Overview of International Collaboration Program at Global Institute for Materials Research Tohoku

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GIMRT is the bridge for multi-core collaboration research to establish international open research alliances in materials science.

GIMRT offers support for overseas researchers to visit Japan for research collaborations involving IMR, domestic, and non-Japanese researchers.

GIMRT offers opportunities for young scientists from Japan to conduct research at overseas institutions.

GIMRT helps to coordinate international workshops, joint-projects, joint-laboratories and knowledge sharing as well as research material transfers.

**MAterials Research Open Alliance**

- **Domestic Researchers and Institutions**
- **Overseas Researchers and Institutions**
- **University**
- **Company**
- **Laboratory**

GIMRT
Outline of Programs

Use IMR Resources for Materials Science

Research Visit for a few weeks
- Single Research Visit

Staying at IMR for few months
- Visiting (Full, Assoc., Assist.) Professor
- Research Fellowship for DC student

Facilities
IMR, Tohoku Univ.

- International Research Center for Nuclear Materials Science
- High Field Laboratory for Superconducting Materials
- Center of Neutron Science for Advanced Materials
- Center for Computational Materials Science
- Cooperative Research and Development Center for Advanced Materials
- Research Division, group and others

Laboratories

Bridge domestic, overseas and IMR researchers

Multi-core research collaboration
- Bridging proposal

Research at Overseas Institute
- Travel Support for young scientist

Exchange of research community
- International Workshop organization

Long term collaboration
- Integrated Joint Project
- Joint Laboratory
Research visit to IMR- a basic single research visit

Objective
The program supports travel and staying expenses for overseas researchers who are willing to stay for a few weeks at IMR. IMR offers opportunity to conduct research collaboration and to use IMR resources developed for materials science.

How to apply
1. Find an IMR local contact (information of centers/divisions/groups, see P10-15)
2. Select one of centers or divisions/groups as the place to do research
3. Get an user ID at GIMRT user system
4. Submit a basic proposal at GIMRT user system. The contents of proposals are different for different programs. For the dead line of application, see P8.

What will be supported (upper limit depends on the review scoring)
1. Travel expenses of the proposer and collaborators to come to IMR
2. Domestic travel expense for visiting non-TU collaborators to perform complemental collaborating research as long as it is short.

*If the period of other business is short, a part of the outgoing flight may be covered.
## Bridge Proposal - International Multi-core Research Collaboration

<table>
<thead>
<tr>
<th>Type of Collaboration</th>
<th>Proposal Form</th>
<th>Necessary Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visit non-TU Collaborator for short discussion etc.</td>
<td>Basic Proposal</td>
<td>Write plan, necessity and travel cost. Add non-TU host as collaborator</td>
</tr>
<tr>
<td>Invite non-TU Collaborator to IMR</td>
<td>Basic Proposal Bridge Domestic</td>
<td>Write plan, necessity and travel cost. Add a non-TU researcher as co-PI</td>
</tr>
<tr>
<td>Conduct Research at IMR and non-TU institute and invite non-TU Collaborator to non-TU institute</td>
<td>Basic Proposal Bridge Domestic</td>
<td>Write plan, necessity and travel cost. Add a non-TU researcher as co-PI</td>
</tr>
<tr>
<td>Conduct Research at non-TU institute by using an instrument partly operated by IMR. Ask to send supporting stuff.</td>
<td>Basic Proposal Bridge Domestic</td>
<td>Write plan, necessity and travel cost. Add the supporting stuff as collaborator.</td>
</tr>
<tr>
<td>Bridge Research at Overseas Institute</td>
<td>Basic Proposal Bridge Oversea</td>
<td>*Combination of Type S and Type O Write plan, necessity and travel cost.</td>
</tr>
<tr>
<td>Conduct Special Designated Research at Overseas Institute</td>
<td>Basic Proposal Bridge Special</td>
<td>Write plan and necessity Add an overseas host as co-PI</td>
</tr>
<tr>
<td>Visit Overseas Institute for Research Collaboration</td>
<td>Type O Proposal</td>
<td>Write plan, necessity and travel cost, also, how applicant develops carrier.</td>
</tr>
</tbody>
</table>
## Supports and conditions of Programs

<table>
<thead>
<tr>
<th>Type</th>
<th>Period</th>
<th>Support</th>
<th>Support for multi-core collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Single Visit</td>
<td>a few weeks</td>
<td>&lt;0.5 MJPY</td>
<td>Can visit non-TU Institute with justification</td>
</tr>
<tr>
<td>Bridge Domestic</td>
<td>a few weeks</td>
<td>Add &lt;0.1 MJPY/each</td>
<td>For Japanese participating at IMR</td>
</tr>
<tr>
<td></td>
<td>a few weeks</td>
<td>Add&lt;0.1 MJPY/each</td>
<td>For Japanese participating at non-TU institute</td>
</tr>
<tr>
<td>Bridge Overseas</td>
<td>a few weeks</td>
<td>Add&lt;0.5 MJPY/each</td>
<td>Combining single visit and overseas research</td>
</tr>
<tr>
<td>Bridge Special</td>
<td>a few weeks</td>
<td>Add&lt;0.5 MJPY/each</td>
<td>For special research program conducted at overseas institute such as material irradiation at foreign reactors.</td>
</tr>
<tr>
<td>Oversea Research</td>
<td>Standard &gt;2 weeks</td>
<td>&lt;0.5 MJPY</td>
<td>Support for young scientist of Japan to perform Research at Overseas Institutes</td>
</tr>
</tbody>
</table>

