

2010

Inter-University Research Institute Corporation

Research Organization of Information and Systems



- National Institute of Polar Research
- National Institute of Informatics
- The Institute of Statistical Mathematics
- National Institute of Genetics
- Transdisciplinary Research Integration Center
- Database Center for Life Science

Collaborative organizations shed light on the future of academic research

The Research Organization of Information and Systems had its beginnings in 2004 as an incorporated organization that brought together research institutes with complementary capabilities, not merely for the purpose of bringing them together but also to enable them to cooperate based on a consistent research vision. Thanks to this cooperation the first phase of our mission as an incorporated organization has concluded successfully, and following an evaluation of the results, we have been able to start the second phase with additional refinements.

The philosophy for establishing the Research Organization is now widely understood and accepted, and the institute has made steady progress with its reforms in line with academic trends. It is also important to note that the Transdisciplinary Research Integration Center, established as a central organization, has been active in research in interdisciplinary areas that are challenging for any single research institute. The Center has been undertaking activities that only an incorporated organization with its increased autonomy could pursue, involving from this year people and society as major areas of research in addition to life and the global environment. Meanwhile, the Database Center for Life Science established in fiscal 2007 has moved forward with the integration of databases that serve important roles as the base for future life sciences, drawing on its capabilities as an Inter-University Research Institute. Although the research environment in Japan faces many challenges, we are determined to use incorporation as an opportunity to raise the level of sophistication of individual research institutes and open up new research areas. We hope that we can count on your understanding and support for our mission and activities.



Inter-University Research Institute Corporation
Research Organization of
Information and Systems

President
Yoshiki Hotta

Philosophy of the Research Organization of Information and Systems

The Research Organization of Information and Systems establishes and operates a core research institute for promoting integrated research on a global level in the areas of polar sciences, informatics, statistical mathematics, and genetics, in collaboration with the research communities at universities and other organizations all over Japan. The Organization also aims to conduct integrated research across disciplines by addressing, from the perspectives of information and systems, issues involving complex phenomena of life, Earth, the natural environment, human society, and other areas, as critical issues for the 21st century. To achieve this, a central organization has been established to facilitate integrated research, and will attempt to construct a new research paradigm and to open up new research areas, again adopting an information and systems perspective. Also, by offering an information platform that supports the speedy and effective development of research at universities and other academic research institutes in Japan and overseas, the Organization seeks to raise the level of research in Japan.

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What are Inter-University Research Institutes?

Inter-University Research Institutes are unique research organizations in Japan that seek to promote joint research across disciplines among universities. The institutes offer large-scale and cutting-edge facilities, large volumes of academic data, and valuable materials, which a single university would find it difficult to create and maintain, making them available free of charge to researchers in Japan as institutes shared by universities in different disciplines.

The first Inter-University Research Institute was formed in 1971, and today there are 17 of them. They play an essential role in facilitating rapid progress in research and in responding to demands from research communities to reorganize research institutes affiliated with national universities.

Each of the institutes has undertaken joint research by pooling the wisdom of nationwide researchers, as the core base of their respective research area. At the same time, the institutes have represented Japan at numerous international conventions, and have served as the organizers of research communities.

In 2004 the Inter-University Research Institutes were reorganized under four independent institutes, pursuant to the National University Corporation Act. Each of these institutes is charged with reinvigorating research in an independent environment, facilitating strategic action to enhance inter-university use and research functions, while creating new research areas.

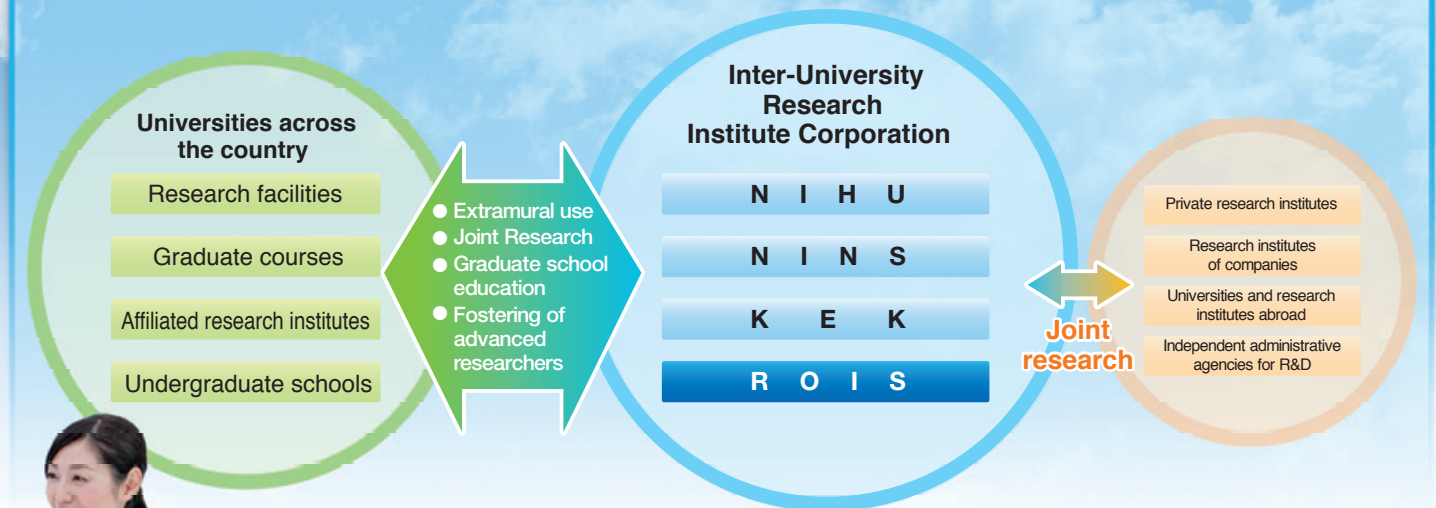
Given this situation, close collaboration with universities is essential. Inter-University Research Institutes have been

established as research bodies that address areas outside the reach of any single university, to pursue world-class studies. Their most fundamental characteristic is to offer the infrastructure needed to facilitate university-led research, and they have made significant contributions to the academic world. Inter-University Research Institutes are likely to become even more important in the years ahead.

Inter-University Research Institutes will continue to play an important role in supporting education and research at universities, and in advancing the academic research that is principally conducted by universities. In addition, we will continue our activities as research institutes of equivalent standing to universities, aiming at genuine research that originates from the independent thinking of our researchers.



As “Centers of Excellence” in Japan



[Features of Inter-University Research Institutes]

1 Joint use of large-scale facilities and joint research

Inter-University Research Institutes develop large-scale and advanced research centers that single universities would find it difficult to maintain, in order to enable cutting-edge research and to offer facilities for researchers nationwide.

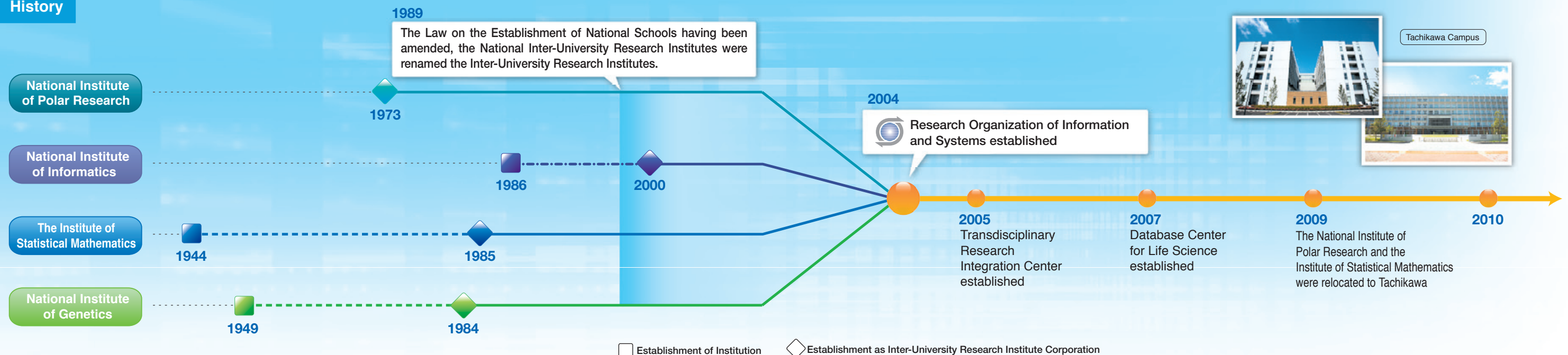
2 Collection, study, and provision of materials and data

Inter-University Research Institutes systematically collect and manage academically valuable materials and large-volume data, and make them openly available for improving intellectual platforms.

3 Establishing academic information platforms and databases

Inter-University Research Institutes create networks for facilitating the exchange of academic information among universities and research institutes, both within Japan and internationally. In addition, databases of the results of research will be developed and made available.

History



TOPICS — Relocation to Tachikawa Campus —

In 2009, the National Institute of Polar Research and the Institute of Statistical Mathematics were relocated to Tachikawa from their long-standing home bases in Itabashi and Hiroo, respectively.

The relocation followed a Cabinet decision “On the Relocation of National Government Organizations” in July 1988. Since June 1993, when the former U.S. military base at Tachikawa was chosen for the new location, preparations have been under way for the relocation.

