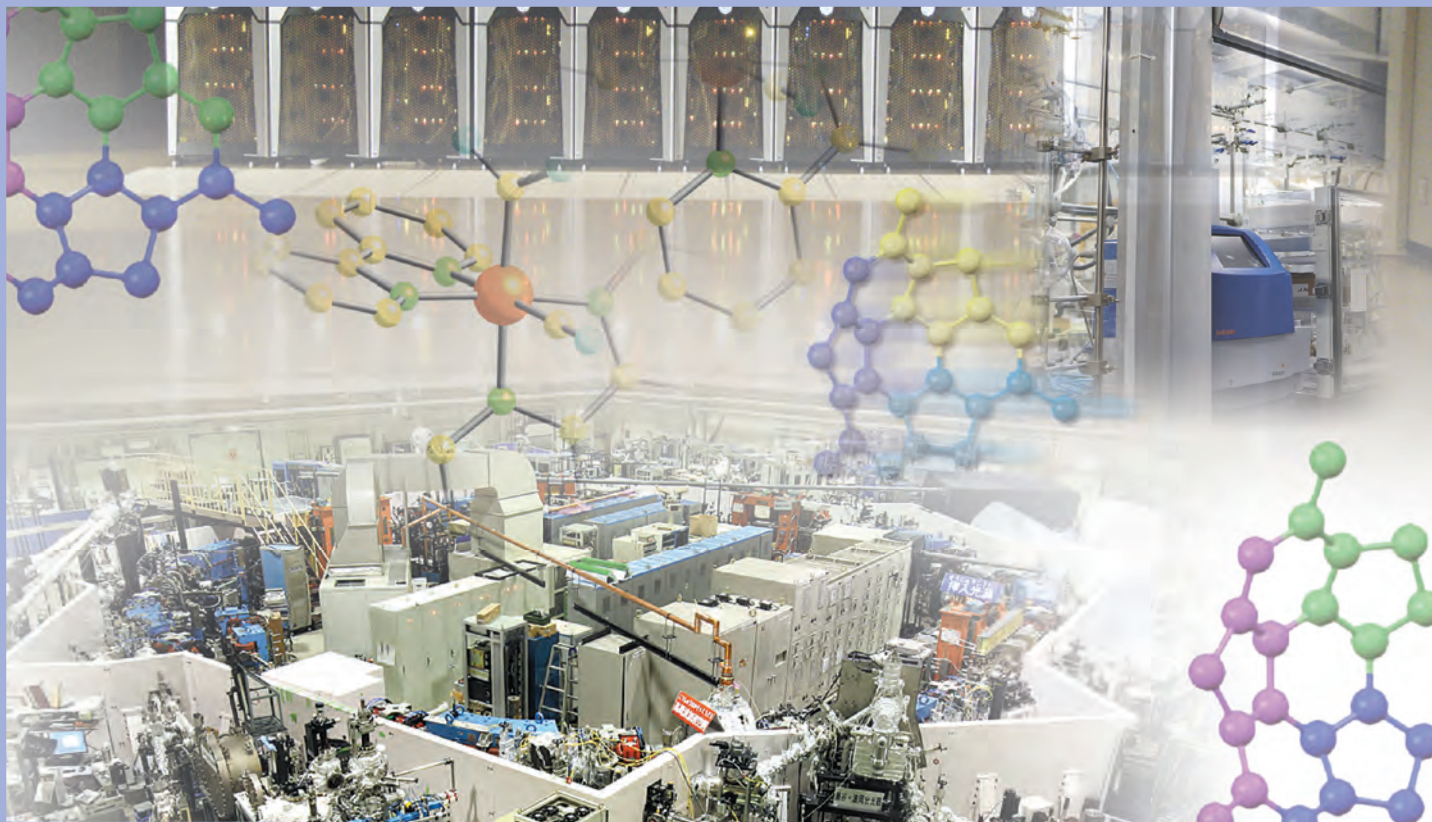
Our researchers at NIPS are striving to understand cellular functions with high spatial resolutions. Innovative phase-contrast electron microscopes, in conjunction with quick freezing or high-pressure freezing techniques, can visualize functional structures of the cell *in vivo* with a molecular resolution (1 nm). This is one of the central themes for post-genomic science and allows us to open the door of a new era of physiology and structural biology by visualizing the dynamics and functions of intracellular proteins translated by gene information.



