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The National Institute of Polar Research (NIPR) was founded in 1973 to develop for comprehensive research and observations in polar regions. It is an Inter-University Research Institute and a key institute for implementing of Japanese Antarctic research programs. In 2004, NIPR became a component of the Research Organization of Information and Systems (ROIS).

The polar regions have a great significance in terms of research relating to the earth, the environment, life, space and other fields. NIPR is opening up new frontiers in interdisciplinary research through cutting-edge studies in collaboration with the researcher community under the framework of the Transdisciplinary Research Integration Center (TRIC) at ROIS and various other inter-university research programs.

NIPR participates in joint research projects at Syowa and Dome Fuji Stations in the Antarctic and Ny-Ålesund Station in the Arctic, and also conducts field, marine, aircraft and satellite observations. Advanced studies are performed by examining the polar regions as subsystems of the earth, time capsules of the global environment and windows into space, and from the perspective of biodiversity.

Japan’s Antarctic research activities began during the International Geophysical Year (IGY) from 1957 to 1958. Over the past 50-odd years, the activities have been growing in scale, content and complexity, and have taken on greater international characteristics. NIPR is now a key player in global observations, participating actively in the programs of the Scientific Committee on Antarctic Research (SCAR), the International Arctic Science Committee (IASC), the Asian Forum for Polar Sciences (AFoPS) and other international frameworks. Furthermore, it uses the Intelsat satellite communication system to promote telescience, telemedicine and outreach activities for school and college students.

Training new researchers is also a major task of the institute. As a parent institute of the Graduate University for Advanced Studies (SOKENDAI), NIPR accommodates graduate students in the Department of Polar Science, School of Multidisciplinary Sciences and is involved in fostering promising researchers with high-level research capabilities and skills for field science.

NIPR relocated its laboratory to Tachikawa, Tokyo in May 2009 and will commission a new Antarctic research vessel in November. We hope that these changes will enhance further advancement of our scientific achievement, and ask for your support and cooperation in our activities.

Yoshiyuki FUJII
Director-General, National Institute of Polar Research
NIPR was founded on April 1, 2004, by the Inter-University Research Institute Corporation as a Research Organization of Information and Systems in accordance with Article 5-2 of the National University Corporation Law to carry out multidisciplinary scientific research into the polar regions and conduct polar observations.

As the main center for Japanese polar research, NIPR undertakes multidisciplinary research and observations in the polar regions. Recognizing that polar science is an advanced, multidisciplinary earth systems science that includes earth science, environmental science, solar-terrestrial physics, space and planetary science, biological science, etc., NIPR conducts joint research projects with researchers from various universities and institutions.

As an Inter-University Research Institute, NIPR provides the infrastructure and scientific materials and information required for research in the Antarctic and Arctic to researchers from universities, research institutes, etc.

As a parent institute of the Graduate University for Advanced Studies (SOKENDAI), NIPR provides doctoral education and research guidance. In 2006, NIPR began accepting students in 5-year integrated doctoral course with the aim of developing researchers who have a broad, international perspective and a high level of creativity. When requested, NIPR assists with education in graduate schools of the other universities.

As the main institute for carrying out the Japanese Antarctic Research Expedition (JARE), NIPR develops and carries out comprehensive research and observation projects related to science in the polar regions. NIPR also maintains and operates observation station facilities in the Antarctic. In addition, NIPR organizes research expeditions, conducts training, obtains the equipment required for research projects, plans logistics and other tasks, and gathers and maintains the scientific materials and data obtained in the course of observations.
Inter-University Research Institute Corporation, Research Organization of Information and Systems

President: Yoshiki HOTTA

Management Council

Executive Directors 4 or less

Conference of Directors-General

Executive Directors: Genshiro KITAGAWA, Masao SAKAUCHI, Yuji KONARA, Mitiko Gou

Auditors: Jun’ichi TSUJII, Kiyoshi SUZUKI

Auditors (2 part-time)

Board of Directors (Consists of President and Executive Directors)