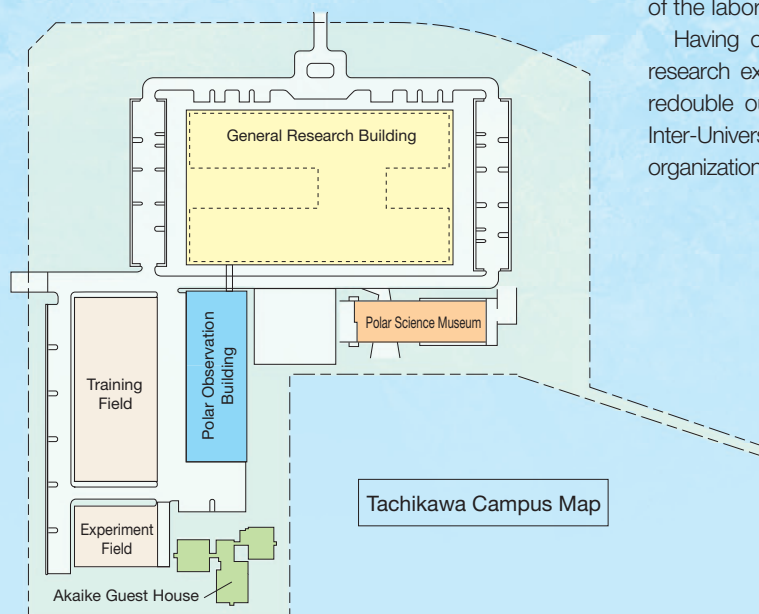
Here at Tachikawa Campus, three research organizations, including the National Institute of Japanese Literature, the National Institutes for the Humanities, which had moved to Tachikawa earlier, began writing the next chapter in their histories.

The H shape seen from above is the general research building, with six floors and one basement level, and a total floor space of 48,105 square meters. It houses

the laboratories and offices of the two institutes, including the National Institute of Polar Research's low-temperature laboratories, where the operating temperature is -50 degrees Celsius, and supercomputers in the basement boasting world-class performance in the area of statistical science. Located on the south side of the general research building is the polar observation building. It has a training field on the opposite side, allowing more space for experiments involving equipment and trial assembly of structures to take to the South Pole on Antarctic expeditions. Also on the campus are the Akaike Guest House, an accommodation facility for researchers, and a pavilion called the Polar Science Museum.

With the addition of the two institutes on the one campus, the administrative facilities of the two institutes were reorganized into the NIPR / ISM Joint Administration Office in July 2010. Team systems were introduced to encourage administrative rationalization and flexible responses, and to enhance the capabilities of the laboratories.

Having obtained ample space for joint research and research exchange on the Tachikawa premises, we will redouble our efforts to accomplish our mission as an Inter-University Research Institute and become a research organization welcomed by the local community.



General Research Building



Entrance & Relief



Polar Observation Building

Tachikawa Campus Site & Buildings

Site Area 62,450m²

Buildings 54,023m²

General Research Building [48,105m²]

Polar Observation Building [4,043m²]

Akaike Guest House [766m²]

Polar Science Museum [1,109m²]



Akaike Guest House

Launched in June this year, the facility was built to accommodate joint researchers for extended periods after the relocation of the two institutes to Tachikawa and to facilitate a lively exchange among researchers. It was named after Dr. Hirotugu Akaike, the eighth director-general of the Institute of Statistical Mathematics. Three buildings are connected by a central exchange lounge and there are 14 single rooms, three double rooms and one barrier-free room. We will provide services to help people who visit and stay at the Research Organization of Information and Systems to concentrate on their research.



Polar Science Museum

The Polar Science Museum is a new front in the National Institute of Polar Research, providing information on the forefront of Japan's polar scientific research, as well as on the current situation, achievements, and history of Antarctic and Arctic observation. Our vision is to act as a “Window on the Global Environment” and as a “Time Capsule,” and we aim to become a base for the distribution of information on the latest research achievements and activities in polar science research.



Transdisciplinary Research Integration Center (TRIC)

Grand design of the Transdisciplinary Research Integration Center (TRIC)

The Research Organization of Information and Systems (ROIS) was established in 2004, integrating four institutes in the Inter-University Research Institute Corporation (IURIC), in order to enhance the activities of IURIC and to produce a new style of cooperative research beyond traditional academic fields. At the same time, the Transdisciplinary Research Integration Center (TRIC) was established within ROIS to carry out the basic plan of the IURIC and create new research fields. TRIC started transdisciplinary research for developing new and original approaches to prediction and knowledge discovery based on data and statistical modeling, and ultimately the creation of new research paradigms. This is achieved by combining vast and varying amounts of experimental and observational data and knowledge about life science and earth science generated by the National Institute of Genetics and the National Institute of Polar Research, statistical modeling and computing technologies developed by The Institute of Statistical Mathematics, and informatics and information infrastructures developed by the National Institute of Informatics.

New research projects of TRIC

In the second phase of operation that started in fiscal year 2010, TRIC has embarked on new projects in the field of Human and Social Systems, in addition to the two fields of Life Systems and Earth Environment Systems carried over from the first phase of operation. TRIC now promotes a total of five transdisciplinary projects in these three fields in cooperation with the Statistical Mathematics Infrastructure and the Information Infrastructure.

TRIC will create action plans for cooperating not only with the four institutes making up ROIS but also with other universities and domestic and foreign institutions, and for implementing those plans.

The two activities of TRIC

TRIC has the following two activities.

1. Transdisciplinary projects

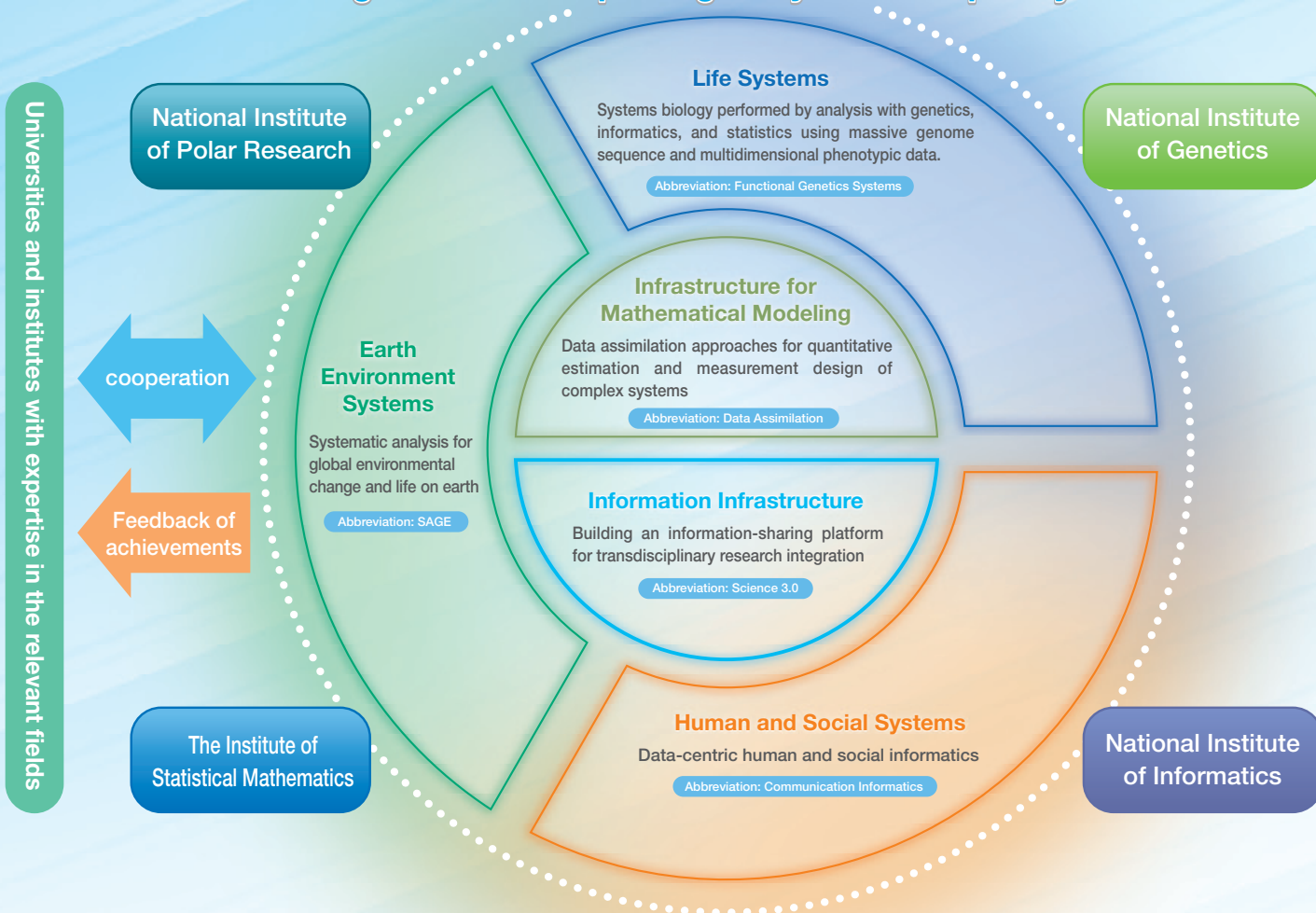
The five projects are distributed over the three fields of Earth Environment Systems, Life Systems, and Human and Social Systems in cooperation with the Statistical Mathematics Infrastructure and the Information Infrastructure. These projects are operated in a functional and organic way beyond the frameworks of the four institutes of ROIS.

2. Human resources development program

This is a program aimed at developing young researchers in institutes and universities, who will take over future TRIC activities. The program has the following three core features.

- 1) An annual meeting called "Young Researcher Cross Talk" is held in order to enhance communication among young researchers.
- 2) Participation in relatively small-scale pilot projects, which may be the seeds of transdisciplinary research and could be expanded into future transdisciplinary projects, is invited for all researchers in ROIS.
- 3) Relatively small-sized research meetings and workshops, for developing action plans to create new transdisciplinary research, are financially supported.

Creating new research paradigms by transdisciplinary research



Life Systems

Systems biology performed by analysis with genetics, informatics, and statistics using massive genome sequence and multidimensional phenotypic data.