An electron-microscopic 3D-reconstructed image of the spines/synapses in the hippocampus of the brain using high spatial resolution.

IMS

Institute for Molecular Science



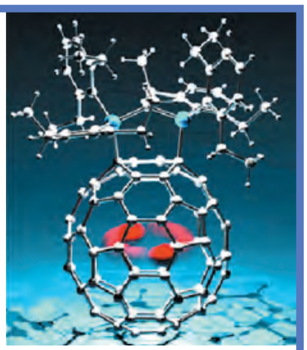
Director-General
Hiroki NAKAMURA

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 life and coordination-complex 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 all over the world by supporting various collaborative research programs in which many researchers in Japan and abroad fully utilize IMS' 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

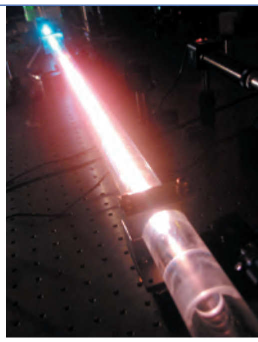
Behaviors of molecules and molecular assemblies are governed by the fundamental laws of physics, i.e., quantum mechanics and statistical mechanics. In the area of theoretical and computational molecular science, new theories and concepts are constructed on the basis of these fundamentals in physics. 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.

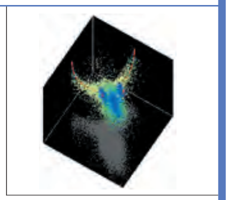


Theoretically predicting the motion of metal atoms inside a molecular cage made of carbon atoms.

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 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.

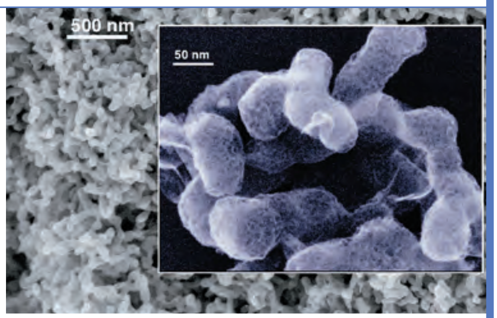




Laser facilities to generate intense ultra-short light pulses (with time duration < 10^{-14} second) and the fragment pattern observed when a molecule is dissociated explosively by the irradiation of the light.

Designing molecules at nanometer scale

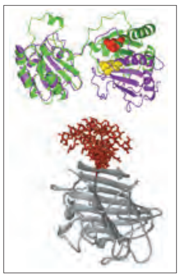
For synthesizing valuable compounds without undesirable by-products and creating new materials with novel functionalities, it is necessary to take precise control of molecules and molecular assemblies. In the area of material molecular science, active researches are in progress to develop synthetic technologies 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.



Porous carbon nano-material, which has potential functionalities beneficial as electrodes and catalytic substrates.

Learning from biological functionalities to develop waste-free chemical reactions

Various biological functionalities in living bodies are closely correlated to the behavior of molecules. In the area of life and coordination-complex molecular science, various advanced methods of research have been developed in the field of molecular science, e.g., state-of-the-art thermometric and spectroscopic measurements including nuclear magnetic resonance (NMR). These methods are extensively applied in conjunction with molecular biologic technologies such as genetic modification to studies on the structure and functionalities of proteins, which play an important role in living bodies. Active research is also underway on the development of efficient light-energy conversion to chemical energy, innovative organic synthesis free from unwanted byproducts, and novel biosensors based on nano-scale semiconductor processing.



The molecular structure of protein 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 of Natural Sciences (NINS) – NAOJ, NIFS, NIBB, NIPS and IMS – are Japan's Centers of Excellence of academic research in their respective fields. Since its inception, NINS has aimed at forming new research fields through coordinating the activities among the five research institutes beyond the borders of their respective academic fields and through promoting its collaborations with universities in the formation of new research communities.

