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Research Organization of Information and Systems**

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<https://www.nipr.ac.jp/english/>

3 National Institute of Informatics

2-1-2 Hitotsubashi, Chiyoda-ku, Tokyo 101-8430, Japan
Phone: +81-3-4212-2000
<https://www.nii.ac.jp/en/>

4 The Institute of Statistical Mathematics

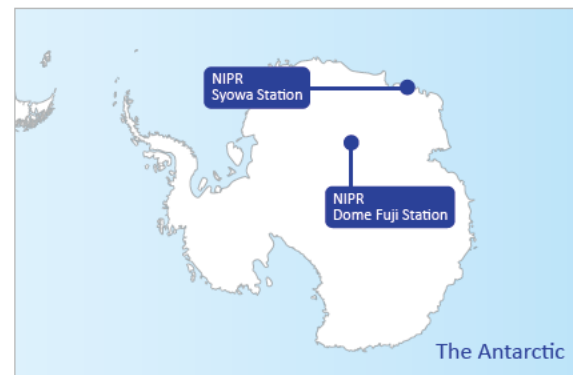
10-3 Midori-cho, Tachikawa, Tokyo 190-8562, Japan
Phone: +81-50-5533-8500
https://www.ism.ac.jp/index_e.html

5 National Institute of Genetics

1111 Yata, Mishima, Shizuoka 411-8540, Japan
Phone: +81-55-981-6707 (Administration Office)
<https://www.nig.ac.jp/nig/>

6 Joint Support-Center for Data Science Research

Data Science Building, 10-3 Midori-cho, Tachikawa,
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Inter-University
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2021 / 2022

National Institute of Polar Research

National Institute of Informatics

The Institute of Statistical Mathematics

National Institute of Genetics

Joint Support-Center for Data Science Research



Pioneering Research Frontiers in the Data Age to Solve Modern Society Problems

There is still no clear end in sight for the pandemic caused by COVID-19 that has spread to all regions of the world since 2019. As illustrated by this and other global crises, today's society is beset by wide-ranging uncertainties that constitute unavoidable risks in multiple domains, including human survival, the earth, the natural environment, and human society.

Rapid and revolutionary advances in information technology, the emergence of diverse types of big data, and dramatic increases in computing performance in recent years have transformed society and dramatically altered the research environment.

Against this backdrop, it would not be an exaggeration to say that advances in data science—which is sometimes referred to as “the fourth science”—will be the driving force behind scientific and technological innovation going forward.

The Research Organization of Information Systems (ROIS) comprises four distinguished research institutes—The National Institute of Polar Research (NIPR), The National Institute of Informatics (NII), The Institute of Statistical Mathematics (ISM), and The National Institute of Genetics (NIG)—plus The Joint Support-Center for Data Science Research (ROIS-DS) established in 2016. ROIS is engaged in efforts to address diverse issues facing society today by pioneering new fields of research from the perspective of information and systems and advancing data science.