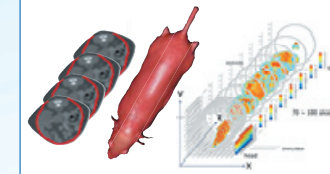
Abbreviation: Functional Genetics Systems

Project director: Professor, Nori KURATA (National Institute of Genetics)

Systems biology is a data-centric transdisciplinary study of genetics, informatics, and statistics focusing on complex interactions in biological systems. This project aims to describe genetic and phenotypic variation of organisms as systems, using massive genome sequence, gene expression and various phenotypic data from the unique and rich genetic resources at the National Institute of Genetics (NIG), information technology at the National Institute of Informatics (NII), and statistical modeling technology at the Institute of Statistical Mathematics (ISM). The collaboration of researchers from these institutes and other universities will develop new methodologies to understand complex systems of morphological and behavioral variation of organisms.

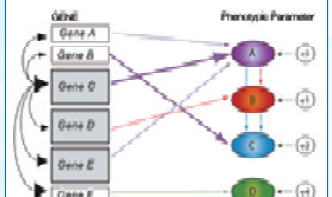
Development of auto-instrumentation systems for measuring phenotypic variations.

Informatic analysis of 3 dimensional graphic data, and statistical analysis of sequential data, etc.



Elucidation of global systems through analysis of individual genetic elements.

We use QTL, e-QTL, association analysis, graphical modeling, etc.



Human and Social Systems

Data-centric Human and Social Informatics

Abbreviation: Communication Informatics

Project Director: Noboru SONEHARA (National Institute of Informatics)

Associate Project Director: Hiroe TSUBAKI (The Institute of Statistical Mathematics)

At present, scientific research is continuing to evolve with further innovative changes brought about by the advent of the Internet and related information and communication technologies. Thanks to the technology used in these sophisticated information systems, most of the hardware and sensors used to gather information are linked to these networks. Information distributed in digital form technically allows anybody to access it at any time and from any place. The empirical scientific research method based on complex large-scale data collected through these networks is called Data-centric Science. The Knowledge Circulation infrastructure, which creates new value by projecting concrete information from our society into cyberspace, analyzing and simulating it on the web, and enabling feedback from the web to real people and objects, will be one of the major pillars of future Human and Social Informatics. We have focused on three points: [1] automatic collection and accumulation of a vast amount of data reflecting our society; [2] providing feedback to users based on models constructed by the collected data; [3] the possibility of forming a site for Human and Social Data Sharing and Collaborative Researches.



The structure of data sharing/collaborative research infrastructure

Earth Environment Systems

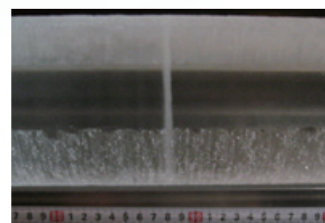
Systematic Analysis for Global Environmental Change and Life on earth

Abbreviation: SAGE

Project Director: Dr. Hideaki MOTOYAMA (National Institute of Polar Research)

Sub-Project Director: Dr. Satoshi IMURA (National Institute of Polar Research)

Environments on the earth have been formed by the balance of the atmosphere, hydrosphere, geosphere, biosphere, and anthroposphere. By analyzing the relationship between the evolution of life and global environmental change, a de novo science of life systems on Earth will be established.



Deep ice core of Dome Fuji station, Antarctica. Volcanic ash about 140,000 years before is seen as strat thin layer at the depth 1,851m.



Moss pillars found at about 3 m in depth in some Antarctic lakes. They are mainly composed of aquatic mosses, algae and bacteria. The largest one, up to about 80 cm in height, is thought to have been growing for about 1,000 years.

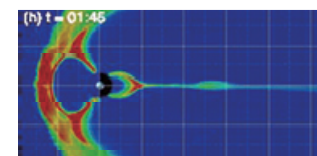
Infrastructure for Mathematical Modeling

Data Assimilation Approaches for Quantitative Estimation and Measurement Design of Complex Systems

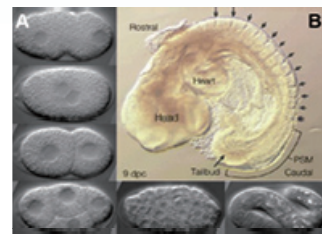
Abbreviation: Data Assimilation

Project Director: Dr. Tomoyuki HIGUCHI (The Institute of Statistical Mathematics)

Increases in computing power enable us to develop more sophisticated multi-dimensional simulation models. Along with the advancement of observational techniques, databases holding observations are also growing rapidly. For these reasons new data fusion platforms need to be constructed for managing, fusing and serving massive data streams coming from simulations and observations. In this project, we focus on the generalization and sophistication of integrated operations that fuse together computational studies with analyses of observational data.



The data assimilation method will combine a numerical simulation model and observation data, thus yielding more powerful algorithms for the Earth's magnetospheric dynamics.



The data assimilation method is applied to developmental biology studies in order to construct quantitative models. On-going topics include cell division in the *C. elegans* embryo (A) as well as mouse embryogenesis (B).

Information Infrastructure

Building an information-sharing platform for transdisciplinary research integration

Abbreviation: Science 3.0

Project Director: Dr. Noriko ARAI (National Institute of Informatics)

Our project team launched a new web service called Research map, which is an information-sharing platform for researchers. By unifying the data of researchers, such as academic literature and conference talks, Research map helps researchers build their own portal sites instantly and start collaboration with other researchers.

The user of Research map obtains three virtual spaces at different access levels. The first one is called "My Portal," which can be used as the homepage. The second is called "My Room" and is meant to be a virtual private space not accessible by anyone else. The third is called "Community" and can be used as a collaborative working/learning space with other member researchers. Research map provides more than 30 portlet applications including Curriculum Vitae, Weblog, Cabinet and Video Sharing. The user can arrange the portlet applications intuitively on a given page by drag-and-drop, just like arranging one's own room to express oneself. With a lot more functions to be added shortly, Research map is now expanding to act as a bridge between researchers and the general public.



Database Center for Life Science

The Database Center for Life Science creates an intellectual information infrastructure to develop life science.

To improve the accessibility of life science repositories, the Database Center for Life Science (DBCLS) was set up as a core organization to promote repository integration, to enable a broad-based view of related knowledge resources, and to establish a new knowledge infrastructure.

As a core institute of the Integrated Database Project funded by the Japanese Ministry of Education, Culture, Sports, Science and Technology, DBCLS provides various services from the Project's portal site (<http://lifesciencedb.jp/?lng=en>). Some of the services available in English (most are available only in Japanese) include a database cross-search service, a catalog that provides information on large-scale genome and post-genome projects in Japan, and other useful tools and resources.

By providing these services, we hope to promote more efficient research and development in the field of life science at institutions and in the bioindustry, and to develop a new paradigm that will become a core model for a grand alliance in life science.

Strategy planning

While Japanese scientists have constructed a number of life science databases (in most cases as part of national projects), the databases are infrequently used by domestic research communities because relevant information exists across several databases. Today an environment that allows the effective use of these data(bases) has become essential for advances in life science research and the bioindustry.

To coordinate the domestic life science databases, DBCLS carries out the following activities. First, DBCLS collects and compiles details of the current situation and trend of life science databases and makes these reports available from the Integrated Database Project's portal site.

Second, DBCLS organizes a committee that is comprised of various stakeholders including Japan's representative database providers, and considers and plans strategies to integrate domestic life science databases.

Third, issues surrounding data access, data sharing, copyright and privacy policies have been and continue to be discussed and considered with experts in these fields. As part of this process, DBCLS has organized conferences to discuss these issues.

Finally, the services developed as part of the Integrated Database Project are made available to the public and annually reviewed by users through a survey. The results of the survey are utilized to improve the functionality of the database services.

Issues in Life Science Databases in Japan

- The whereabouts and usage of each database are difficult to discover
- Databases are not available in Japanese
- New technologies must be developed to effectively utilize databases
- The number of people who are capable of constructing and maintaining databases is insufficient
- The outcomes and products of national projects are not sufficiently open to the public
- Databases can no longer be maintained when the funding of large-scale national projects ends
- Experimental biologists and bioinformaticians rarely work synergistically
- The association between experimental data and knowledge extracted from the literature is insufficient
- Institutions responsible for coordinating database integration on a long-term basis do not exist

Solutions

Design database strategies and perform feasibility assessments

Accept databases that can no longer be maintained and archive them in repositories

Provide training and education for human resource development

Promote research and development in the information technologies necessary to database integration

Annotate genomes of model organisms manually and automatically

Provide methods to access articles and publications together with databases

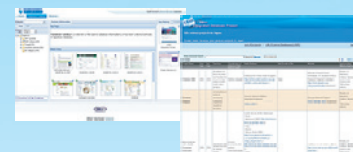
Develop and maintain a portal site that presents the whereabouts and usage of databases

Portal site of the "Integrated Database Project"
<http://lifesciencedb.jp/?lng=en>



Toward the integration of databases

Information technologies and services available from the Integrated Database Project



Catalogs of life science databases, national projects, societies and academies, species



Search systems using natural language processing



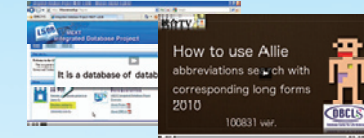
Tools and resources



International conferences for developers working on biological resource integration



Building dictionaries for life science vocabulary



Text and movie tutorials

Integrating databases

Finding databases and retrieving records that fulfill one's needs from over 500 domestic databases or over ten million databases worldwide have become time-consuming and difficult.

As part of the Integrated Database Project and to overcome this situation, DBCLS is committed to providing various database services. For example, there is a database of life science databases ("Database catalog") from which users can browse and find out about the life science databases that are currently available worldwide. There are also movie tutorials ("togotv") that describe how to use a certain database or tool, and an archive ("Life Science Database Archive") where users can submit their datasets to be made downloadable and maintained in a long-term and stable state. In addition to these services, DBCLS carries out basic research and development of web services, tools and ontologies that are essential information technologies for database integration.