Education and Research Council

General Planning Office

Intellectual Property Center

Administration Office

Planning Division

Auditors: Jun’ichi TSUJII, Kiyoshi SUZUKI

President: Yoshiki HOTTA

Planning Division

Administration Office

Intellectual Property Center

Office of Administration Director: Shintarou WATANABE

Director-General Office

Director-General: Yoshiyuki FUJII

Vice Director-General (Research and Education): Natsuo SATO

Vice Director-General (Polar Information): Yoichi MOTOTOMI

Vice Director-General (Polar Programs): Kazuyuki SHIRAISHI

Administrative Council

National Institute of Polar Research

Director-General Office

Vice Director-General (Research and Education): Natsuo SATO

Vice Director-General (Polar Information): Yoichi MOTOTOMI

Vice Director-General (Polar Programs): Kazuyuki SHIRAISHI

Administrative Council

Division for Research and Education

Space and Upper Atmospheric Sciences Group

Leader: Hisao YAMAGISHI

Meteorology and Glaciology Group

Leader: Makoto WADA

Geoscience Group

Leader: Kazuo SHIBUYA

Bioscience Group

Leader: Tsuneo ODATE

Polar Engineering Group

Leader: Natsuo SATO

Advanced Scientific Research Group

Leader: Hideaki MOTODA

Division for Polar Information

Polar Science Resources Center

Director: Hideyasu KOJIMA

Polar Data Center

Director: Takashi YAMANOUSHI

Public Relations Section

Head: Mamoru KAWAKUBO

Division for Polar Programs

Center for Antarctic Programs

Director: Kazuyuki SHIRAISHI

Deputy Director (for Japan Management): Takuya OKAMOTO

Deputy Director (for Research): Koichi KAMIYAMA

Arctic Environment Research Center

Director: Hiroshi KANDA

Library

Director: Kazuo SHIBUYA

Intellectual Property Section

Head: Yoichi MOTOTOMI

International Affairs Section

Head: Takashi YAMANOUSHI

Secretariat Section

Head: Toshihiko TANABE

Accounting Section

Head: Toshiaki TAMAMIZU

National Institute of Polar Research

10-3 Midori-cho, Tachikawa-shi, Tokyo

National Institute of Informatics

The Institute of Statistical Mathematics

National Institute of Genetics

Transdisciplinary Research Integration Center

Database Center for Life Science
**Research Staff**

---

### Space and Upper Atmospheric Sciences Group

**Professor** Natsuo SATO  
Aurora Physics

**Professor** Hisao YAMAGISHI  
Upper Atmosphere Physics

**Professor** Takashi NAKAMURA  
Atmospheric Dynamics

**Associate Prof.** Hiroshi MIYAKA  
Plasma Physics

**Associate Prof.** Akira KADOKURA  
Magnetospheric Physics

**Associate Prof.** Masaki TSUTSUMI  
Atmospheric Physics

**Associate Prof.** Akira YUKIMATSU  
Magnetospheric Physics

**Associate Prof.** Masaki OKADA  
Plasma Physics

**Lecturer** Yasunobu OGAWA  
Ionospheric Physics

**Assistant Prof.** Yoshinobu TOMIKAWA  
Middle Atmosphere Science

**Assistant Prof.** Mitsuru EJRI  
Upper Atmosphere Physics

---

### Biology Group

**Professor** Mitsuo FUKUCHI  
Marine Ecology

**Professor** Hiroshi KANDA  
Plant Taxonomy

**Professor** Tsuneo ODRIE  
Biological Oceanography

**Professor** Kentaro WATANABE  
Marine Ecology

**Associate Prof.** Sakae KUDOH  
Aquatic Ecology

**Associate Prof.** Saboshi IMURA  
Plant Ecology

**Associate Prof.** Akiro TAKAHASHI  
Animal Ecology

**Assistant Prof.** Masaki UCHIDA  
Microbial Ecology

**Assistant Prof.** Takahiro IIDA  
Satellite Oceanography

**Assistant Prof.** Yuuki WATANABE  
Marine Zoology

---

### Meteorology and Glaciology Group

**Professor** Takashi YAMANOUCHI  
Atmospheric Science

**Professor** Kokichi KAMIYAMA  
Geochemistry

**Professor** Makoto WADA  
Atmospheric Physics

**Professor** Hideaki MOTOMOYA  
Snow Hydrology, Glaciology

**Associate Prof.** Hajime ITO  
Oceanic Glaciology

**Associate Prof.** Masatada SHIBOARA  
Atmospheric Physics

**Associate Prof.** Kumiko GOTO-AZUMA  
Giacology

**Associate Prof.** Shoji FUJITA  
Giacology

**Associate Prof.** Shuki USHIRO  
Polar Oceanography

**Assistant Prof.** Naohiro HIRASAWA  
Climatology

**Assistant Prof.** Tetsuji KURAMOTO  
Glaciology

**Assistant Prof.** Shinji MORIMOTO  
Atmospheric Physics

**Assistant Prof.** Gen HASHIDA  
Polar Marine Biogeochemistry

**Assistant Prof.** Kenji KAWAMURA  
Paleoclimatology

---

### Geoscience Group

**Professor** Kazuyuki SHIRAISHI  
Geology

**Professor** Kazuo SHIBUYA  
Solid Earth Geophysics

**Professor** Hideyasu KAJIMA  
Geophysics

**Professor** Yoritaka MOTOYOSHI  
Geology

**Associate Prof.** Minoru FUNAKI  
Rock Magnetism

**Associate Prof.** Yoshihito NOGUCHI  
Solid Earth Geophysics

**Associate Prof.** Keiji MIYAKA  
Cosmochemistry

**Associate Prof.** Koichiro DOI  
Geodesy

**Associate Prof.** Tomokazu HOKADA  
Geology, Petrology

**Assistant Prof.** Masaki KANNO  
Solid Earth Geophysics

**Assistant Prof.** Hideki MURO  
Quaternary Geology

**Assistant Prof.** Naoya IMAYA  
Meteorology

**Assistant Prof.** Akira YAGUCHI  
Meteorology

**Assistant Prof.** Hiroshi KAIICHI  
Mineralogy, Meteoritics

**Assistant Prof.** Yuichiro ADAMAYA  
Geodesy

**Assistant Prof.** Yusuke SUGANUMA  
Quaternary Geology, Paleomagnetism, Rock magnetism

---

### Polar Engineering Group

**Assistant Prof.** Masayuki KIKUCHI  
Plasma Physics

---

### Project Researcher

Kazue SUZUKI  
Polar Climatology

Tetsuo MOOTOBA  
Upper Atmosphere Physics

Hideaki HANAKAWA  
Geodesy, Solid Earth Geophysics

Kunie TAKAHASHI  
Marine Ecology

Jun'ichi OKUNO  
Solid Earth Geophysics

Takahiko KURAMOTO  
Glaciology

Miwa YOSHIDA  
Isotopic Cosmochemistry, Meteoritics

Kenji HORIE  
Isotopic Geochemistry

Dakki NOMURA  
Marine Life Geochimistry

Yukiko YANAI  
Plant Physiological Ecology

Takahito MIYAKE  
Environmental Chemistry

Motohiro HIRABASHI  
Analytical Chemistry

Daniel DUNLEY  
Petology

Suriyik SYLVIANE  
Remote Sensing in Glaciology

---

### Project Researcher

Takahiro SEGAWA  
Glacier Microbiology

Yoshimasa TANAKA  
Upper Atmosphere Physics

Fumio NAKAZAWA  
Glaciology

Koji NISHIMURA  
Instrumentation Engineering

Ryo KAKuno  
Extensive Environmental Microbiology

Jun UETAKE  
Glacier Microbiology

Satoko SATO  
Magnetospheric Physics

Tetsuto HINOMI  
Mathematical Statistics

---

### Project Faculty Member

Project Assoc Prof. Shogo NISHIKAWA  
Power and Energy Engineering

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### Visiting Staff

Visiting Prof. Gichiro OHNO  
Antarctic Medical

Visiting Prof. Naomasa NAKAMURA  
Astronomy

Visiting Prof. Kaoru SAIJO  
Atmospheric Dynamics, Middle Atmosphere Sciences

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(As of April 1, 2009)
Research Organization of Information and Systems National Institute of Polar Research
Third period Administrative Council member

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tadayuki IMANAKA</td>
<td>College of Life Sciences, Ritsumeikan University</td>
<td>Professor</td>
</tr>
<tr>
<td>Shuhei OKUBO</td>
<td>Earthquake Research Institute, The University of Tokyo</td>
<td>Professor</td>
</tr>
<tr>
<td>Shoichi OKANO</td>
<td>Planetary Plasma and Atmospheric Research Center, Graduate School of Science Tohoku University</td>
<td>Director / Professor</td>
</tr>
<tr>
<td>Isao KUIKE</td>
<td>University of the Ryukyu</td>
<td>Auditors</td>
</tr>
<tr>
<td>Kiyoshi SAITO</td>
<td>Center for Coordination, Promotion and Communication, Research Institute for Humanity and Nature, National Institutes for the Humanities</td>
<td>Professor</td>
</tr>
<tr>
<td>Akiko SHIBATA</td>
<td>Graduate School of International Cooperation Studies, Kobe University</td>
<td>Professor</td>
</tr>
<tr>
<td>Shuhei TAKAHASHI</td>
<td>Faculty of Engineering Department of Civil and Environmental Engineering, Kitami Institute of Technology</td>
<td>Professor</td>
</tr>
<tr>
<td>Akira TANIGUCHI</td>
<td>Faculty of Bio-Industry, Tokyo University of Agriculture</td>
<td>Professor</td>
</tr>
<tr>
<td>Takakiyohi NAKAZAWA</td>
<td>Center for Atmospheric and Oceanic Studies, Graduate School of Science, Tohoku University</td>
<td>Director / Professor</td>
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<tr>
<td>Yosio HIROI</td>
<td>Faculty of Science, Chiba University Graduate School</td>
<td>Professor</td>
</tr>
<tr>
<td>Ryokichi FUJII</td>
<td>Nagoya University</td>
<td>Trustee / Vice-President</td>
</tr>
<tr>
<td>Takao HONDORI</td>
<td>Hokkaido University</td>
<td>Executive / Vice-President</td>
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<td>Takeshi MORI</td>
<td>Kanagawa Institute of Technology</td>
<td>Vice-President</td>
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<tr>
<td>Natsume SATO</td>
<td>National Institute of Polar Research</td>
<td>Professor / Vice Director-General (Research and Education)</td>
</tr>
<tr>
<td>Kazuyuki SHIRASNOHI</td>
<td>National Institute of Polar Research</td>
<td>Professor / Vice Director-General (Polar Programs) / Director of Center for Antarctic Programs</td>
</tr>
<tr>
<td>Yoshiki MOTOMOSHI</td>
<td>National Institute of Polar Research</td>
<td>Professor / Vice Director-General (Polar Information) / Head of Intellectual Property Section</td>
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<tr>
<td>Kikuchi KAMIMOTO</td>
<td>National Institute of Polar Research</td>
<td>Professor / Deputy Director of Center for Antarctic Programs (for Research)</td>
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<tr>
<td>Hideyuki KOJIMA</td>
<td>National Institute of Polar Research</td>
<td>Professor / Director of Polar Science Resources Center</td>
</tr>
<tr>
<td>Takahiro YAMANOUCHI</td>
<td>National Institute of Polar Research</td>
<td>Professor / Director of Polar Data Center / Head of International Affairs Section</td>
</tr>
<tr>
<td>Hiroshi KANDA</td>
<td>National Institute of Polar Research</td>
<td>Professor / Director of Arctic Environment Research Center</td>
</tr>
<tr>
<td>Kazuo SHIBUYA</td>
<td>National Institute of Polar Research</td>
<td>Professor / Director of Library</td>
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</tbody>
</table>

Term of office: April 1, 2008 - March 31, 2010 (As of April 1, 2009)

Number of staff (As of August 1, 2009)

<table>
<thead>
<tr>
<th>categories</th>
<th>Director-General</th>
<th>Vice Director-General</th>
<th>Professor</th>
<th>Associate Professor</th>
<th>Lecturer</th>
<th>Assistant Professor (Research and Education)</th>
<th>Technical Staff</th>
<th>Administrative Staff</th>
<th>Extra Staff for Antarctic Expeditions</th>
<th>Total</th>
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<tbody>
<tr>
<td>Director-General</td>
<td>1</td>
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<tr>
<td>Vice Director-General</td>
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<td>Office of Administration</td>
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<td>1(3)</td>
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This figure shows the number of staff in parentheses indicates the number of concurrent offices.