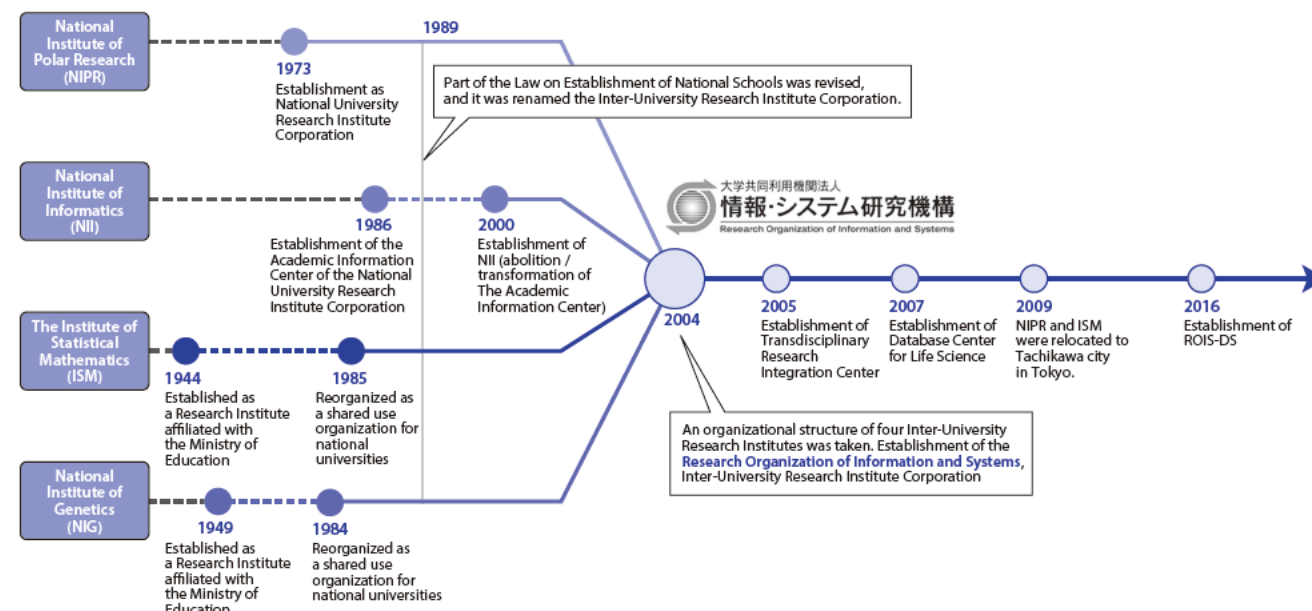
ROIS's primary mission is to contribute to the advancement of research by universities and other research institutions by promoting resource-sharing and joint research that responds to the needs of the research community. In addition, ROIS aims to respond to the needs and expectations of industry and local governments as well as raise societal awareness of science through active promotion of open science based on the publication and sharing of data generated by academic research.



Ryoichi Fujii

President of Research Organization of Information and Systems

History



The Research Organization of Information Systems (ROIS)

Through its four core research institutions that conduct world-class integrated research in the domains of polar science, information science, statistical and mathematical sciences, and genetics, ROIS seeks to resolve critical issues facing society in the 21st century by investigating complex phenomena related to life, the earth, the natural environment, and human society from the perspective of information and systems. ROIS promotes interdisciplinary research that cuts across traditional disciplinary boundaries by leveraging the strengths of the organization's two-pronged structure of “domain research” conducted by NIPR and NIG and “information foundation and methodological research” conducted by NII and ISM.

In 2016, to further accelerate these activities, ROIS established ROIS-DS. ROIS-DS provides cross-disciplinary support for the data science-related activities of researchers in diverse fields.

Inter-University Research Institutes

Inter-university research institutes are specially designated “shared use research institutes for all universities,” whose mission is to prepare and maintain large-scale, state-of-the-art equipment, voluminous academic data, as well as hard-to-find research materials and analytical methods that are prohibitive for individual universities and to provide these free of charge to scholars nationwide with the goal of promoting collaborative research among multiple universities. In 2004, they were reorganized under four inter-university research institute corporations under the National University Corporation Act in order to energize and allow each institute to more flexibly manage its efforts to promote strategic efforts to increase joint-resource use, improve collaborative research capabilities, and pioneer new areas of study according to its own particular circumstance.

At present, 17 organizations are managed by four corporations: National Institutes for the Humanities (NIHU), National Institutes of Natural Sciences (NINS), The High Energy Accelerator Research Organization (KEK), and ROIS.

Efforts to Foster Human Resources

ROIS is engaged in efforts to foster the next generation of scientific leaders.

As the infrastructural core of the Graduate University for Advanced Studies (Sokendai), ROIS's main role is to provide opportunities for graduate education involving multiple research laboratories and instructors that leverage ROIS's state-of-art research environment and to integrate research and education.

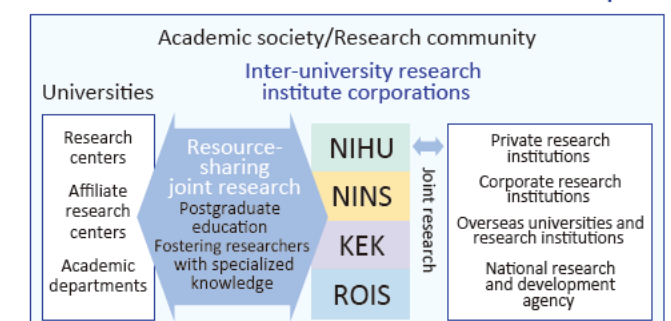
ROIS also offers various schemes for hosting and educating researchers and graduate students from other universities, including a special collaborative research student program, residency programs for graduate students from collaborating universities, and programs to promote researcher exchanges.