A single integrated database cannot satisfy the interests of every researcher in the life sciences, since there are specific research fields within the life science community. Institutions participating in the Integrated Database Project therefore develop databases for specific research fields, such as medicine, pharmacology, and glycobiology. Along with the general integration tools mentioned above, these specific databases should help to unearth useful information that a researcher was previously unaware of. We hope that these activities will take us a step further in resolving issues surrounding life science databases.

Public relations and communications

In cooperation with institutions participating in the Integrated Database Project, DBCLS holds training courses for potential annotators, curators and system administrators on a regular basis. These training courses cover basic to advanced uses of life science databases and tools and are held at universities nation-wide.

DBCLS also exhibits its services at annual meetings and exhibitions to receive feedback from users. Events and information related to the Integrated Database Project are available from the "Information" Section of the Project's website.



NIPR

National Institute of Polar Research (NIPR)

Institute

Investigating the earth's system through the Antarctic and the Arctic

The National Institute of Polar Research (NIPR) was established in 1973 as an Inter-University Research Institute to pursue integrated research and to conduct observations in the polar regions. Since then, based on field observations in the Antarctic and the Arctic and using the results of modeling and data and sample processing, the NIPR has been promoting joint research with a view to developing an advanced earth system science that includes earth science, environmental science, solar-terrestrial system science, space and planetary science, biological science, etc.

As well as being responsible for scientific observation and logistics in the Japanese Antarctic Research Expedition (JARE), which is overseen by the JARE headquarters within the Ministry of Education, Culture, Sports, Science and Technology, the NIPR also plays a principal role in Japanese Arctic research with regard to managing the observational facilities, supporting field research, disseminating information, and dealing with international relations.



Syowa Station

Polar science as part of earth system science

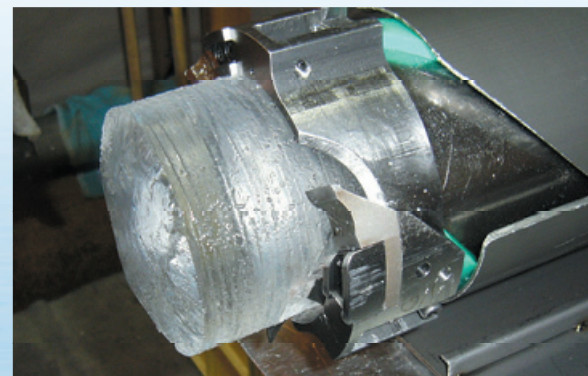
Nature in the polar regions of the Antarctic and the Arctic is an interrelated system consisting of space, the magnetosphere, the ionosphere, the atmosphere, the cryosphere, the oceans, the lithosphere, and the biosphere. These components are closely interactive and form a large natural system of their own. The aim of polar science is to elucidate physical, chemical, and biological processes and their interaction as part of the earth's system by utilizing the diverse natural science disciplines dealing with the above components.



Ice shelf in the Antarctic Ocean

Global environmental change from the vantage point of the polar regions

The cryosphere, which consists of the Antarctic ice sheet, glaciers in the Arctic region, and sea ice, plays an important role in the global climate, affecting both the atmospheric and oceanic circulation as the heat sink for the globe. The polar regions are therefore the best place to observe global environmental change because the extent of environmental changes is much enhanced in polar regions by the natural feedback mechanism, the background condition of the earth's environment can be most clearly monitored in the Antarctic, which is remote from human activity, studies on the ecosystem in the extreme polar environment can help develop new viewpoints regarding life and the environment, and the history of the global environment is recorded in the cryosphere.



Ice core drilling at Dome Fuji

Polar regions as a window for space and planetary research

The aurora that colors the polar upper atmosphere is a product of the interaction of the solar wind and the earth's magnetosphere, and to study its behavior is so valuable in elucidating the physical process of plasma and solar wind energy entering the magnetosphere and ionosphere that the polar regions are recognized as an important window for research on the upper atmosphere.

The Antarctic is also an indispensable research site for space and planetary science because in this region the meteorites and cosmic dust that form planetary material can be efficiently collected, and cosmic rays and millimeter waves can be received without excessive obstruction from the earth's atmosphere. Thus the Antarctic is a window through which space and the planets can be observed.



Auroral observation at Syowa Station

Earth's history explored in the Antarctic

Antarctica is a continental crust including a complex dating from about 3.8 billion years ago, implying that it is part of the early continental crust formed on the earth. The Antarctic is the best area for investigating the formation of Gondwana 500 million years ago and its separating process afterward, and the characteristics of the Antarctic plate involved in the formation of the Antarctic ice sheet 40 million years ago. The Antarctic ice sheet has been changed so much since its creation that it has affected sea level change and crustal movement. The study of Earth's history as explored in the Antarctic involves the clarification of various phenomena on the inside of the earth and the surface of the continental crust over the long timespan of 4.6 billion years.



Geological survey in the Sør-Rondane mountains

National Institute of Informatics (NII)

Supporting the Foundations of ICT Society as a Core Informatics Research Organization

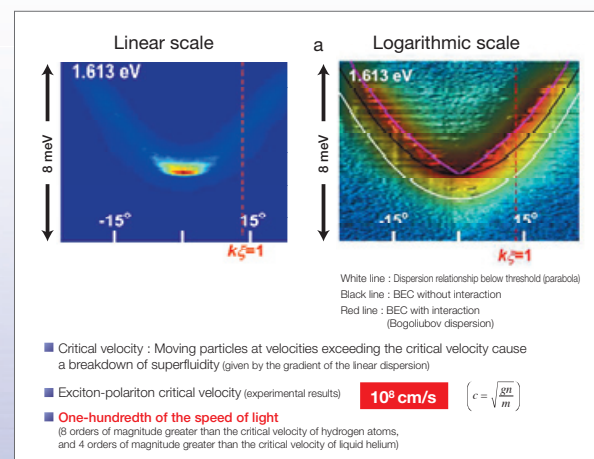
The National Institute of Informatics (NII) celebrates the 10th anniversary of its founding this year. As the sole core informatics research organization in Japan, the NII is involved in front-line research into information, which is a vital part of our daily lives, currently in demand by society in general and academia in particular. The NII is also involved in establishing an academic information network for supporting research and education activities at universities and other institutions, and in providing academic content services, such as research paper databases, by creating an academic information base to support academic and research activities across all fields, not only informatics. The NII has already made significant social and international contributions by acting as a central hub for research in informatics through its close ties with organizations in a wide range of fields both within Japan and overseas, including universities, research bodies, and private-sector businesses.



Quantum Information Processing

Future computers known as “quantum computers” will offer the potential of vastly increased computational power compared to the supercomputers currently in use today. The NII aims to become a world leader in this field by utilizing Japanese technology for quantum information processing, conducting fundamental theoretical and experimental research towards the realization of such devices.

Quantum information processing is a much sought-after technology which is expected to revolutionize the fields of communications and information processing, and may also reinvigorate the information, communications, and semiconductor industries.



Top SE Project

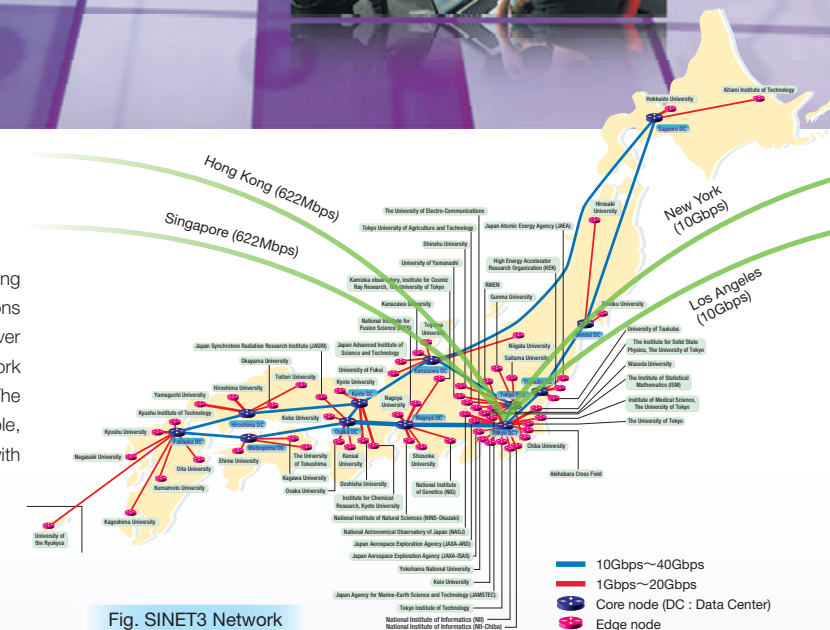
The Top SE Project involves incorporating research, education, and practical experience into a world-class software engineering training program with the aim of producing top-class software engineers. Twenty courses are provided, enabling participants to gain applied skills through practical assignments and exercises based on actual development activities as well as software engineering theory based on state-of-the-art technology and theory. To date, there have been four semesters, with a total of 105 participants completing their courses. 30 companies have provided assistance, a figure which is increasing annually. The program has received attention as a means of producing engineers capable of applying state-of-the-art technology in the workplace in a way not possible through a conventional university education.



A Top SE lecture in progress

Science Information Network

The Science Information Network (SINET) is an information network supporting the research and educational activities of universities and research institutions throughout Japan. Having currently been used by over 2 million people from over 700 member institutions in Japan, it has grown to become a vital network infrastructure forming an information lifeline for the academic community. The current version, SINET3, provides a wide range of services that are highly reliable, and promotes international academic collaboration through interconnections with Asian, European, and American research networks.