Budget (As of April 1, 2009)

<table>
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<th>FY</th>
<th>Funding for Operations</th>
<th>Commissioned Research Payments</th>
<th>Self Income</th>
<th>Total</th>
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<tr>
<td>2009</td>
<td>3,428,240</td>
<td>7,905</td>
<td>9,730</td>
<td>3,445,875</td>
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(unit: thousand yen)

Facilities (As of May 1, 2009)

Tachikawa Site

Site Area
62,450m² (total of 3 institutes)

Floor Space
52,196m² (total of 3 institutes)

- Exclusive area for NIPR 16,588m²
- Common-use area for 3 institutes 10,781m²

Research Building
48,105m² (total of 3 institutes, RC, 6 floors and 1 basement)

- Exclusive area for NIPR 12,515m²
- Common-use area for 3 institutes 10,733m²

Polar Expedition Building
4,043m² (S, 3 floors)

Grant-in-aid for Scientific Research

<table>
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<tr>
<th>FY</th>
<th>Amount of Money</th>
<th>Number of Adoption</th>
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<tr>
<td>2009</td>
<td>87,006 thousand yen</td>
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</tbody>
</table>
History

May 1961 | The Science Council of Japan recommended to the government the establishment of the “Institute of Polar Research” (tentative name) as an organization of Ministry of Education, Science and Culture for the cataloging, storage, and research of materials obtained as a result of Japanese Antarctic Research Expedition.

April 1962 | “Polar Department” of the National Science Museum established.

April 1965 | The “Polar Department” is expanded and renamed the “Polar Division,” and is divided into the No. 1 and No. 2 Polar Sections.

April 1966 | The National Science Museum is reorganized and the “Polar Division” is also reorganized into the “Polar Research Division”. The Division is divided into the Polar Laboratories No. 1 and No. 2.

April 1970 | Evolution of the “Polar Research Division” continues, and the Division becomes the nucleus of Japanese Antarctic Research Expedition as the “Polar Research Center”. The Center is divided into the Polar Operations Division, Polar Research and Materials Division, and the Administration Section.

August 1970 | Moves from Ueno to Itabashi, to the location formerly occupied by the Japanese Imperial Army’s No. 2 Tokyo Arsenal.

September 29, 1973 | Establishment of the National Institute of Polar Research. The institute has four sections in the Division for Research (Geoscience, Glaciology, Ecology, Polar Region Engineering), two sections in the Data Collection and Processing Division (Biology, Inorganic Materials), two sections and six groups in the Administrative Office, and one section and two groups in the Operational Office. Syowa Station has become the base for NIPR observational activities in the Antarctic.

April 1974 | Establishment of the Cold Region Construction Section to the Research Division, the Data Analysis Section to the Data Collection and Processing Division, the Collaborative Observation Section to the Operational Office, and the Library.

April 1975 | Addition of the Geology Research Section, Cryobiology Research Section to the Research Division, and the Low-Temperature Materials Section to the Data Collection and Processing Division.

April 1978 | Addition of the Polar Meteorology Research Section and the Polar Minerals and Mining Research Section to the Research Division, and the establishment of the new No. 1 and No. 2 Cryobiology Research Section.

April 1979 | Reorganization of the Upper Atmosphere Physics Research Section of the Research Division into the No. 1 and No. 2. The Cold Region Construction Section is renamed the Antarctic Logistics and Polar Region Engineering Research Section.

April 1981 | The Meteorite Collection Section to the Data Collection and Processing Division established. Establishment of Mizuho Station.


April 1984 | Meteorite Research Section added to Research Division. Aurora Science Data Section added to the Data Collection and Processing Division.

June 1990 | Arctic Environment Research Center and Information Science Center established. Data Analysis Section eliminated from Data Collection and Processing Division.

April 1993 | Atmospheric and Hydrospheric Remote Sensing Research Section eliminated from Research Division and Polar Atmospheric Material Cycle Research Section established. The Department of Polar Science, the School of Mathematical and Physical Science created as a program of postgraduate study in the Graduate University for Advanced Studies (SOKENDAI). NIPR became a parent institute of SOKENDAI.

June 1994 | Establishment of the Crustal Activity Evolution Research Section to Research Division.

April 1995 | Establishment of the Center for Antarctic Environmental Monitoring as one of the research facilities.

May 1996 | Reorganization of the Center for Antarctic Environmental Monitoring and elimination of the Inorganic Materials Group from the Data Collection and Processing Division.

April 1997 | Reorganization of the Arctic Environment Research Center and the Center for Antarctic Environmental Monitoring.

April 1998 | Antarctic Meteorite Research Center established as a research facility. Environmental Impact Section of the Operational Office established. Meteorite Research Section (research fellows group) eliminated from the Research Division, and Meteorite Collection Section eliminated from the Data Collection and Processing Division.

November 2000 | NIPRI was established by the Inter-University Research Institute Corporation as a Research Organization of Information and Systems. At the same time, the Graduate University for Advanced Studies (SOKENDAI) was established by the National University Corporation. The School of Mathematical and Physical Science was renamed the School of Multidisciplinary Sciences, and incorporates the departments of Statistical Science, Polar Science, and Informatics.

October 2006 | The research framework is regrouped to include the Polar Data Center and the Polar Science Resources Center in the Division for Polar Information. The Center for Antarctic Programs within the Division for Polar Programs is reorganized into the Antarctic Operation Center.

April 2008 | The Intellectual Property Section is established.

April 2009 | The Office of Polar Expeditions and the Antarctic Operation Center are merged as the Center for Antarctic Programs.

May 2009 | NIPRI relocates from Kaga, Itabashi Ward, Tokyo to the new campus in Midori-cho, Tachikawa-shi, Tokyo.
NIPR fulfills its purpose as an Inter-University Research Institute to undertake multidisciplinary scientific research of the polar regions and polar observation. All members of the NIPR faculty belong to one of the five research groups (Space and Upper Atmospheric Sciences, Meteorology and Glaciology, Geoscience, Bioscience, Polar Engineering) of Division for Research and Education, carry out research, and participate in a variety of duties, in addition to project research and Antarctic expedition. The Advanced Scientific Research Group also takes part in special promotion research projects.

Apart from research by staff members who have their sights on a broad range of global environments particularly to do with the natural surroundings of the polar regions, an important role of the Inter-University Research Institute is carrying out cooperative research based on proposals from researchers nationwide. NIPR has made considerable advances through cooperative research with researchers from various countries.

As a forum for announcing findings and discussing research items, various research and education groups invite researchers from home and abroad each year to hold symposia and publish the results in their scientific publications.

Furthermore, since polar expeditions are conducted as part of a cooperative international project, NIPR researchers have participated in foreign expeditions and Arctic expeditions in addition to Japan's own expedition to the Antarctic to further their knowledge of the polar science.
The polar regions are windows into the space, filled with magnetic field lines stretching out into the terrestrial magnetosphere and interplanetary space, and outstanding upper-atmospheric phenomena such as aurora are observed there. The Syowa Station is located directly beneath the southern-hemisphere auroral zone, and auroras and magnetic fields there have been continuously monitored since the commencement of Japanese Antarctic Research Expedition.

Taking advantage of this ideal location, the Space and Upper Atmospheric Sciences Group studies energy flow of solar winds into the earth’s magnetosphere, magnetosphere-ionosphere couplings, and effects of the ionospheric and the lower atmospheric phenomena on the middle and the upper atmospheres, etc. using state-of-the-art instruments. We take part in global network observations by collaborating with other antarctic stations, arctic stations in Svalbard Islands, Norway, Sweden, as well as Iceland which is located at the geomagnetic conjugate point of Syowa Station. The observed data and results are provided to collaborative researchers nationwide through project researches organized by NIPR and other collaborative scientists for further analysis and study. The group is also active in the development of ground-based optical instruments, unmanned instruments operated in Antarctica, satellite and balloon-borne instruments, and large-aperture atmospheric radars, as well as graduate education at the Department of Polar Science, the Graduate University for Advanced Studies (SOKENDAI).