In June of 2021, ISM was selected to serve as the core institute for the consortium tasked with implementation of the “Initiative to Foster Statistical Experts” launched by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Accordingly, over the next five years, ROIS will engage in efforts to foster the development of statistics instructors at universities and other statistics experts.

Linkages between Inter-University Research Institute Corporations and Sokendai

The four corporations plan and execute joint initiatives and institute research (IR) aimed at promoting interdisciplinary collaboration, pioneering of new research domains, and dissemination of information. To further enrich opportunities for graduate education and to deepen existing linkages, preparations are currently underway to establish a general incorporated association made up of the four corporations and Sokendai.

A Central Research Hub for Academic Institutions in Japan



The Research Institutes in Pursuit of Scientific Principles and Cutting-Edge Research



National Institute of Polar Research

Japan's Core Institution for Polar Research and Observation

The Antarctic and the Arctic are key to understanding our planet. Changes in polar regions, which are sensitive to changes in the global environment, will have substantial human impacts in the future. Polar research seeks to elucidate the universal principles and rules governing a variety of environmental phenomena and the role played by polar regions in global warming and Earth systems through polar field studies based on astronomy, atmospheric-oceanic-snow and ice science, solid earth science, and life sciences. NIPR also has research stations in the Antarctic and the Arctic and serves as the core institute for Japanese Antarctic Research Expedition and for the Arctic Challenge for Sustainability II (ArCS II) initiative.



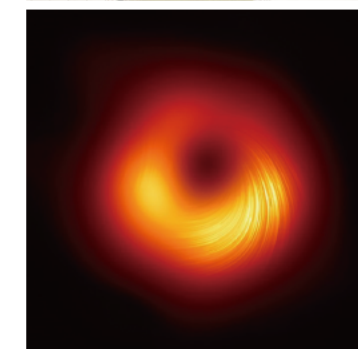
Edge of the Totten Glacier (Antarctica). The transport of warm water responsible for melting this glacier was elucidated.



The Institute of Statistical Mathematics

Multidisciplinary Research in Statistical and Mathematical Sciences and Professional Development in Statistics

As Japan's core research institute for statistical and mathematical sciences based on big and complex data, ISM conducts cutting-edge critical research and seeks to contribute to society by sharing the fruits of activities in various domains such as risk research, simulations, survey science, statistical machine learning, material informatics, medical and health data science, and data science for resource-environmental management through network-based collaborative research that leverages the cross-disciplinary nature of statistical and mathematical sciences research. In addition to offering a range of programs to foster persons engaged in statistical thinking at various levels, ISM is fully committed to training experts in statistical science, who are in high demand in Japan.



Astronomers Image Magnetic Fields at the Edge of M87's Black Hole using statistical methods. Credit: Event Horizon Telescope Collaboration

NII National Institute of Informatics

Weaving Information into Knowledge and Creating Future Value

NII promotes research in all areas of informatics – from theoretical computer science to such cutting-edge topics as artificial intelligence, big data, IoT (Internet of Things), and cybersecurity – to build the way for “future value creation” in this new study field as Japan's only academic informatics research center. In addition to building and operating networks such as the Science Information NETwork (SINET) and offering academic online content and services, NII develops research data infrastructures for open science and information security platforms based on inter-institutional cooperation. NII also focuses on collaboration with domestic and overseas universities, research institutions, and corporations.



NII hosts “Symposium on DX at Educational Institutions—Cyber-Symposium on Online Education and Digital Transformation at Universities and Other Institutions” regularly.



National Institute of Genetics

The Activity of Biological Organisms is Based on the Genetic Information

Genetic information is the source of life, which evolves as it is passed on to the next generation. Genetics aims to unravel the mystery of life from the perspective of genetic information. NIG conducts state-of-the-art research on cell function, development/differentiation, evolution/biodiversity, and genome/bio information; simultaneously, it pioneers new research in the life sciences. Furthermore, NIG, as an inter-university research institute, operates three research infrastructure projects: BioResource Project, Advanced Genomics Project, and Bioinformation and DNA Data Bank (DDBJ) Project. Through these efforts, NIG provides academic and industrial communities engaged in the life sciences with access to research infrastructures and opportunities for joint research in genetics.