Academic Information

CiNii (NII Scholarly and Academic Information Navigator) is a search engine for academic papers published in society journals and university bulletins. CiNii consists of a metadata database on 13 million papers and the full text of 3.5 million papers. Over 64 million queries are made on CiNii each year and 32 million papers are downloaded. Today the users are not only researchers and students but also members of the general public. Other specialized databases such as Webcat Plus (NII Book Information Navigator), KAKEN (Grants-in-Aid for Scientific Research), and JAIRO (Institutional Repositories Portal) have been created and are actively sharing data with GeNii (NII Scholarly and Academic Information Portal), a general portal site for academic information for research and education.

Informatics of Association

“IMAGINE Book Search” is a federated search service which collects related information from various resources, such as library catalogue databases, stock databases of second-hand bookstores in Jimbouchou and other bookstores, genre-based guides to paperback pocket editions, encyclopedias, museum artifact databases, etc. Collected information can be dynamically correlated by the association engine known as GETA. Contributions are also made to the community and to culture by providing “BOOK TOWN JIMBOU,” a portal site to the world’s largest book district; “Cultural Heritage Online,” the Agency for Cultural Affairs’ cultural heritage portal site; and “Yuhokan,” the National Museum of Art’s virtual brochure system, all of which use the associative computational engine GETA.



The Institute of Statistical Mathematics (ISM)

Promoting research on the mechanism of data-based rational inference

Extracting information from data forms the basis of such intellectual activities as prediction and knowledge discovery. As our modern information society progresses, enormous amounts of data are being accumulated continuously in many different forms.

The Institute of Statistical Mathematics is promoting research on the mechanism of data-based rational inference within a wide range of diverse fields, such as life science, environment, society and economics. In the face of increasing complexity and uncertainty we aim to create added value in order to meet the growing needs of present-day society, hence improving the valid utilization of data.

Through prediction and knowledge discovery, modeling of uncertainty, risk analysis, data design and investigation, and computational, statistical and fundamental mathematics, we research and develop solutions to a diverse range of problems arising in Japanese science and technology. In particular, we are actively involved in interdisciplinary and cooperative research within and across the boundaries of business and academia.

$$\begin{aligned} \text{AIC} &= -2 \sum_{a=1}^n \log f(x_a | \hat{\theta}) + 2p \\ \text{GIC} &= -2 \sum_{a=1}^n \log f(x_a | \hat{\theta}) + \frac{2}{n} \sum_{u=1}^n \gamma^{(1)}(x_u; \hat{G}) \frac{\partial \log f(x_a | \theta)}{\partial \theta} \bigg|_{\theta = T(\hat{G})} \\ p\bar{l}_\delta(V) &= - \sum_{j=1}^N \log \hat{p}_{Ci}(V K_\omega(x_j)) + \frac{\delta}{2} \text{trace} \Gamma V K_\omega V^t \end{aligned}$$

Composition of the basic research organization

Department of Statistical Modeling

This department studies the modeling of complex causally interrelated phenomena which vary in time and space and of intelligent information processing, as well as model-based statistical inference methodologies.

Group composition

- Spatial and Time Series Modeling Group
- Intelligent Information Processing group
- Graph Modeling Group

Department of Data Science

This department carries out research regarding data design and investigation to cope with uncertainty and incompleteness of information, and data analysis methods based on the advanced use of computers.

Group composition

- Survey Research Group
- Multidimensional Data Analysis Group
- Computational Statistics Group

Department of Mathematical Analysis and Statistical Inference

This department studies fundamental statistical theory and statistical learning theory, optimization for statistical inferencing, and the theory and fundamental mathematics of computational algorithms.

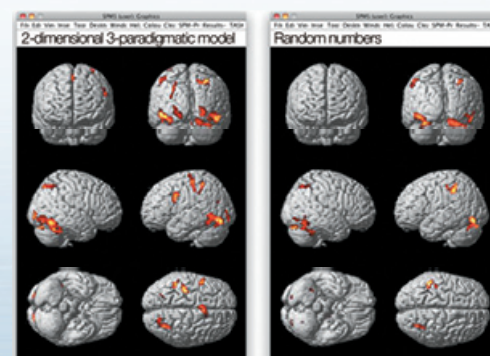
Group composition

- Mathematical Statistics Group
- Learning and Inference Group
- Computational Mathematics Group

Collaborative Use and NOE activities

As an Inter-University Research Organization charged with the central role of researching statistical mathematics and its applications, we recruit domestic and foreign researchers and promote solicited cooperative research in the techniques of prediction and knowledge discovery, data assimilation, and investigation technology.

From 2004 a strategic research organization was set up in an interdisciplinary way involving researchers from diverse basic research organizations, and NOE (Network of Excellence) activities were started to bring various research organizations to work cooperatively from the standpoint of statistical mathematics. One of the aims of the cooperative research done within the NOE is to train young researchers with a practical bias. As the only domestic full-scale statistical mathematics research organization which also trains researchers, we intend to accelerate NOE-type cooperative research in the future and thus to carry out our responsibility to society.

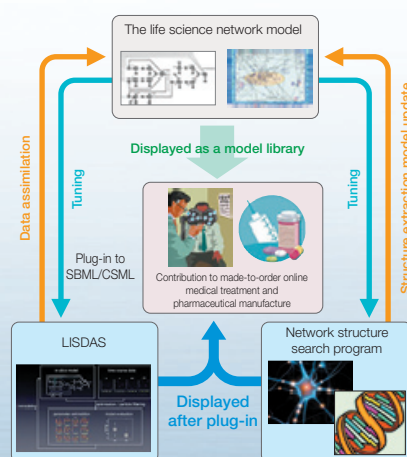


Difference in cerebral activity according to different algorithms (cooperative research with Jichi Medical University)

An organization to strategically create an interface between statistical mathematics and cutting-edge technology and real society

Prediction and Knowledge Discovery Research Center (PKDRC)

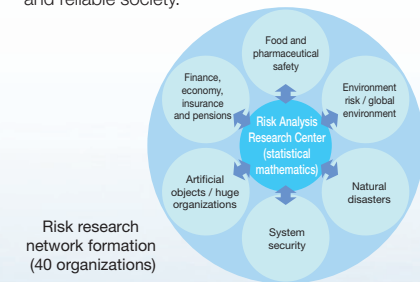
The Prediction and Knowledge Discovery Research Center aims to create modeling and inferencing algorithms for prediction and discovery to utilize information extracted from the huge data sets created by complex systems, and to develop statistical software based on these algorithms. Additionally, the center aims to solve specific problems in substantial sciences such as genomic, earth, and space sciences.



Made-to-order pharmaceutical manufacture through data assimilation technology

Risk Analysis Research Center (RARC)

As uncertainty and risks in society increase with the growing globalization of society and the economy, the Risk Analysis Research Center is pursuing a scientific approach to uncertainty and risk, and is also constructing a network for risk analysis to contribute to the creation of a safe and reliable society.



Risk research network formation (40 organizations)



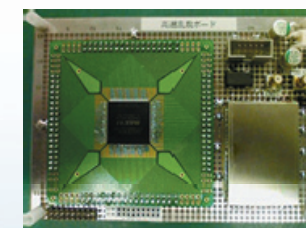
1993-1997 Age-adjusted mortality rate (DAR, per 100,000 populations) Empirical Bayes estimates



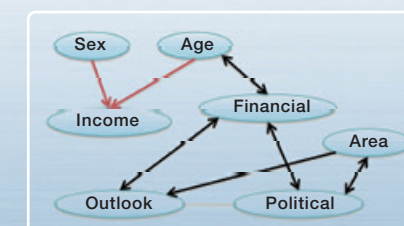
1998-2002 Age-adjusted mortality rate (DAR, per 100,000 populations) Empirical Bayes estimates

Research Innovation Center

The objective of this center is to develop innovative research in statistical science to keep up with new trends in the academic and real worlds. The center carries out original research projects, ranging over both pure and applied frontiers.



The high-speed random number board which is being developed at the Institute of Statistical Mathematics



Example of causal network using kernel methods



National Institute of Genetics (NIG)

Institute

Exploring life systems through the gene and the genome

The National Institute of Genetics (NIG) was established in 1949, 4 years before the DNA double-helix discovery, as a central institute to study various aspects of genetics. Since then the NIG has produced high-quality research achievements during its 60-year history, overlapping with the recent revolution in the field of life science. Life is a complex system, for which the methodologies of genetics form a powerful exploratory tool: since life is constructed by interactions between genomic information and the internal and external environments, genetics can be said to be the basis of all of life science.

The NIG carries out advanced research as a core institute of genetics in the field of life science, and works to build the necessary intellectual infrastructure to support life science research, promoting collaborative use and research.

Additionally, the Center for Frontier Research was established to develop new areas of research in life science and to further the development of young researchers. The NIG is also in charge of the department of genetics at the School of Life Sciences in the Graduate University for Advanced Studies, producing the next generation of talented researchers.

At the cutting-edge of life science research

The NIG conducts research to reveal the individual mechanisms of biological systems, in such areas as chromosomes and cells, epigenetics, development and differentiation, reproduction, neuroscience and behavior, genomics and bioinformatics, and evolution and diversity. We are also working toward clarifying the bigger picture of life systems using computer science to deal with large-volume experimental data involving genomic information and gene expression.

<From the Press Release>

Simulation of Genomic Evolution of Plants

Genomic evolution of plants mimicked with DNA hypomethylation mutants of Arabidopsis.



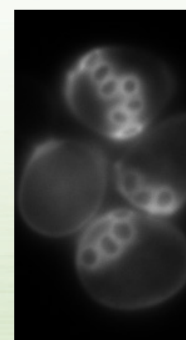
Normal



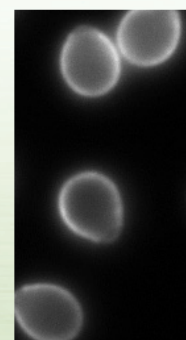
Abnormal

Discovering the rejuvenation mechanism of cells

A system copying junk genes contributing to reset of aging was found using yeast.