The Meteorology and Glaciology Group collects materials (aerosols and gases in the atmosphere, ice cores, etc.) and data (ice radar data, weather data, etc.) through observations and surveys in the polar regions, such as Antarctica, Greenland, Ny-Ålesund etc. and conducts analysis on them. It tries to identify what is currently happening in the atmosphere, cryosphere and the ocean; what were the earth’s environment and climate like in the past; and how they will change in the future by examining the cause of changes. The polar regions are heat sink areas least influenced by human activity. As such, the information obtained can give insight about earth’s evolution.

Some of the main research projects conducted recently include research to recreate past environments using an ice core sample from a depth of 3,035m collected at the Dome Fuji Station; joint research with Sweden to study the internal structure and surface deposition of an ice sheet conducted by means of 3,000km land trip; joint research with Germany using aircrafts to examine the behavior of atmospheric aerosols in summer; research to estimate the exchange volume of gases and other substances in the ocean biosphere and the lower atmosphere using JARE research ship, Shirase, and the training and research vessel of Tokyo University of Marine Science and Technology, Umitaka Maru; and research into the formation mechanism of polynya which are in sea ice and their role in global climate and ocean cycles. Research is also carried out to understand global environmental and climatic changes by analyzing satellite data from the polar region.
The fundamental task of this group is to establish how the organisms have adapted and survived in the extremely harsh environments of polar region. The group also studies the sensitive response mechanisms of marine and terrestrial communities to global environmental changes. Its studies extend into the production process in marine low trophic levels, behavior of marine predators and terrestrial biology.

1. Production process in marine low trophic levels: Research focusing on the primary production of Antarctic Ocean is carried out in conjunction with the Meteorology and Glaciology Group on the training and research vessel, Umitaka Maru, which belong to the Tokyo University of Marine Science and Technology.

2. Foraging strategies of top predators: Data loggers with sensors are fitted to animals to identify foraging strategies, energy balances and other biological aspects.

3. Terrestrial biology: Research focuses on the origins and establishment of Antarctic lake biota, paleo-environmental reconstruction from lake sediment samples, and response mechanisms in lake ecosystems to global environmental change. The Arctic ecosystem in particular has been conducted for more than 10 years accumulating ecophysiological data on soil microbial respiration and photosynthetic production.
Research and Education

Polar Engineering Group

The Polar Engineering Group conducts research into logistics for observation activities and robotic exploration technology in the polar regions. Logistical activities in support of observation in the polar regions cover an extensive range from general living to, on occasions, observation methods. They rely on a technological capacity based on an extensive technical understanding of almost every facet of science and engineering as well as life sciences. Many of Japan’s technologies cannot be applied without modification in the logistics required by the harsh polar environment and there are still many problems that must be resolved in this area. The research group is currently involved with the following main issues.

1. Development of small wind turbines and grid integration systems
2. Research and development on polar robot exploration
3. Development of transport sleds for a new cargo system
4. Studies and research to improve efficiency in energy use

Advanced Scientific Research Group

NIPR launched the new flagship project (advanced scientific research project) entitled “Approaching Earth System Dynamics Through the Past Polar Changes: Reconstruction of Quaternary Polar Environmental and Global Atmospheric Changes with High Accuracy and High Temporal Resolution”, on 1 April 2008. The ultimate goal of this project is to contribute to improving future climate prediction through better understanding of the climate system. Toward this goal, the project members analyze the Dome Fuji ice core from Antarctica and the North Greenland Eemian ice core (NEEM core), and conduct field surveys in a broad region from the Antarctic continent to the Southern Ocean sea floor. The new data, together with existing paleoenvironmental data from polar and other regions, are analyzed for reconstructing the Quaternary histories of bipolar climate, atmospheric greenhouse gases, Antarctic ice sheet and Southern Ocean environment.

In fiscal year 2009, the members will conduct field surveys, obtain Antarctic geological samples and the NEEM ice core, and analyze the Dome Fuji and NEEM ice cores and the geologic samples to acquire the basic information necessary for the above aims. The research group will also hold the “Ice Core Research Symposium” (a tentative title) to provide venues for researchers in Japan and abroad to present their findings and exchange information.

Components of the global environment system and research regions
### Projects

#### Advanced Project

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Principle Investigator</th>
<th>Period (FY)</th>
<th>Number Inside NIPR</th>
<th>Number Outside NIPR</th>
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<tbody>
<tr>
<td>Approaching Earth System Dynamics Through the Past Polar Changes: Reconstruction of Quaternary Polar Environmental and Global Atmospheric Changes with High Accuracy and High Temporal Resolution</td>
<td>Hidaki MOTOYAMA</td>
<td>2008 - 2012</td>
<td>18</td>
<td>63</td>
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#### Project Research (10 titles)  
Research that is distinctive and contributes to the furthering of pioneer studies.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Project Title</th>
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<th>Period (FY)</th>
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<tbody>
<tr>
<td>Sub theme 1</td>
<td>Comprehensive analysis of global environment changes viewed from the north and south polar regions</td>
<td>Natsuo SATO</td>
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<tr>
<td>Sub theme 1</td>
<td>Integration and changes in the magnetosphere, ionosphere and atmosphere</td>
<td>Natsuo SATO</td>
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<tr>
<td>P1</td>
<td>Study of the Aurora Phenomenon in the Northern and Southern Polar Regions</td>
<td>Natsuo SATO</td>
<td>2004 - 2009</td>
<td>11</td>
<td>51</td>
</tr>
<tr>
<td>P2</td>
<td>Study on the coupling and variability of the polar upper atmosphere</td>
<td>Masaki TSUTSUMI</td>
<td>2004 - 2009</td>
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<td>34</td>
</tr>
<tr>
<td>Sub theme 2</td>
<td>Interaction system within the atmosphere and cryosphere, biosphere and geosphere</td>
<td>Takashi YAMANOUCHI</td>
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<tr>
<td>P5</td>
<td>Study on mechanism for sea ice and oceanographic variation in the Indian sector of the Southern Ocean</td>
<td>Shuki USHIO</td>
<td>2004 - 2009</td>
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<td>P6-1</td>
<td>Study of the Earth’s environmental change from the geodetic approach to the Antarctic Ice Sheet and Southern Ocean variations</td>
<td>Kazue SHIBUYA</td>
<td>2004 - 2009</td>
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<tr>
<td>P9</td>
<td>Studies on sea ice variation and biological production</td>
<td>Tsuneo ODATE</td>
<td>2004 - 2009</td>
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<tr>
<td>P10</td>
<td>Study on the system of biological production and gas production related to the global climate by time-series observations</td>
<td>Mitsuo FUKUCHI</td>
<td>2004 - 2009</td>
<td>13</td>
<td>21</td>
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<tr>
<td>Sub theme 3</td>
<td>Reconstruction of paleo-environment changes and examination of biodiversity and ecological changes</td>
<td>Yoshifumi NOGI</td>
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<td>Sub theme 3</td>
<td>The biodiversity and ecosystem change in extreme environment</td>
<td>Hiroshi KANDA</td>
<td>2004 - 2009</td>
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<td>Sub theme 4</td>
<td>Planetary evolution and solid sphere changes</td>
<td>Yoschi MOTOYOSHI</td>
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<tr>
<td>P7</td>
<td>Dynamics of supercontinent formation and break up viewed from polar regions</td>
<td>Yoschi MOTOYOSHI</td>
<td>2004 - 2009</td>
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<tr>
<td>P8</td>
<td>Evolution of the early solar system and planets</td>
<td>Hideyuki KUJMA</td>
<td>2004 - 2009</td>
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</table>

#### Technical Development Research (7 titles)  
Those for the purpose of developing observation and experimental equipment as well as methods for observation and analysis.