Signing of the memorandum of understanding with Shizuoka Prefecture regarding the complete genomic analysis of the novel coronavirus.

The Research Institutes in Pursuit of Scientific Principles and Cutting-Edge Research



Joint Support-Center for Data Science Research

Cultivation of New Knowledge through Data Science

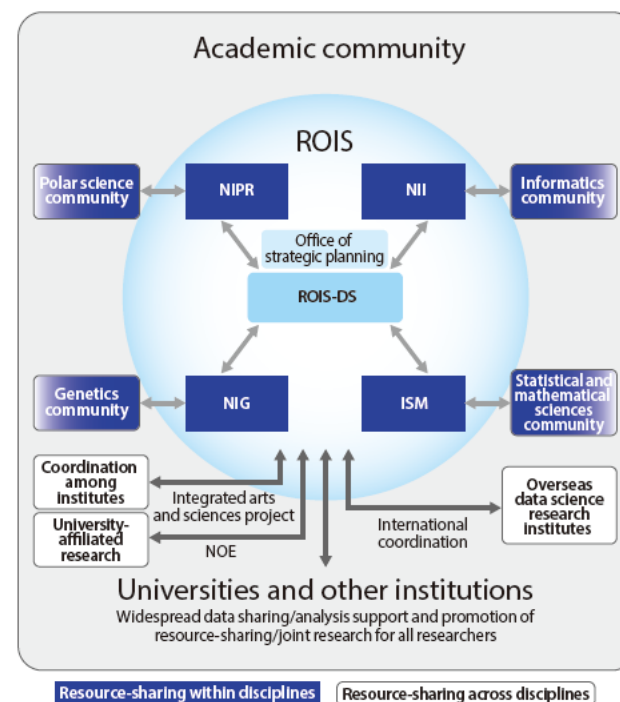
The Joint Support-Center for Data Science Research (ROIS-DS) is the newest organization of ROIS established in 2016. The mission of ROIS-DS is to support variety of researchers to conduct projects on the subjects of data-driven or data-oriented sciences using technologies for big-data analysis, for example, through collaborations with the members of our centers.



The edomi website, a data portal for the history of Edo.
<http://codh.rois.ac.jp/edomi/>

Relationship between Research Institutes and ROIS-DS

Based on ROIS' Philosophy of the organization, as a center to focus on promoting integrated research alongside the four research institutes (NIPR, NII, ISM, NIG), ROIS established ROIS-DS, a new type of research organization. Efforts led by ROIS-DS in coordination with other inter-university research institutes are underway to further strengthen coordination and cooperation with universities and other research institutes both in Japan and abroad with the goal of contributing to scientific advances and social innovation. As of 2021, ROIS-DS comprises six research centers: the Database Center for Life Science (DBCLS), the Polar Environment Data Science Center (PEDSC), the Center for Social Data Structuring (CSDS), Center for Open Data in the Humanities (CODH), the Center for Genome Informatics (CGI), and the Center for Data Assimilation Research and Applications (CARA).



Resource-Sharing and Joint Research to Satisfy the Increasing Sophistication of Diverse Needs



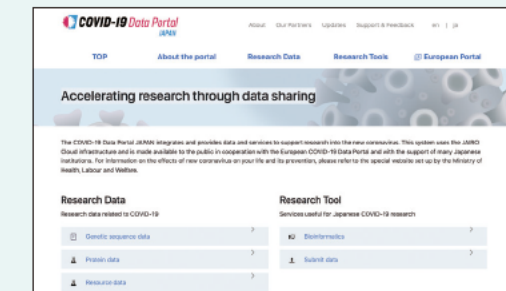
Quick Access Environment to COVID-19 Research Data

The COVID-19 pandemic and the need for Japanese research data

Since the global spread of COVID-19 in 2020, sharing of research data has become increasingly important. Early in the pandemic, the EMBL-EBI created a European data portal for COVID-19 research (COVID-19 Data Portal), and the COVID-19 Data Portal Sweden was launched later. Around the same time, numerous websites were launched in Japan to provide COVID-19 information to the public, but the data required by researchers were scattered among institutions.

Construction of a research data portal site by cooperation with research institutes

Based on the European framework, the Research Center for Open Science and Data Platform (RCOS) and the Bioinformatics and DDBJ Center constructed the COVID-19 Data Portal Japan, which launched in October 2020. Using this portal, research institutes in Japan have worked together to categorize data, link to useful information, and provide comments to help researchers quickly access data on COVID-19 in Japan and overseas.