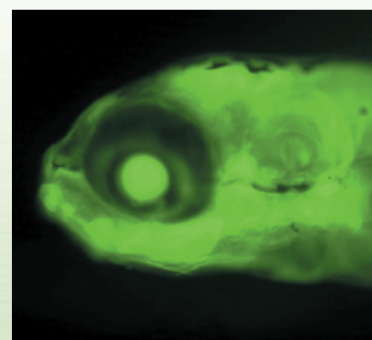
Aged



Rejuvenated

Constructing a system to induce gene expression

Successful development of high-efficiency transgenic and gene expression using transposon in zebra fish.



Transposon-inserted zebrafish

Building the intellectual infrastructure to lead in life science research

The NIG operates the DNA data bank of Japan (DDBJ), the Bioresources Project, and the DNA Sequencing Center as their core international base. The NIG supports the scientific community and helps to lead life science research through these organizations in collaboration with other universities and research institutes.



DDBJ Project

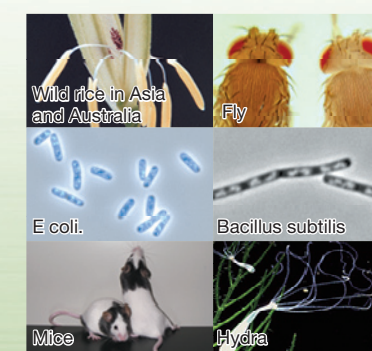
Together with Europe's EBI/EMBL and the U.S.'s NCBI/GenBank, the DDBJ makes up and administers the International Nucleotide Sequence Database (INSD). INSD data can be viewed, downloaded, manipulated, and redistributed regardless of intended applications or national boundaries. The INSD data is a shared resource for all peoples.



Supercomputer

Bioresources Project

NIG serves as a center for developing, collecting, and distributing biological resources of various strains of experimental organisms for academic research. NIG also plays an important role as a central institute for the National BioResource Project and functions as its information center to promote development of biological resource databases in collaboration with universities and other organizations.



DNA Sequencing Project

NIG is the national leader in technical knowhow and success at complete sequencing of multicellular organism genomes. NIG has conducted analyses of genes and genomes of 44 species in collaboration with 29 organizations (universities and research groups). NIG is a key producer of genomic information for academia and science.



DNA sequencer

The Graduate University for Advanced Studies <SOKENDAI>

Cooperation with the Graduate University for Advanced Studies

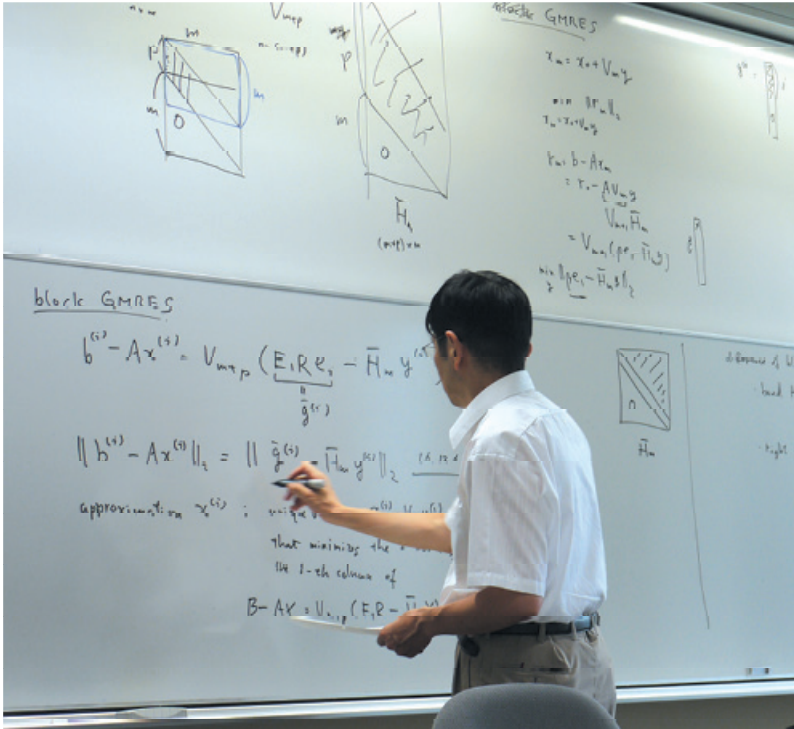
Cooperation with the Graduate University for Advanced Studies

The Research Organization of Information and Systems (ROIS) serves as the platform for the educational activities of the Graduate University for Advanced Studies (SOKENDAI)

Founded in 1988, SOKENDAI is a dedicated graduate university, offering no undergraduate courses but providing doctoral programs taught by researchers and using the research facilities of the Inter-University Research Institutes. Students receive education on a

one-to-one basis and have the opportunity to interact with researchers working at the very forefront of their fields. Many of the students who graduate from the university go on to play important international roles as researchers.

The four research Institutes of the Research Organization of Information and Systems also take part in SOKENDAI and have been making outstanding contributions.



University Organization

School	Department
School of Cultural and Social Sciences	
School of Physical Science	
School of High Energy/Accelerator Science	
School of Multidisciplinary Science	Department of Statistical Science Department of Polar Science Department of Informatics
School of Life Science	Department of Genetics
School of Advanced Science	

Inter-University Research Institute Corporation

Location
The Institute of Statistical Mathematics (ISM)
National Institute of Polar Research (NIPR)
National Institute of Informatics (NII)
National Institute of Genetics (NIG)

Research Organization of Information and Systems

■ Number of students enrolled (FY2009)

School	Department	Number of students		1st year		2nd year		3rd year		4th year		5th year		Total	
		3-year term	5-year term	Foreign students		Foreign students		Foreign students		Foreign students		Foreign students		Foreign students	
School of Multidisciplinary Science	Statistical Science	3	2	1	0	1	0	8	0	6	0	11	1	27	1
	Polar Science	1	2	3	0	2	0	3	0	6	1	4	0	18	1
	Informatics	6	4	7	3	7	2	10	5	11	4	37	11	72	25
School of Life Science	Genetics	6	3	8	2	3	2	9	1	12	0	12	0	44	5
Total		16	11	19	5	13	4	30	6	35	5	64	12	161	32

■ Degrees Conferred (FY2009)

School	Department	Location	Total
School of Multidisciplinary Science	Statistical Science	The Institute of Statistical Mathematics (ISM)	4
	Polar Science	National Institute of Polar Research (NIPR)	4
	Informatics	National Institute of Informatics (NII)	12
School of Life Science	Genetics	National Institute of Genetics (NIG)	11
Total			31

School of Multidisciplinary Sciences

○Department of Statistical Science

Amid a flood of information and uncertainty, statistical science researches statistical models and methods for the use of data to enable rational inferences, discover scientific truths, and make effective predictions. The Department of Statistical Science aspires to equip students with the confidence and research capabilities to help solve important and intricately interrelated problems. The department has accepted students from a wide range of disciplines, and graduates have gone on to become university professors and laboratory technicians, meeting needs from universities and other institutions for researchers and teachers of statistical science.



Poster session

○Department of Polar Science

The polar regions encompass a grand natural system of polar space, the polar atmosphere, the polar hydrosphere, the polar lithosphere, and the polar biosphere. Building on a broad area of research, polar science seeks to investigate and clarify physical, chemical, and biological processes and their interactions as part of the earth's system.

The Department of Polar Science seeks to educate students and conduct research mainly on natural phenomena in the Arctic and Antarctic regions, taking a holistic view of the global environment and training researchers with sophisticated research capabilities and competence as field scientists.



Auroral observation

○Department of Informatics

Informatics is a new academic specialty that synthesizes a wide range of information-related tasks. It is a complex science that traverses humanistic informatics and social informatics, dealing with people and society, stepping outside the traditional core of information science and information technology.

The Department of Informatics covers a number of academic fields, from traditional computer science and information technology to humanistic social science and life science. It aspires to train researchers through fundamental, applied, and practical levels of education and research, and to develop leaders who will play an active role in informatics through highly sophisticated professional training.