<table>
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<tr>
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<th>Period (FY)</th>
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<th>Number Outside NIPR</th>
</tr>
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<tbody>
<tr>
<td>E10</td>
<td>Development of large Antarctic atmospheric radar and its possibilities for polar atmospheric science</td>
<td>Masaki TSUTSUMI</td>
<td>2007 - 2009</td>
<td>9</td>
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<tr>
<td>E13</td>
<td>Design of ROV and ALV for surveys in the Antarctic sea covered by sea ice</td>
<td>Yoshifumi NOGI</td>
<td>2007 - 2009</td>
<td>4</td>
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<tr>
<td>E14</td>
<td>Development of unmanned high-speed communications platform for mass data observations in the Antarctic</td>
<td>Hisao YAMAGISHI</td>
<td>2008 - 2009</td>
<td>5</td>
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<tr>
<td>E15</td>
<td>Research into atmospheric composition at Dome Fuji station</td>
<td>Hidaki MOTOYAMA</td>
<td>2009</td>
<td>3</td>
</tr>
<tr>
<td>E16</td>
<td>Development of wireless GPS data collection system using unmanned micro air vehicles</td>
<td>Koichiro DOI</td>
<td>2009</td>
<td>3</td>
</tr>
<tr>
<td>E17</td>
<td>Development of programmable long-term interval recording high-definition underwater video camera system</td>
<td>Sakae KUDO</td>
<td>2009</td>
<td>3</td>
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<tr>
<td>E18</td>
<td>Development of assessment test instruments for optimum installation of solar cells</td>
<td>Shogo NISHIKAWA</td>
<td>2009</td>
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</table>

#### Innovative Research (3 titles)  
Budding research that is creative, particularly research based on unique ideas.

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Principle Investigator</th>
<th>Period (FY)</th>
<th>Number Inside NIPR</th>
<th>Number Outside NIPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>G11</td>
<td>Secondary mass spectrometry for the determination of refractory trace element abundances in planetary materials</td>
<td>Keiji MISAWA</td>
<td>2007 - 2009</td>
<td>4</td>
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<tr>
<td>G13</td>
<td>Establishment of Study on Arctic Change</td>
<td>Takashi YAMANOUCHI</td>
<td>2009</td>
<td>6</td>
</tr>
<tr>
<td>G14</td>
<td>Comprehensive medical research on JARE members</td>
<td>Kentaro WATABE</td>
<td>2009</td>
<td>1</td>
</tr>
</tbody>
</table>
Collaborative Research

General Collaboration Projects

Collaborative research into the polar regions is carried out at NIPR’s facilities by NIPR staff members working together with individuals or groups of researchers from outside the institute. Outside researchers, otherwise referred to as co-researchers, are given access to NIPR facilities and experimental and analysis instruments such as the Polar Data Center, Polar Science Resources Center and the low-temperature room. They are selected from applicants and are assigned to any one of the Space and Upper Atmospheric Sciences, Meteorology and Glaciology, Geoscience, Bioscience and Polar Engineering groups. 108 co-researchers have been invited in fiscal 2009.

■ Recent Collaboration Project

Practical wear for the Antarctic expedition with an outstanding design was developed in a recent collaboration project based on an ergonomic apparel design and attuned to cold-climate and the design was registered. The outfits have been tested out in Antarctica and research is in progress to further upgrade their performance.

Outfit designed with functionality and style as its concept

Collaboration Agreements

NIPR participates in collaboration projects under agreements with other organizations for the purpose of mutual use of R&D capacities and resources and to work closely together to combine strengths with a view to fulfilling the important role of advancing research and education and personnel training.

■ Collaboration Agreement with Institute of Low Temperature Science (ILTS) at Hokkaido University

Concluded on December 16, 2008 with the aim of furthering research and education into low temperature and polar science.

Prof. Akira Kouchi, Director of ILTS (left) and Dr. Yoshiyuki Fujii, Director-General of NIPR (right) at the signing ceremony

■ Collaboration Agreement with Tokyo University of Marine Science and Technology (TUMSAT)

Concluded on February 9, 2009 with the aim of furthering research and education into marine and polar science.

TUMSAT’s Umitaka Maru on a monitoring mission in the Antarctic Ocean

Research Workshop

A small workshop was convened to deliberate the direction, methodology and results of research projects at NIPR. Seven projects were selected from applications to be implemented in fiscal 2009.
NIPR has enormous amounts of data and samples from its expeditions to the Arctic and the Antarctic. Besides organizing and releasing these resources to support collaboration with researchers in Japan and overseas, it also undertakes various tasks in maintaining the information infrastructure so that the data on the polar regions can be utilized widely by researchers and the general public.
Polar Data Center

With rapid improvement and development in technology for earth observation by satellites and ground-based observation networks both in the Arctic and the Antarctic, large quantities of observation data are being generated in the field of polar science. The Polar Data Center assumes the twofold task of developing and operating the information infrastructure, and managing and supplying a database, so that observation data are processed and utilized effectively. All scientific data obtained from the Antarctic Research Expedition must be made public as prescribed by the Antarctic Treaty. Each member country is required to establish a National Antarctic Data Center (NADC) and Japan’s NADC is the Polar Data Center.

Science Information Infrastructure

Computer System
The computer system at the center comprises a polar science supercomputer for numerical modeling and processing data from the polar regions, a polar science integrated data library system (the polar science data library system, POLARIS) for storing and presenting data, and networks between the institute’s laboratories and Syowa Station.

Intelsat Satellite Link
NIPR and the Antarctic Syowa Station are networked via an Intelsat satellite link (upgraded to 2 Mbps in 2009).

Multipurpose Satellite Data Receiving System
The S/X band satellite data receiving station equipped with an 11m-diameter antenna receives data from various earth observation satellites (MOS, ERS, JERS, ADEOS-II) including the aurora observation satellite, Akebono (EXOS-D). It is currently being used in reception of the Innovative-technology Demonstration Experiment, Reimei (INDEX) and VLBI (very long baseline interferometry). An L/S band system is also in operation to automatically receive data from NOAA and DMSP satellites.

Database

Science Database
Data from the Arctic and Antarctic regions is collected, archived and made available via Internet by the polar science data library system (POLARIS). The system functions as an NADC and is linked to the Arctic/Antarctic Master Directory of NASA/GCMD and the IPY portal. Efforts are underway to expand the online database and to set up a public database.

World Data Center for Aurora
The World Data Center (WDC) for Aurora was established on the recommendation of the International Council for Science (ICSU). It is responsible for collecting, organizing and disseminating mainly auroral optical observation materials and other related space and upper atmospheric observation data.
The Polar Science Resources Center manages ice sheet core, meteorite, rock, and biological specimens collected in the polar regions, and publishes data catalogues so that they can be made available for collaborative projects with researchers in Japan and overseas, as well as to educators and the general public.

**Polar Science Resources Center**

**Antarctic Meteorite Research Center**

The Antarctic Meteorite Research Center manages some 16,200 Antarctic meteorites recovered by JARE. These represent more than 30% of the meteorites discovered around the world, making it one of the world’s biggest meteorite collections, and include meteorites from the moon and Mars, and numerous other extremely rare samples. These meteorites are distributed as research specimens and are used in collaborative research projects. Hand specimens and thin sections of the meteorites are available on request for exhibition or education as part of NIPR’s outreach activities. The laboratory also conducts petrological and mineralogical studies, and isotopic analyses using SHRIMP (sensitive, high-resolution ion microprobe) in order to reveal the evolutionary processes of planetary materials.

**Ice Core Laboratory**

The Ice Core Laboratory (henceforth, ICL) conducts management on ice cores drilled from ice sheets and glaciers in the Antarctic and Arctic. The ICL also conducts basic analysis for the ice cores. The core samples are preserved in the cold storage in NIPR. When ice cores are analyzed, they are first processed in the low-temperature room. And then, various analyses are carried out using instruments such as the mass spectrometer, liquid scintillation counter, ion chromatograph, laser particle counter and ICP mass spectrometer.

Recently, the ICL has focused on the analysis of a 3,035m ice core drilled at Dome Fuji Station in Antarctica. The laboratory publishes monthly reports, providing details on equipment and instrument operation status, sample analysis updates and other information.