We surveyed and collected open data for the coronavirus infection (COVID-19) and released "COVID-19 Data Portal JAPAN" in 2020.

Platform for quick access to critical information

As Japan's first cross-organizational portal for COVID-19 information, the website is already being used by researchers. With the aim of ending the COVID-19 pandemic and preventing future pandemics, we are continually improving the platform to enable prompt sharing of information as well as domestic and international research collaboration.



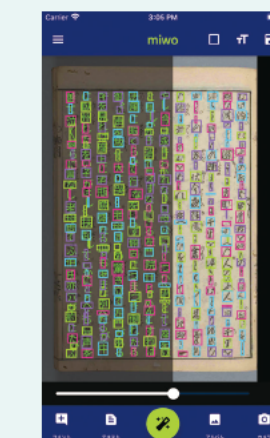
miwo: A Mobile App for the AI-Based Recognition of Kuzushiji, Japanese Cursive Characters

Kuzushiji and AI

Classic books from the Edo period (1603–1868) were written in *kuzushiji*, Japanese cursive characters; however, only a few thousand Japanese people today can fluently read these characters. To use the large volume of historical documents still preserved in Japan, it is necessary to convert cursive characters to modern characters. Therefore, we decided to use AI (artificial intelligence) to perform this task.

Kuzushiji recognition using AI

The National Institute of Japanese Literature and the Center for Open Data in the Humanities (CODH) in the DS center released the "Kuzushiji Dataset" by combining *kuzushiji* character coordinates and their transcriptions. In addition, the CODH developed the KuroNet *kuzushiji* recognition model, which uses AI-based object recognition technology to detect characters in an image and convert *kuzushiji* to modern characters. Because the "Kuzushiji Dataset" was compiled primarily from woodblock-printed books in the Edo period, the KuroNet, trained using the abovementioned dataset, is also proficient at recognizing characters on the woodblock-printed books in the Edo period.



Screenshots of the miwo app. The app offers many features: show recognition results in characters, use a slider for comparing with the book image, show hentaigana and its root character, show a recognition result in text, and save recognition results.



Towards a world where everyone can read kuzushiji

We also released a mobile app called miwo for the general public, free for Android and iOS, to take advantage of this AI-based *kuzushiji* recognition technology. The name *miwo* comes from *miwotsukushi*, which is the title of the 14th chapter of the *Tale of Genji*. We hope that, just as *miwotsukushi* [channel markers] help people navigate waterways, the app will help readers navigate in the ocean of works written in *kuzushiji*.

Resource-Sharing and Joint Research to Satisfy the Increasing Sophistication of Diverse Needs

NIPR

Joint Use of Polar Research Facilities

NIPR engages in a wide range of resource-sharing and joint research activities, including the provision of assistance and equipment for ice-core sampling and joint research using ice cores collected at the Dome Fuji Station in Antarctica (Ice Core Research Center); conducting analyses of meteorite, rock, and mineral samples using the Sensitive High Resolution Ion Micro Probe (SHRIMP) secondary ion mass spectrometer (Polar Science Resources Center); optical calibration using the only large-scale integrating sphere in Japan (Optical Calibration Room); and use of the Polar Science Computer System (Communications and Computing Science Center).

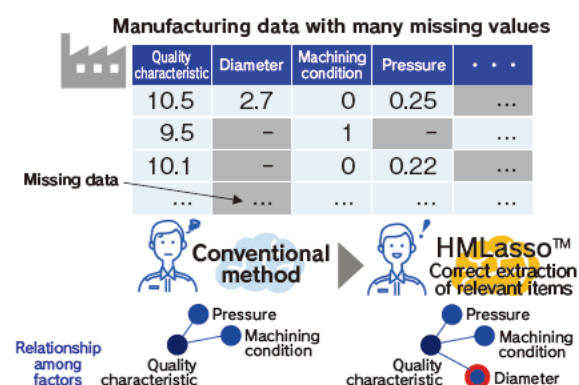


Ice core drilled at the Dome Fuji station in the Antarctica.