In April 2009, NINS inaugurated the Center for Novel Science Initiatives (CNSI) with the results of the research project undertaken by the Research Cooperation and Liaison Office concerning such themes as "Imaging Science" and "Hierarchy and Holism in Natural Science". The new center is composed of the Brain Science Division, which plays a leading role in brain science research promotion in Japan, and the Imaging Science Division, which leads the way in the possibilities of new academic research in the field of imaging science by rendering each institute's research results into 4-dimensional materials. With this new center as the focal point, NINS is promoting the expansion of a new creative research community and research that is linked to academic development.

Formation of an Interdisciplinary and International Research Base

International Cooperation

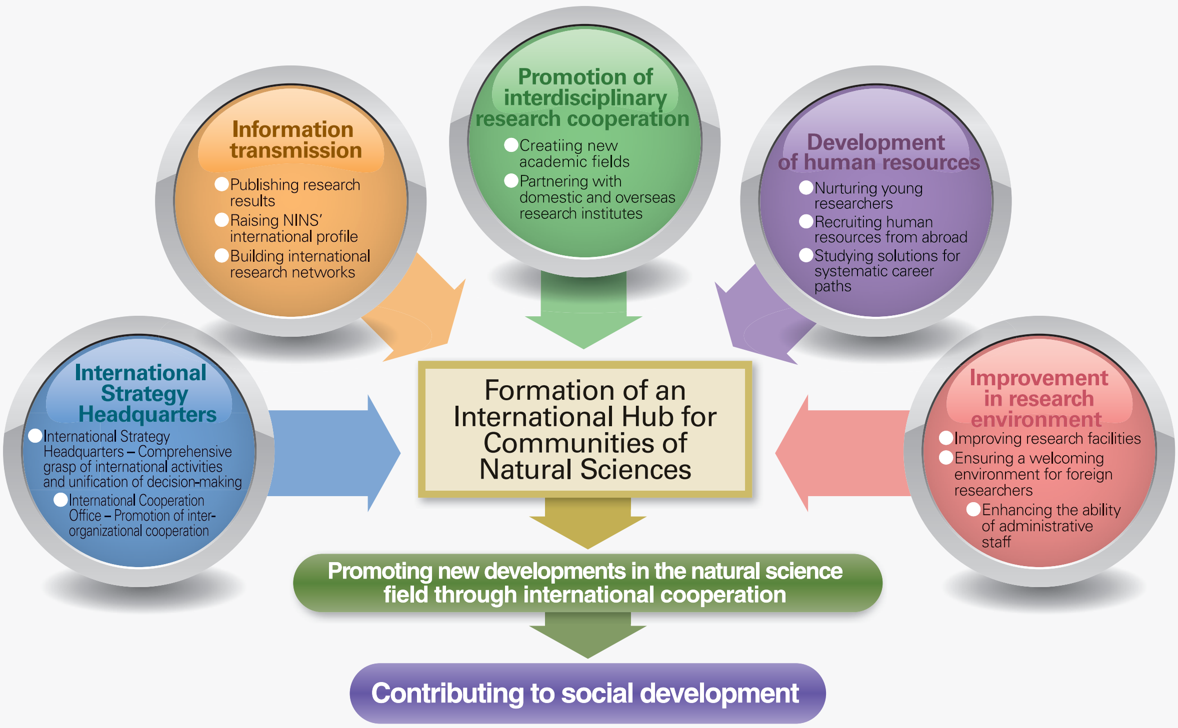
Formation of an International Hub for Communities of Natural Sciences

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 (ICO) 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. Furthermore, the ICO is implementing activities designed to enhance the international perspective of NINS' administrative staff. During this past year, the ICO conducted an intensive staff training seminar at NAOJ's facilities in Hawai'i.