**Rock Specimen Archive**

Since the first Japanese Antarctic Research Expedition (JARE), we have collected and preserved some 12,000 rock and mineral specimens. These specimens are organized according to collected year and region and are recorded in a database.

The archive covers rocks and minerals not only from Antarctica, but also from Sri Lanka, India and Africa as part of its international scientific research. These are also important for geological comparisons and studies into the earth’s crust and mantle materials constituting the Gondwana supercontinent.

**Biological Specimen Archive**

NIPR collects, lists and manages biological specimens collected by JARE and Arctic surveys conducted by Japan and other countries. NIPR loans those specimens to a wide range of organizations not only in Japan, but also in various overseas countries. Plant specimens, mainly comprising bryophytes (mosses), have been a part of World Public Herbaria with the code “NIPR” by the International Association of Plant Taxonomy since 1979. There are approximately 40,000 specimens on file for physiological and genetic research. The databases are made public to facilitate research with these specimens and to improve the understanding of polar organisms.

**Plants around Syowa Station**

- Moss: *Bryum pseudotriquetrum*
- Green algae: *Usnea sphacelata*
- Cyano bacteria: *Cyanothece* sp.
- Lichen: *Usnea sphacelata*
Both polar regions are important research and observation fields for discovering the role they play in global climatic changes, and for studying the history of the earth, biodiversity in extreme environment, long term observation of the global environment and space observation. NIPR established the Division for Polar Programs comprising the Center for Antarctic Programs and the Arctic Environment Research Center to effectively promote observation and research in the polar regions. The Center for Antarctic Programs plays a particularly important role in the process of formulating, implementing and assessing expedition programs approved by the Headquarters of the Japanese Antarctic Research Expedition under the direction of the Ministry of Education, Culture, Sports, Science and Technology.

While providing a range of support for on-site observations by Japan’s polar researchers, the Division for Polar Programs also acts as an information center for researchers in Japan and abroad and holds symposiums on observations and logistics. Furthermore, it works with the International Affairs Section in promoting international collaborative observations, and also makes the necessary adjustments to comply with international and social frameworks relating to the polar regions such as the Council of Managers of National Antarctic Programs (COMNAP), the International Arctic Science Committee (IASC), and the Antarctic environment laws under the Antarctic Treaty.
Center for Antarctic Programs

The Center for Antarctic Programs was launched on April 1, 2009 following reorganization of NIPR with a view to offering a safer and more efficient promotion framework. The research and clerical staff were integrated into a single group so that the center can maximize its function as the core organization of NIPR’s Antarctic research activities. Staff members are allocated into teams to perform various tasks including planning programs with researchers in Japan and overseas, maintaining the bases in Antarctica, organizing and dispatching expeditions, arranging transportation and implementing safety and environment protection measures. For the smooth-running of Antarctic operations, a temporary task team has also been set up to respond promptly to various issues in collaboration with groups of the Division for Research and Education.

Organization for Implementing Antarctic Programs

[Diagram showing the organization structure of the Center for Antarctic Programs, including various teams and their responsibilities.]

Ice sheet at Sør Rondane Mountains
The Arctic is one of the most important areas for investigating the state and changes in the global climate and environment. Field investigations have been conducted to clarify the change in global environment, the driving mechanism of the change and its influence on ecological systems. The disciplines involved are lower atmospheric science, glaciology, marine science, terrestrial biology and upper atmosphere physics.

The Arctic Environment Research Center (AERC) was established in the National Institute of Polar Research in June 1990. The aim of the center is to organize frameworks for cooperative research as the core organization of Japan’s Arctic Research for the management and administration (handling applications for use, disseminating of station information, implementing safety measures, etc.) of the Ny-Ålesund Station and the NIPR office at Svalbard University Centre in Longyearbyen (UNIS). Furthermore the centre affords the facilities for pursuing the cooperated regions such as conjugate aurora observatory station in Iceland, NEEM project (an international ice core research project in North-West Greenland), Arctic data collection, website management (http://www-arctic.nipr.ac.jp/) and Arctic Research Directory editing (issued by Science Council of Japan).

Ny-Ålesund Station

The Ny-Ålesund Station was set up in collaboration with the Norwegian Polar Institute in 1991 in the village of Ny-Ålesund on Spitsbergen Island, Svalbard archipelago (lat. 79° N, long. 12’ E). The facilities, fixtures and equipment are maintained to offer user’s easy-to-use environment including high-speed Internet connection etc. Projects that are currently in progress focus on the field of atmosphere science such as greenhouse gas, ozone, radiation and aerosol observations, as well as predictions on the effects of global warming by monitoring plant distribution and ecological net production.
The International Affairs Section deals specifically with international issues to do with scientific research in the polar regions. Any matters relating to (1) international treaties and conferences, (2) cooperative research and scientific agreements with foreign institutions, and (3) international scientific exchanges are handled by the section with the assistance of the International Affairs Committee. Since polar research is conducted on foreign territory, an international framework is indispensable. NIPR complies with the Antarctic Treaty and the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), as well as various arrangements under such bodies as the Scientific Committee on Antarctic Research (SCAR), the Council of Managers of National Antarctic Programs (COMNAP), the International Arctic Science Committee (IASC) and the Asian Forum for Polar Sciences (AFoPS).

In addition to the International Polar Year (IPY) 2007-2008 which lasted 2 years, numerous international collaborative research projects are presently underway and the International Affairs Section is entrusted with the task of setting the institute’s direction and policies for these items.

Moreover, with greater emphasis placed on globalization by research institutes, there is a growing need for promotion of international exchange among scientists and revitalization of research. The International Affairs Section offers assistance in these areas. It is called upon to deliberate and propose a broad range of international strategies and makes arrangements for their implementation.
As an Inter-University Research Institute, NIPR serves as a science information center for the polar science field. It maintains a large collection of scientific journals, books and expedition reports regarding polar research. These materials are provided to researchers in the open-shelf library and requests are also accepted from non-visitors for copies to be delivered by mail. In addition, NIPR publishes many scientific journals, including the Antarctic Record.

Since November 1996, the library is networked with the National Institute of Informatics (NII; formerly, National Center for Science Information Systems) so that its books, journals and data collection are registered in a comprehensive national catalog. As of March 31, 2009, the library has a total of 20,325 books and 3,428 journals recorded in the catalog including Japanese and foreign-language publications. These books and journals are made available via the Internet and can be searched using keywords. The contents of the 5 English scientific journals published by NIPR can all be searched using keywords from the very first edition released in 1988 using the library’s administration system, and the text is supplied in PDF format.

Furthermore, the Arctic & Antarctic Regions Database is available through via an internet with LAN terminals at NIPR. It is containing 1.05 million reference materials relating to polar science.

Facilities

The reading room, rare books room, shelves for single-volume books, magazine stands and the library office are on the first floor. There are 26 reading desks complete with wireless LAN access. The library is open 24 hours a day to NIPR staff. The library offers a range of copying services. Maps of the area around Prince Olav Coast compiled from past expeditions are displayed and distributed at Library by staff.

Books and Other Publications (As of April 1, 2009)

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<tr>
<th>Books</th>
<th>Japanese</th>
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Reading room

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<td>906</td>
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Publications

The NII Scholarly and Academic Information Navigator (CiNii) provides a keyword search function with free access to scientific journals published by the NIPR Library in PDF format from the first to the latest issue. Furthermore, back issues for the following publications are available free of charge (with exceptions) and can be requested as required.

Please contact the following email address:
publication402@nipr.ac.jp

- Antarctic Record (Nankyoku Shiryō)(Japanese and English) (Published 3 times a year, currently up to Vol.53-1)
- Polar Science (English)(Distributed for a charge) (Published 4 times a year in partnership with Elsevier B.V., first published in 2007, currently up to Vol. 2)
- Memoirs of National Institute of Polar Research (Irregular: Series A-F, Special Issue)
- JARE Data Reports (Irregular: Currently up to No.309)
- NIPR Arctic Data Reports (Irregular: Currently up to No.7)
- Antarctic Geological Map Series (Irregular: Currently up to Sheet 30)
- Special Map Series (Irregular: Currently up to No.7)
NIPR performs a various of publicity work on Japanese research activities in the Antarctic and Arctic.