ISM

Joint Research with Toshiba Corporation

A large amount of data on manufacturing processes and equipment, such as quality characteristics, processing conditions, and equipment temperatures and pressures, are collected in factories every day. We have developed HMLasso™ to build a regression model with high accuracy even with many missing data. This method contributes to the identification of deterioration factors of quality and their improvement.



NIG

Support for Sequencing and Analyzing Genetic Information

The Advanced Genomics Center offers the latest sequencing technology and genomic research tools to the research community. Nucleotide sequence data from genomic analyses are archived at the Bioinformation and DDBJ Center and provided to researchers worldwide as open data. In addition, NIG provides supercomputer system services optimized for information analysis in life science.



NIG

Development and Provision of Bioresources

The Genetic Resource Center (GRC) develops and analyzes model organism strains that are important for life sciences research. The center coordinates with the National BioResource Project (NBRP) to stably maintain and provide these strains to researchers worldwide. In addition, as the core institution of NBRP's Information Center, GRC provides databases for genetic resource information.



ISM

Supercomputer Systems and Information Resources

As an inter-university research institute, ISM offers joint-use supercomputing resources/environments—namely, the Supercomputer System for Statistical Science and the Communal Cloud Computing System—to researchers in Japan and abroad. As Japan's only library dedicated to statistical science, ISM collects and provides access to a wide range of academic journals and books in both print and digital form.

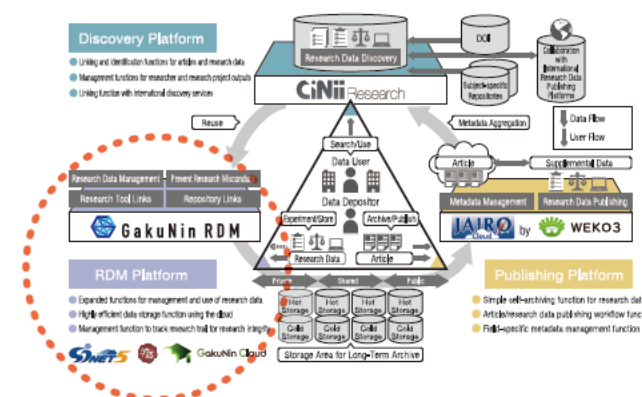


The Supercomputer System for Statistical Science (left) and the Communal Cloud Computing System (right)

NII

GakuNin RDM: Research Data Management Platform

NII has launched GakuNin RDM, a research data management service to help researchers advance their projects with high efficiency. This service is one component of the research data infrastructures (NII Research Data Cloud) powered by NII. GakuNin RDM enables researchers across organizations to quickly manage and share their research data and aims not only to provide convenience in research data management but also to provide a space for creativity through research collaboration.



ROIS-DS

Open-Call Multidisciplinary Research Collaboration

The major aim of ROIS-DS-JOINT, applications for Joint Research Program, is to conduct collaboration-based research projects on the subjects of data-driven sciences with the variety of university researchers. The number of participating institutions has increased every year along with a steady expansion of the range of support provided for data-driven research. There are two types of ROIS-DS-JOINT programs: Joint Research Program and Joint Research Meetings Program. We are pleased very much to announce that ROIS-DS-JOINT is open to the wide range of researchers including ones from foreign universities/non-profit institutes.

Centers	Program	2017	2018	2019	2020	2021	Total	Sum Total
DBCLS	Joint Research Program	3	7	8	7	7	32	44
	Joint Research Meeting Program	4	4	4	0	0	12	
PEDSC	Joint Research Program	3	7	8	7	8	33	35
	Joint Research Meeting Program	0	1	1	0	0	2	
CSDS	Joint Research Program	5	7	10	7	8	37	39
	Joint Research Meeting Program	2	0	0	0	0	2	
CODH	Joint Research Program	2	4	3	4	4	17	20
	Joint Research Meeting Program	0	3	0	0	0	3	
CGI	Joint Research Program	3	1	3	2	4	13	13
	Joint Research Meeting Program	0	0	0	0	0	0	
CARA	Joint Research Program	4	4	5	6	6	25	29
	Joint Research Meeting Program	2	1	1	0	0	4	
Number of accepted projects/acceptance rate	Acceptance Rate	20	30	37	33	37	157	180
	Acceptance Rate	95.2%	90.9%	100.0%	91.7%	94.9%	94.6%	
Number of applications	Joint Research Program	8	9	6	0	0	23	189
	Joint Research Meeting Program	21	33	37	36	39	166	
Number of participating institutions*	Joint Research Program	43	72	74	66	78	333	333
	Joint Research Meeting Program	43	48	33	16	17	157	157
Number of participants**	Joint Research Program	80	129	135	123	145	612	612
	Joint Research Meeting Program	80	129	135	123	145	612	612