Discussion

School of Life Science

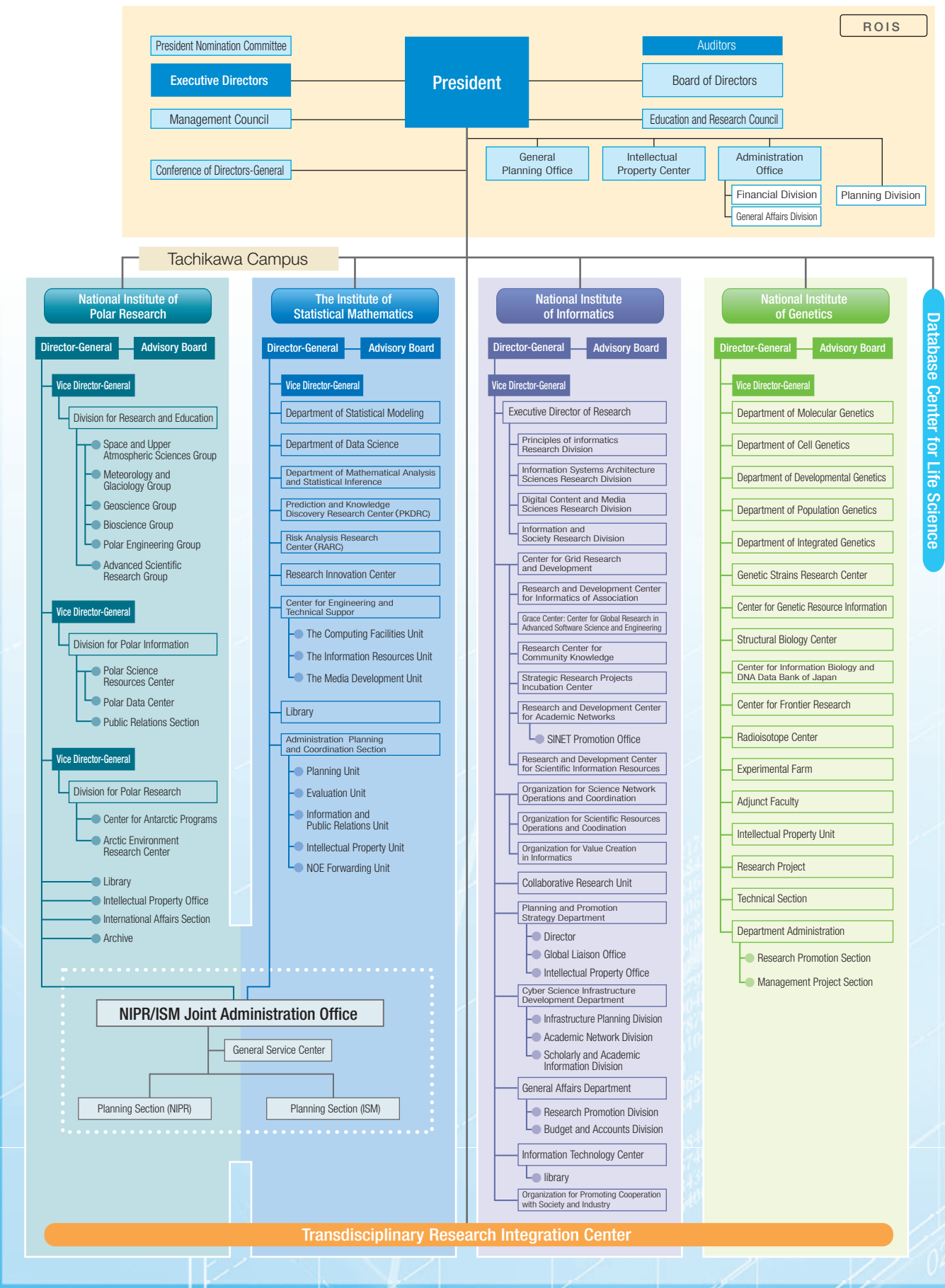
○Department of Genetics

Aiming to understand the phenomena of life in the context of genes, the Department of Genetics educates students and conducts research in the fundamental areas of molecules, cells, individuals, and population genetics, as well as in fields that apply these fundamental areas, by utilizing bioinformatics based on numerous experimental organism systems and DNA databases developed by the National Institute of Genetics and other state-of-the-art research equipment.

Graduate programs provide a system in which students receive guidance from several instructors, in addition to one tutor under the policy that all faculty members should be involved in the education of each student.



High-Quality Research



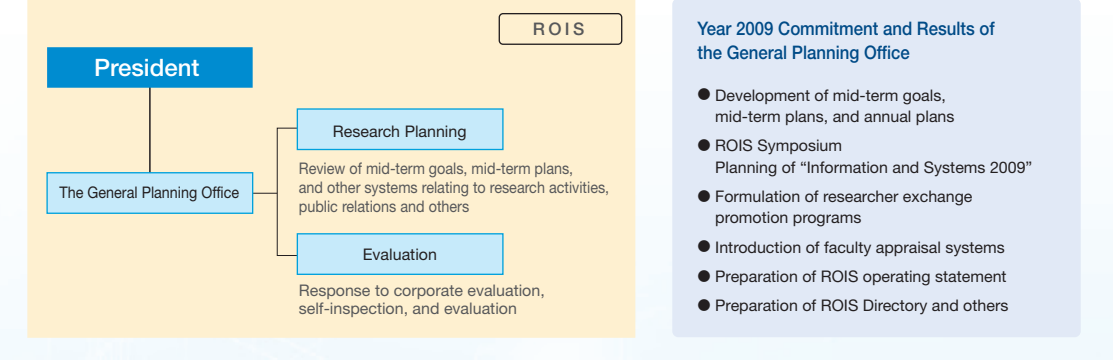
General Planning Office

The General Planning Office was established simultaneously with the Research Organization of Information and Systems (ROIS) as part of the headquarters organization of ROIS, aiming to deal with cross-functional activities of ROIS such as the development, execution, and evaluation of mid-term plans, annual plans, and public relations.

The General Planning Office comprises faculty in charge of the management of each of the research institutes, including vice-directors, as well as administrative managers of ROIS

headquarters and each of the research institutes. Faculty and administrative staff work together to ensure efficient operation of the organization.

A dedicated organization has been established within each of the research institutes as a counterpart to the General Planning Office to facilitate the management of ROIS through cooperation between ROIS headquarters and the research institutes.

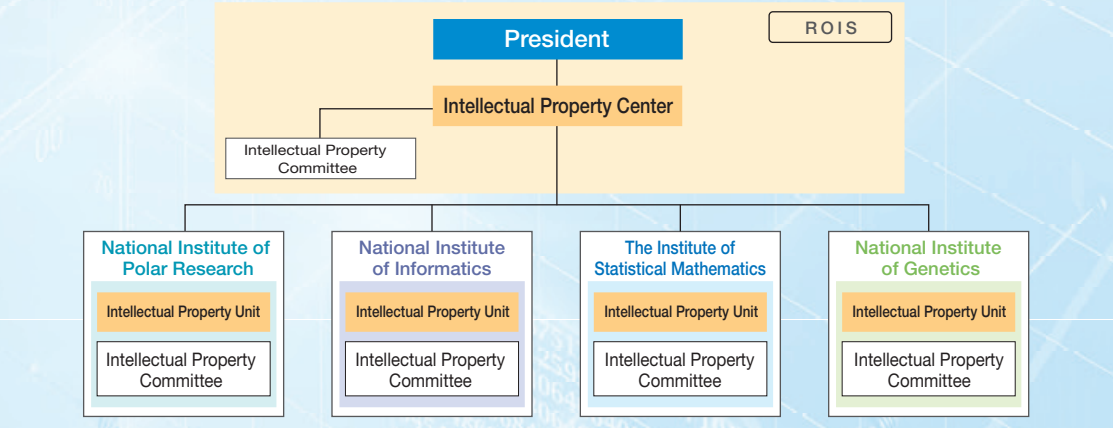


Intellectual Property Center

The Intellectual Property Center was established simultaneously with the incorporation of the Research Organization of Information and Systems (ROIS) as part of headquarters organization of ROIS to deal with ROIS's business relating to "Cooperation among Businesses, Universities and Government" and intellectual property. Later in fiscal 2008, each of the research institutes established an Intellectual Property Unit to prepare for the development of the system currently in place, which enabled mutual cooperation and a flexible response to intellectual activities that required immediacy.

The Intellectual Property Unit has the mission of developing and executing measures to make the best use of the research

results achieved by the research institutes in areas such as "Cooperation among Businesses, Universities and Government," intellectual property management, and copyright analysis. A significant number of works, including software and content, are held by ROIS. To resolve issues such as ownership of the rights that arise when these works are provided to society, actual project support cases are used for case-based modeling. The Intellectual Property Center is pursuing mutual cooperation and information exchange with the four Inter-University Research Institute Corporations as well as the Graduate University for Advanced Studies ("SOKENDAI").



Board of Directors

President	Yoshiki Hotta	President, Research Organization of Information and Systems
Executive Director	Masao Sakauchi	Director-General, National Institute of Informatics
Executive Director	Genshiro Kitagawa	Director-General, The Institute of Statistical Mathematics
Executive Director	Yuji Kohara	Director-General, National Institute of Genetics
External Executive Director	Mitiko Go	External Executive Director, Research Organization of Information and Systems
External Auditor	Jun'ichi Tsujii	Professor, Department of Computer Science, University of Tokyo
External Auditor	Hitoshi Terao	Certified Public Accountant

Management Council

Toshiharu Aoki	Senior Advisor, NTTData Corporation
Shunichi Amari	Director, Brain Science Institute, Institute of Physical and Chemical Research (RIKEN)
Toru Araki	Professor Emeritus, Kyoto University
Shirou Ishii	Professor Emeritus, The University of Tokyo
Hitoshi Osaki	Director, NIFH (National Institutes for the Humanities)
Hajime Sasaki	Director, NEC Corporation
Keiko Nakamura	Director General, JT Biohistory Research Hall
Atsuhiko Nishida	Professor Emeritus, Institute of Space and Astronautical Science
Kunihiko Niwa	Principal Fellow, Center for Research and Development Strategy, Japan Science and Technology Agency (JST)
Shinji Mae	Professor Emeritus, Hokkaido University
Kenichi Matsubara	President, DNA Chip Research Inc.
Yoshiki Hotta	President, ROIS
Masao Sakauchi	Executive Director, ROIS
Genshiro Kitagawa	Executive Director, ROIS
Yuji Kohara	Executive Director, ROIS
Mitiko Go	External Executive Director, ROIS
Yoshiyuki Fujii	Director-General, NIPR
Kazuyuki Shiraishi	Vice Director-General, NIPR
Yoh'ichi Tokura	Vice Director-General, NII
Takashi Nakamura	Vice Director-General, ISM
Takashi Gojobori	Vice Director-General, NIG
Shigeru Kure	Executive Secretary, ROIS