**Exhibits**

A display corner has been arranged in the atrium on the 1st floor for the general public and a special Exhibits Room is scheduled to open in autumn 2010.

**Publications of PR Journals**

NIPR produces a variety of pamphlets for distribution besides issuing the quarterly NIPR News. In June 2009, it released a new journal on polar research for general readers called "Kyoku", which means polar regions.

**Loans of Items for Display**

NIPR lends out films and images and specimens of biological samples, meteorites and rocks for special exhibitions in museums and lectures by former expedition members.

**Polar Archives**

NIPR stores and manages some 10,000 items that have been collected to date over the past 50 years ever since Japan's first expedition in 1956.

**Antarctic Classes**

About 40 to 50 times a year, Antarctic Classes are held by linking Syowa Station with elementary and junior high schools in Japan via real-time satellite communications.

Coming directly into contact with expedition members carrying out research in the harsh Antarctic conditions helps children understand the importance of Antarctic research activities and of the global environment.

**Intellectual Property Section**

The Intellectual Property Section was established in April 2008. The section mainly deals with discoveries and research results, in other words, intellectual property, acquired through polar expeditions, joint research activities and other projects. Its duties include filing patent and trademark registration applications for claiming and utilizing research results as well as releasing and publicizing intellectual properties and their copyrights. The section is also in charge of providing incentives for employee inventions, intellectual property-related personnel training, preparation of guidelines for use of trademarks and industry-academia-government collaborative projects in close cooperation with the Research Organization of Information and Systems (ROIS).
Since 1993, NIPR accepts students for 5-year full-term and 3-year second-term doctoral courses through the Department of Polar Science, the School of Multidisciplinary Sciences, the Graduate University for Advanced Studies (SOKENDAI). Eighteen students are currently enrolled in the course. It also accepts graduate students as special collaborative research fellows and operates joint graduate schools in collaboration with graduate schools of other universities.

The Graduate University for Advanced Studies (SOKENDAI)

The Graduate University for Advanced Studies (SOKENDAI) was established as Japan's first national graduate school to exclusively offer doctoral courses in October 1988 (National University Corporation since 2004). Apart from the School of Cultural and Social Studies, all other schools at the University change over to 5-year doctoral courses in 2006 and 2007. The university currently consists of 6 schools with the assistance of 18 parent institutes. The university undertakes doctoral education and research in close collaboration with its parent institutes, making full use of their highly capable personnel and superior research environments. It fosters researchers with a broad, international perspective and a high level of creative thinking so that they can take the lead in responding to new trends in academic research. In addition, the university promotes original, international academic research that transcends conventional academic fields and pioneers new disciplines.

The Department of Polar Science

The Earth is the only habitable planet with abundant water in our solar system. It is home to many kinds of organisms, including mankind. A better understanding of its origin and changing environments is essential if we are to maintain sustainable development on this planet. It has recently become apparent that environmental changes on the Earth, whether in the ionosphere, atmosphere, hydrosphere, geosphere, or biosphere, first appear in the two polar regions. The objective of the Department of Polar Science is to identify the primary cause and interaction between these individual changes within Earth’s overall system. Polar Science is rooted firmly in fieldwork. Therefore, great importance is attached to education and study concerning practical methodologies for carrying out research. The department fosters researchers who have the ability to carry out a broad range of earth science studies in a flexible and creative way.

Special Collaborative research Fellows

In accordance with the Article 29-1-3 of the National University Corporation Law, the Inter-University Research Institute Corporation accepts graduate students at the request of universities and cooperates with university education. Every year since 1981, NIPR has accepted graduate students in polar science and related fields as special collaborative research fellows. In 2008, NIPR accepted fifteen students.

Joint Graduate School

In July 2006, NIPR and the Graduate School of Social and Cultural Studies at Kyushu University entered into the Agreement on Partnership and Cooperation in Education and Research between the National Institute of Polar Research, Research Organization of Information and Systems and the Graduate School of Social and Cultural Studies, Kyushu University. From October 1 of the same year until March 31, 2011, the two institutes have joined hands in offering graduate education in the field of polar environment studies.
The Graduate University for Advanced Studies Organization

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Prior to April 2004, national universities and research institutes in Japan were operated under the umbrella of a national body governed by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Since then, oversight was transferred to a cooperative organization, the Research Organization of Information and Systems (ROIS). ROIS was established by combining the National Institute of Polar Research (NIPR), the National Institute of Genetics (NIG), the National Institute of Informatics (NII), and the Institute of Statistical Mathematics (ISM).

The Transdisciplinary Research Integration Center (TRIC) was established during the same period as ROIS. TRIC’s goal is to construct new paradigms in the fields of Earth science and life systems. The TRIC program integrates a vast amount of wide-ranging data, collected by observatory networks. TRIC was initiated as a five-year program and consists of four umbrella projects, which focus on three fields of research: 1) life systems, 2) environmental systems, and 3) complexity systems and modeling/information processing.

Four transdisciplinary integration projects listed below have been in progress since 2005 as 5-year projects.

1. Environmental and Genetic Approach for Life on Earth, by investigating microorganisms present in ice cores and life systems in extreme environments with a study of relevant modeling and prediction techniques.

2. Construction of information Space and Information Infrastructure for Interdisciplinary Research, designed to facilitate analysis and classification of large data sets and acquisition of knowledge.

3. Function and induction: Modes of Scientific Inference for the Information Age, which aims to develop modeling techniques for prediction and discovery.

4. Development of Systems for Performing Correlative Analysis of Genomic Polymorphisms and Phenotypic Diversity Using Statistical techniques and Informing Technology, which grapples with the mystery of biological diversity.

NIPR heads the project number ① which is known as the EAGLE project.

Environmental and Genetic Approach for Life on Earth with a study of relevant modeling and prediction techniques (EAGLE)

Recent advances in biotechnology have improved our ability to process genomic material. Thus, researchers are now able to study the microorganisms present in ice cores taken from Antarctic ice sheet by analyzing the DNA contained in the ice. This data is useful for understanding the relationships between global environmental change and evolution or diversity of microbial organisms.

The EAGLE project is also hoped that transdisciplinary researches in TRIC program will yield novel results which challenge the conventional notions of polar biology and the links to the global environment.

A historical record of the biota is contained in the DNA captured within the freeze zone. Analysis of the abundance, origin, and diversity of these microbes yields a record of environmental change over a long period of time (~720,000 years). Another focus of this project is to compare the microorganisms from a variety of ecosystems in extreme environments. Such environments are characterized by very low temperatures, strong ultraviolet rays and isolation. The project examines strategies used by organisms living in extreme environments under the following two subtitles.

① Microbial analysis of ice sheet cores as a time capsule of paleoenvironments.

② Comparative studies on the biological systems in extreme environments in polar regions.

The Dome Fuji Station ice core. Left and center: Black substance which may be organic. Right: Trace of what appears to be a water channel.

Benthic moss pillars in Antarctic lakes

Analysis of Greenland ice sheet and dirt material as origin of living matter.
Japanese Antarctic Research Expedition (JARE) is a government-operated program conducted with international cooperation in accordance with the Antarctic Treaty. Subsequent to the decision of the cabinet meeting in 1955, the program started off as part of the International Geophysical Year (IGY: 1957-1958) and has been in action for half a century ever since the opening of Syowa Station on January 29, 1957 on East Ongul Island in Lützow-Holm Bay, Antarctica.

Japan’s stations serve as outposts for the global observation network and have produced numerous results by taking constant meteorological observation, discovering ozone holes, acquiring the world’s largest collection of meteorites including those from the moon and Mars through research projects, unveiling climatic changes over the past several hundred thousand years by analyzing ice cores obtained from drilling ice sheets, and studying environmental changes by monitoring atmospheric concentration of carbon dioxide, etc.

In September 2003, the Science Council of Japan requested that the Japanese government reaffirm its view that Antarctic research be an especially important national project deserving of government-wide efforts for continuous implementation and the government take necessary measures to continue and enrich the research activities, including the provision of delivery system such as research ship.