Track record of activities related to open-call collaborative research

*at the time of acceptance **at the time of acceptance, cumulative

NIPR

Progress of Large-Scale Arctic Research

The Arctic Challenge for Sustainability II (ArCS II) project was launched in June of 2020. As the institute representing Japan, we will assemble a team of Japanese Arctic researchers to conduct cutting-edge, interdisciplinary research related to the Arctic and share the findings of our research with society through the dissemination of Arctic sea-ice forecasts and other related information. NIPR also participates in the Next-Generation IS Radar Project for Atmospheric and Geospace Science (EISCAT_3D) project and manages the Ny-Ålesund NIPR Observatory.



Ny-Ålesund, Svalbard

Expansion of Joint Research Activities with Other Institutes Based on Open-Call Joint Research

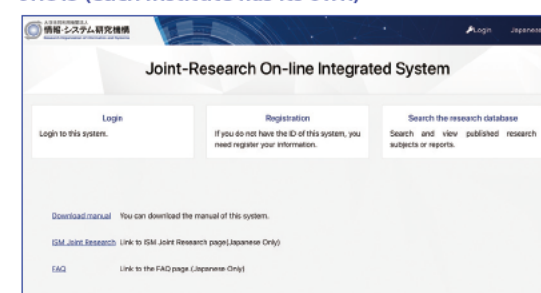
In addition to conducting cutting-edge research and pioneering new research areas in their respective domains, inter-university research corporations provide resource-sharing use and joint research platforms that transcend the boundaries of individual universities.

Every year, ROIS hosts over 2,000 researchers as part of open-call joint research that involves the research resources and personnel of ROIS's four institutes and ROIS-DS.

Individuals interested in participating in open-call joint research that makes ROIS research facilities available to universities and other research institutions, technical colleges, and private companies can apply by using the Joint Resource On-line Integrated System (JROIS) or contacting the open-call joint research desk of the individual ROIS institutes. Applicants who are accepted will be able to conduct joint research and participate in joint research meetings together with ROIS researchers.

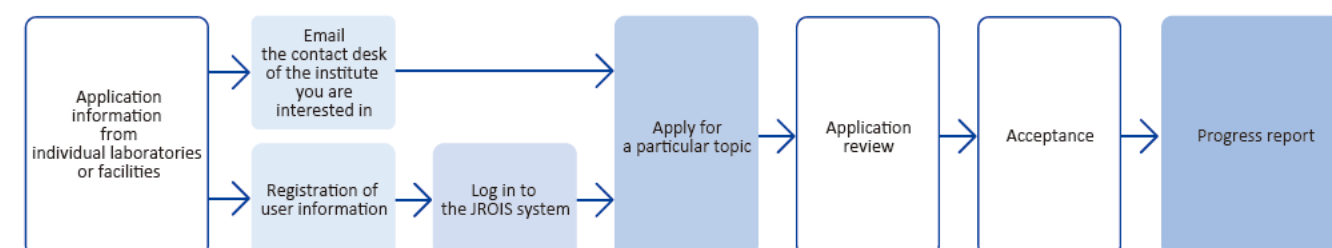
The eligibility requirements and content of open-call joint research vary by laboratory or facility. As such, please visit individual websites for detailed information.

JROIS (each institute has its own)



e.g. ISM) <https://jrois.rois.ac.jp/rois-dev/rois/public/ISM>

The process for participation in open-call joint research



Inquiries Related to Resource-Sharing and Joint Research



NIPR

NIPR

https://www.nipr.ac.jp/collaborative_research/koubo.html (Japanese)
Phone: +81-50-5533-8642 E-mail: kyodo-nipr@t.rois.ac.jp



NII

NII

<https://www.nii.ac.jp/research/collaboration/koubo/> (Japanese)
Phone: +81-3-4212-2139 E-mail: kyoudou@nii.ac.jp



ISM

ISM

https://www.ism.ac.jp/kyodo/index_j.html (Japanese)
Phone: +81-50-5533-8513 E-mail: kyodo-ism@t.rois.ac.jp



NIG

NIG

<https://www.nig.ac.jp/nig/research-infrastructure-collaboration/nig-collaboration-grant>
Phone: +81-55-981-6728 E-mail: kyodo-mail@nig.ac.jp



ROIS-DS

ROIS-DS

https://ds.rois.ac.jp/en_crp/en_calling/
Phone: +81-42-512-9254 E-mail: ds_suishin@ois.ac.jp

■ For general inquiries related to resource-sharing and joint research, please contact the ROIS head office (see below).