Education and Research Council

Setsuo Arikawa	President, Kyushu University
Tomoko Ogawa	Vice President, Iwate College of Nursing
Isao Koike	Inspector General, University of Ryukyus
Takamitsu Sawa	President, Shiga University
Mutsuo Sekiguchi	Visiting Professor, Fukuoka Dental College
Hidehiko Tanaka	The Head of the Department, Graduate School of Information Security, Institute of Information Security
Chihiro Hirotsu	Professor Emeritus, The University of Tokyo
Syouichirou Fukao	Professor, Fukui University of Technology
Yoshiki Hotta	President, ROIS
Masao Sakauchi	Executive Director, ROIS
Genshiro Kitagawa	Executive Director, ROIS
Yuji Kohara	Executive Director, ROIS
Mitiko Go	External Executive Director, ROIS
Yoshiyuki Fujii	Director-General, NIPR
Natsuo Sato	Vice Director-General, NIPR
Jun Adachi	Director Cyber Science Infrastructure Development Department, NII
Hiroe Tsubaki	Vice Director General, ISM
Toshihiko Shiroishi	Director, Genetic Strains Research Center, NIG

As of May 1, 2010

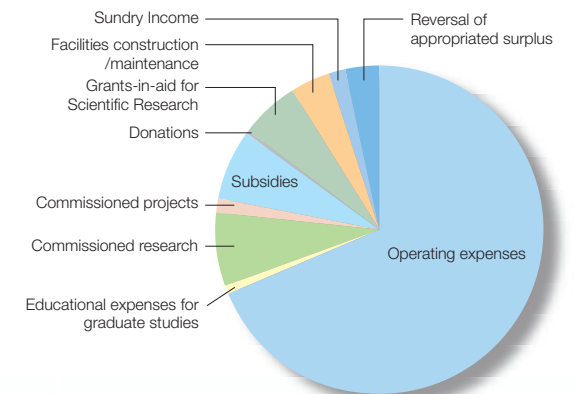
Membership

As of May 1, 2010					
Institute	Director General	Research/Education staff	Technical staff	Administrative Staff	TOTAL
Administration Office				19	19
National Institute of Polar Research	1	51	20	24	96
National Institute of Informatics	(1)	71	10	41	122 (1)
The Institute of Statistical Mathematics	(1)	48	10	13	71 (1)
National Institute of Genetics	(1)	63	14	19	96 (1)
Database Center for Life Science		1			1
TOTAL	1(3)	234	54	116	405 (3)

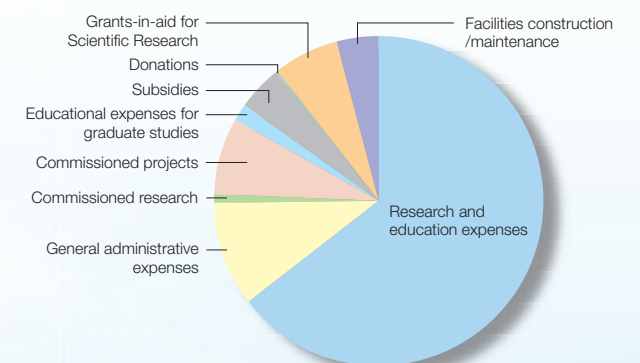
※() Includes Board of Directors

Accounting, FY2009

Revenue (figures in thousands of yen)	
Operating expenses	20,354,859
Educational expenses for graduate studies	236,294
Commissioned research	2,120,511
Commissioned projects	464,962
Subsidies	2,001,799
Donations	83,323
Grants-in-aid for Scientific Research	1,780,288
Facilities construction/maintenance	1,152,068
Sundry Income	425,643
Reversal of appropriated surplus	974,677
TOTAL	29,594,424



Expenses (figures in thousands of yen)	
Research and education expenses	17,983,111
General administrative expenses	2,870,098
Educational expenses for graduate studies	236,294
Commissioned research	2,101,265
Commissioned projects	464,013
Subsidies	1,221,025
Donations	70,957
Grants-in-aid for Scientific Research	1,780,288
Facilities construction/maintenance	1,152,068
TOTAL	27,879,119



External Funds, FY2009

	Grants-in-aid for Scientific Research ※including other research subsidies		Commissioned Projects		Joint Research (private-sector)		Commissioned Research		Donations	
	Project	Amount	Project	Amount	Project	Amount	Project	Amount	Project	Amount
National Institute of Polar Research	44	203,912	1	2,829	0	0	2	8,375	12	6,488
National Institute of Informatics	101	391,521	16	10,824	16	224,636	20	284,250	21	34,214
The Institute of Statistical Mathematics	54	104,427	0	0	1	10,000	15	170,147	5	3,900
National Institute of Genetics	113	1,068,869	1	270	7	36,132	13	1,384,629	20	36,689
TRIC	9	10,550	0	0	0	0	0	0	0	0
DBCLS	1	1,008	1	432,038	0	0	1	2,340	1	1,200

Number of Institutions and Joint Researchers Enrolled in Inter-University Joint Research Projects, FY2009

	No. of institutions	Total	Breakdown of organization to which joint researchers belong							
			National Universities	Inter-University Research Institutes	Public Universities	Private Universities	Public Institutions	Private Institutions	Foreign Organizations	Others
National Institute of Polar Research	190	562	310	13	17	82	96	24	11	9
National Institute of Informatics	225	702	410	21	23	106	41	50	49	2
The Institute of Statistical Mathematics	262	736	354	10	28	174	117	38	15	0
National Institute of Genetics	90	445	271	6	26	73	42	22	5	0
TOTAL	767	2445	1345	50	94	435	296	134	80	11

Special Inter-University Researchers, FY2009

National Institute of Polar Research	National Institute of Informatics	The Institute of Statistical Mathematics	National Institute of Genetics	TOTAL
15	16	2	1	34

Inter-University Research Institute Corporation Research Organization of Information and Systems

Kamiyacho Central Place 2F,
4-3-13 Toranomon, Minato-ku,
Tokyo 105-0001, Japan
TEL : +81-(0)3-6402-6200
FAX : +81-(0)3-3431-3070
<http://www.rois.ac.jp/english/index.html>

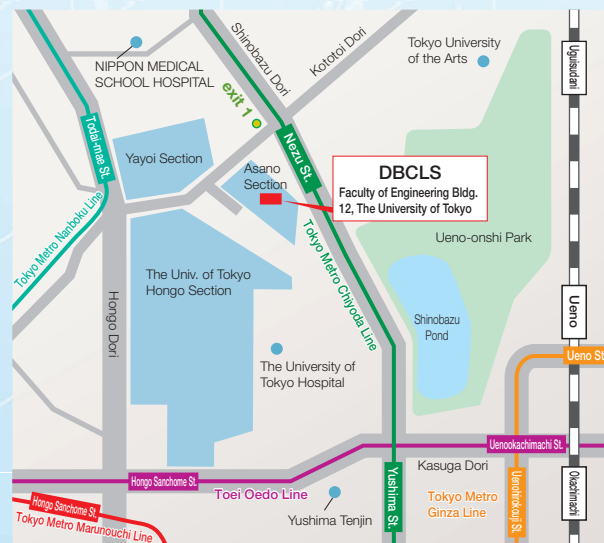


Transdisciplinary Research Integration Center

Kamiyacho Central Place 2F,
4-3-13 Toranomon, Minato-ku,
Tokyo 105-0001, Japan
TEL : +81-(0)3-6402-6228
<http://www.rois.ac.jp/tric/index.html>

Database Center for Life Science

Faculty of Engineering Bldg. 12,
The University of Tokyo 2-11-16,
Yayoi, Bunkyo-ku, Tokyo
113-0032, Japan
TEL : +81-(0)3-5841-6754
<http://dbcls.rois.ac.jp/en/>



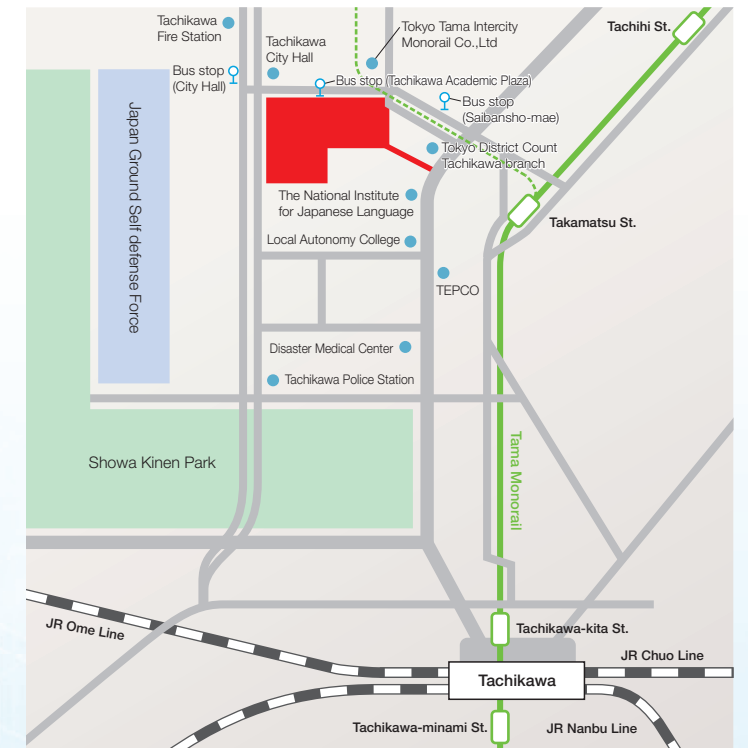
National Institute of Polar Research

10-3, Midori-cho, Tachikawa,
Tokyo 190-8518, Japan
TEL : +81-42-512-0608
<http://www.nipr.ac.jp/english/>



The Institute of Statistical Mathematics

10-3, Midori-cho, Tachikawa,
Tokyo 190-8562, Japan
TEL : +81-(0)50-5533-8500
http://www.ism.ac.jp/index_e.html



National Institute of Informatics

2-1-2 Hitotsubashi, Chiyoda-ku,
Tokyo 101-8430, Japan
TEL : +81-3-4212-2000(Exchange)
<http://www.nii.ac.jp/en/>



National Institute of Genetics

Yata 1111, Mishima, Shizuoka
411-8540, Japan
TEL : +81-(0)55-981-6707
<http://www.nig.ac.jp/index-e.html>