The International Council for Science (ICSU) and the World Meteorological Organization (WMO) called for concentrated scientific research and observation in earth’s polar regions between March 2007 and March 2009 as the International Polar Year (IPY) 2007-2008. Japan made its contribution to the international scientific research and observations through active participation with JARE activities.
Construction of Syowa Station was begun by the 1st Japanese Antarctic Research Expedition (JARE) on January 29, 1957. The station is located on East Ongul Island in Lützow-Holm Bay, about 4 km west from the coast of East Antarctica and it serves as the mother station for Japan's Antarctic research activities. The facilities are built directly on the bedrock. The operations building, powerhouse, sleeping quarters, science building, environmental protection building, satellite signals receiving building, stores, etc., are about 6,820 m² in total area. The station has supplies and equipment for a full year of research activities by about thirty people. It is powered by diesel generators as well as by photovoltaic generators that utilize natural energy sources.

The temperature at the station is higher and the katabatic wind from the continent is weaker than in the interior of the continent. However, since the station is located in a coastal area, it is subject to the effects of atmospheric depressions and experiences blizzards about 57 days a year on average.

- Average temperature: -10.5°C
- Maximum temperature: 10.0°C (January 21, 1977)
- Minimum temperature: -45.3°C (September 4, 1982)
- Average wind speed: 6.5 m/s
- Maximum gust wind speed: 61.2 m/s (May 27, 1996)
- Average sea-level pressure: 986.6 hPa
- Location: 69°00'22"S and 39°35'24"E
- 29.18 m above sea level
Dome Fuji Station

The station was established in 1995 at the highest point of the ice sheet in Dronning Maud Land, about 1,000 km south of Syowa Station. Its facilities comprise buildings such as the powerhouse, sleeping quarters, drilling room, drilling control room and evacuation facility as well as snow caves such as the deep drilling trench and ice core treatment and experiment room. The 36th to 38th JARE wintering party succeeded in deep drilling of the ice sheet to a depth of 2,503 m. The specimen is being examined to uncover global climatic and environmental changes over the past 340,000 years. The 45th to 48th JARE implemented the second-phase ice sheet deep drilling plan during the summer and managed to obtain an ice core from a depth of 3,035 m. It is hoped that this will help reveal global environmental changes extending back 720,000 years in the past. The station is located in the cold central core, with an extremely low ambient temperature, atmospheric pressure, and humidity.

Mizuho Station

The station was opened in 1970 about 270 km southeast of Syowa Station on the ice sheet of the Antarctic Mizuho plateau. The facility is buried under the snow. It was used by the 13th to 27th JARE as a winter research station but is now an unmanned observation base which also serves as a relay point to inland stations. The average ambient temperature is about 20°C lower than that at Syowa Station and a katabatic wind blows constantly at 10-20 m/s.

Asuka Station

The station was established in 1985 about 670 km westsouthwest of Syowa Station on the ice sheet of Dronning Maud Land. The location is about 155 km from where the research ship Shirase enters Breid Bay. It was used by the 28th to 32nd JARE for winter research. A strong, east-southeast katabatic wind blows all year and there are many blizzards due to its location near the coast. The station is closed down now.
Research Observation Activities

Routine Observations
Since the 7th JARE when Antarctic observations were resumed, “routine observations” have been defined as observations undertaken to obtain basic data essential for scientific research, long-term observations, observations undertaken as part of an international observation network and observations with internationally established reporting standards. The National Institute of Information and Communications Technology, the Japan Meteorological Agency, the Geographical Survey Institute and the Hydrographic and Oceanographic Department of Japan Coast Guard are responsible for various routine observations. Syowa Station has been designated as an observation point by the World Meteorological Organization (WMO). As such, its observation data are used worldwide in weather charts and plays an important role in identifying how the ionosphere affects global telecommunications. Various marine studies are also conducted aboard the research ship Shirase to obtain basic data on ocean structure.

Research Observations
Since the Antarctic is far from the human habitats and the effect of human activity on the region is extremely low, it is an ideal location for catching changes in the global environment. Observations and surveys with the high level scientific objective are conducted in the following form of research observations: Priority Project Research Observations, internationally important, selective, concentrated five-year projects based on annual plans; General Project Research Observations, comparatively small projects conducted with institutes and researcher organizations in Japan and abroad; and Monitoring Research Observations with long-term, wide-range monitoring of global environmental trends. Since there are only a few observation bases in East Antarctica, the continuous flow of data about the region is precious significant in unveiling trends in global environmental changes.

International Cooperative Observations
The Antarctic Treaty limits use of the Antarctic to peaceful purposes. It stipulates that each signatory nation carry out observation and research with active international cooperation. Japan exchange researchers with foreign stations every year. International cooperative observations have been implemented since 1973, when NIPR was founded. Recently, NIPR participated in the Sweden-Japan Antarctic Expedition from November 2008 to February 2009. There is growing trend towards international cooperation in Antarctic expeditions. Active participation and contributions to the International Polar Year (IPY) 2007-2008 as well as collaboration with other Asian countries are especially important and are being recommended by the Science Council of Japan and the Committee on International Affairs of the Council for Science and Technology, MEXT.

Expedition Activity Topics

49th JARE
- A study of the upper atmosphere with remote sensing of the OH airglow changes, research is underway to continuously monitor the temperature in the polar mesopause region so as to identify the relationship between temperature changes in the polar upper atmosphere and auroral precipitations.
- Observation of atmospheric aerosols using X-ray fluorescence analysis
The behavior of aerosols in the Antarctic atmosphere is closely linked to cloud formation in the cold region and to global warming. Measurements were made to reveal the seasonal changes of aerosol features. The aerosols collected were immediately analyzed using X-ray fluorescence analysis systems. It is hoped that comparisons with previous results taken by other techniques will shed light on the aerosol features in the polar region and global warming research.
Environmental Protection

Waste Management

In accordance with The Protocol on Environmental Protection to the Antarctic Treaty of January 14, 1998, the Japanese Antarctic Research Expedition (JARE) has implemented a number of environmental protection measures. JARE has been bringing back over 100 tons of discarded waste every year since 1998. Moreover, JARE has brought back most of the snow mobiles and other vehicles as well as research equipment left by previous expeditions under the four-year program to clean-up Syowa Station started in 2004. These efforts will be continued in future expeditions. In addition, some of the waste is disposed of on site. For example, sewage is treated using septic tanks and some of the burnable garbage and kitchen waste is disposed of by incinerator or kitchen waste volume reduction devices.

Consideration for Antarctic Nature

To protect the natural surroundings of the Antarctic as much as possible, access to Yukidori Valley in Langhovde, Antarctic Specially Protected Area (ASPA) No. 41 is restricted and instructions to bring back garbage and leave no human waste even in surveys in exposed rocky areas are thoroughly enforced. Furthermore, at Syowa Station, every effort is made to minimize the consumption of fossil fuels through the use of solar energy and wind power (currently being tested).

50th JARE

Japan-Australia Cooperative Research

The 50th JARE made its outward voyage on the Australian research ship, Aurora Australis. Using the vessel, a cooperative study between Australia and Japan took place in the Lützow-Holm Bay seasonal ice zone which had not been sufficiently observed in previous expeditions. The training and research vessel, Umitaka Maru, of the Tokyo University of Marine Science and Technology was deployed to monitor the open water area while Aurora Australis conducted the same task in the ice sea area, and data on plankton composition in the Lützow-Holm Bay seasonal ice zone was obtained. The data will be compared with regional monitoring results by other countries to identify the distribution of marine life throughout the Antarctic Ocean.

Research into Growth and Breakup Mechanism of supercontinents and Mantle Evolution Process

Six researchers were flown to the Ser Rondane Mountains to find out about the phenomena that took place in the earth’s interior when the supercontinents was formed and to explore the mechanism behind the meeting and parting of continents. Exceptionally porous rocks were found in the igneous rock layer that had pierced through the metamorphic rock layer strongly indicating that the crust had shifted upward towards the earth’s surface from deep underground and that the magma had penetrated the near-surface areas.
Cover: Shirase Glacier. It is the fastest-moving glacier (3 km per year) in the Antarctic.