<https://www.rois.ac.jp/en/research/coop.html>

Liaison and Planning Division Phone: +81-3-6402-6211 E-mail: kenkyo@ois.ac.jp

Information Dissemination/Data Types

Exhibits

The NIG Genetics Museum features displays of various historical documents that show the development of genetics and life sciences, including a first edition of Darwin's *Origin of Species*.

The ISM Historical Computers Exhibit Hall features displays of many rare instruments, including a physical random number generator that has been designated an information processing heritage object by the Information Processing Society of Japan.



The NIG Genetics Museum



The ISM Historical Computers Exhibit Hall

Science Report

ROIS head office maintains a Science Report website that provides easy-to-understand reports on ongoing research activities.

The Japanese website of ROIS is currently running a series called "100 News Stories!" that features videos of research accomplishments and provides teaching materials. Some of them are also available in English. <https://www.rois.ac.jp/contents/theme.html>



<https://sr.rois.ac.jp/en/article/index.html>



<https://www.rois.ac.jp/en/index.html>

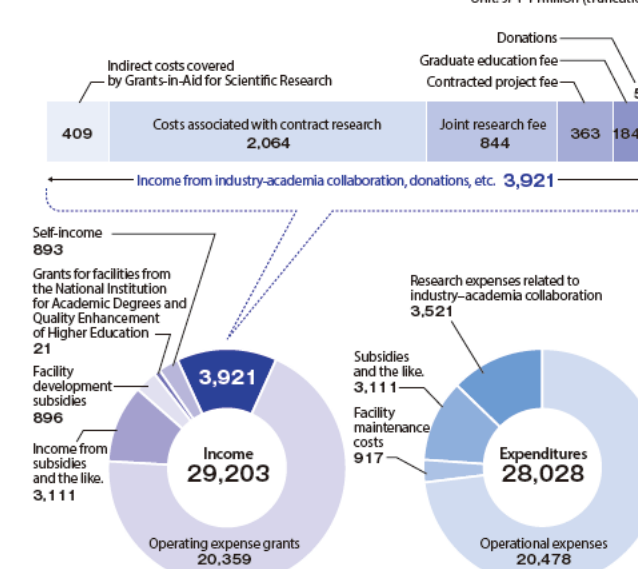
Polar Science Museum

Located next to NIPR, the Polar Science Museum is home to the Aurora Theatre, which offers visitors the opportunity to experience a realistic aurora simulation, view objects such as meteorites and a snow vehicle used at the Syowa Station in Antarctica, and learn about polar observation.



Income and Expenditures (FY2020)

Unit: JPY 1 million (truncation)



Number of Institutions and Joint Researchers Enrolled in Joint Research Project (FY2020)

	Number of Institutions	Total	Breakdown of organizations to which joint researchers belong					
			National and public universities	Private Universities	Inter-University Research Institutes	Public Institutions	Private institutions and the like	Foreign Organizations
Head Office	7	8	1	2	2	0	0	3
NIPR	133	721	435	76	10	133	55	12
NII	127	430	285	79	18	14	31	3
ISM	224	566	308	142	8	73	25	10
NIG	107	423	243	82	22	27	12	37
ROIS-DS	66	123	52	24	0	23	9	15
Total	434*	2,271	1,324	405	60	270	132	80

*Duplicates are excluded.

Students at SOKENDAI, the Graduate University for Advanced Studies (FY2020)

Schools	Departments	Parent institutes	Number	Number of academic degrees granted
School of Multidisciplinary Sciences	Polar Science	NIPR	20	(1) 3
	Informatics	NII	99	(54) 17
	Statistical Science	ISM	36	(2) 4
School of Life Science	Genetics	NIG	37	(19) 6
Total			192	(76) 30

※ The number of students as of May 1.

※ The number in brackets is the number of international students.