NINS' International Strategies




Professor A.J. Stewart Smith, Dean for Research of Princeton University, visits NINS' President Yoshiro Shimura


Nobel Laureate James D. Watson attends the NINS International Forum on Molecular Biology 2008 with Professor Joan A. Steitz and NINS President Yoshiro Shimura

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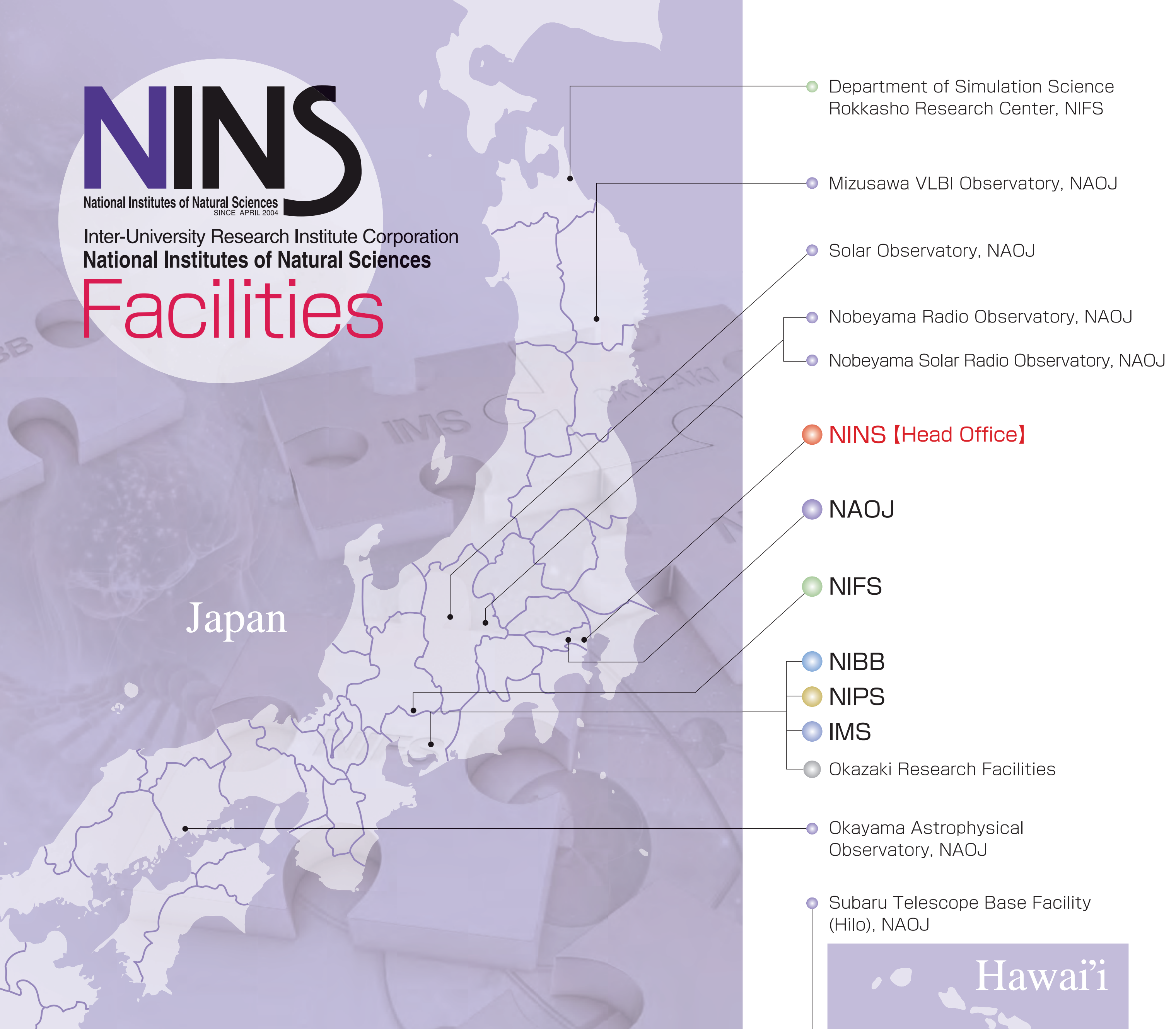

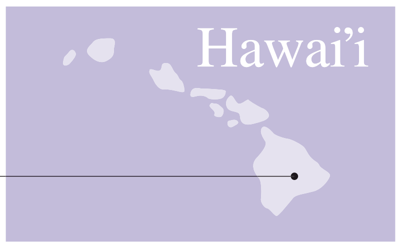

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