### Qualifications

<table>
<thead>
<tr>
<th>Visiting Guest Professor</th>
<th>1-6 months</th>
<th>standard salary relocation travel</th>
<th>Full, Assoc. and Assist. Professors and equivalent position at home institute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Fellowship</td>
<td>2 months</td>
<td>0.25 MJPY/month</td>
<td>Doctor course student. One can stay longer, but upper limit of support is 0.5 MJPY in total.</td>
</tr>
<tr>
<td>International Workshop</td>
<td>-</td>
<td>&lt;1.5 MJPY</td>
<td>Language English, Travel support of Overseas Participants</td>
</tr>
<tr>
<td>Challenging Project</td>
<td>Several weeks to 1 year</td>
<td>&lt;1 MJPY</td>
<td>For those who can visit IMR many times or can stay for longer period</td>
</tr>
<tr>
<td>Integrated Joint Project</td>
<td>Two year</td>
<td>&lt;10 MJPY</td>
<td>For outstanding research conducting by an international research team</td>
</tr>
</tbody>
</table>
How to select the best international program?

Type S can be combined with Type B or Type O.

For Overseas researchers

Research stay of a few weeks for and researchers (PhD student can be collaborator)

- Use one of facilities ⇒ Submit proposal for one of centers
- Collaborate with IMR groups ⇒ Submit proposal for RDG
  ⇒ Travel Support by Type S

- In addition, collaborating with researchers other than IMR
  - Submit Bridge Application with domestic co-PI
  ⇒ Travel Support is added for domestic collaborator by Type B

Research stay for a few month

- Doctor course student ⇒ Fellowship for Young Researcher
  ⇒ Travel and staying Support by Type F

- Researchers ⇒ Visiting Professor
  ⇒ Employment by Type G

- Conduct large scale two years collaboration
  ⇒ Integrated Joint Project Type J

For Both for Overseas and domestic researchers

- Conduct small project at IMR ⇒ Challenging Project
  ⇒ Research budget support by Type P

- Organize workshop ⇒ Collaboration with IMR members
  ⇒ International Workshop type W

For domestic researchers

- Conduct research at overseas institutes ⇒ Support for visit
  ⇒ Travel support by Type O
Application and Review Process

**Preparation**
- Discussions with collaborators and local contact

**Start**
- Single Research Visit
- Bridge Research for multi-core collaboration
- Outgoing Overseas Research Visit
- Challenging Project
- Workshop (from 2 years in advance)

**6 weeks**
- Peer review by referees including overseas researchers
- Decision of acceptance by center/program proposal committee for scientific part
- Adjustment of travel budget by GIMRT-ICC Joint Committee
- Report to GIMRT council
- Acceptance Letter, compliance document, VISA, travel plan
- Provisional time planning with local contact

**1 year**
- Research visit (proposal is valid for one year, one year delay is acceptable by request)

**3-6 month after visit**
- Submit progress report

**Finish**
- Journal publications of outcomes count for up to 3 years after the visit

**Visiting Professor**
- 8-9 weeks for approval
- +6-8 weeks for VISA

**Research Fellowship**
- 8-9 weeks for approval

**Joint Project (no call when all position is filled)**
- 8-9 weeks for acceptance
RDG: Research Divisions and Groups

Outline

IMR has 24 individual Research Divisions and Groups. Collaboration with RDG is conducted jointly by researchers outside IMR and members of each Research Division and Group. This aims to promote research utilizing novel devices, samples, research knowledge, and accumulated information possessed by each Research Division and Group.

Research Divisions and Groups in IMR

Research on each Division and Group is summarized on WEB site below.

www.imr.tohoku.ac.jp/en/about/divisions-and-centers/#research-division

Head of each Division and Group is seen in the next page.

Application

Yearly scientific proposal application for domestic user is Mid. December. Call for urgent proposal and overseas user application opens 4 times/year. About 100 proposal is accepted every year. Rejection rate is low, but research expense priority and support depends on the review score.

User Log-in Website

https://imr-kyodo.imr.tohoku.ac.jp/?lang=en

Groupe list is in the next page
### Head and Catchphrase of each Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Head and Catchphrase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prof. Bauer: Theory of Solid State Physics</strong></td>
<td>Applied Theoretical Physics - From Quantum Mechanics to Nanotechnology</td>
</tr>
<tr>
<td><strong>Prof. Nojiri: Magnetism</strong></td>
<td>Exploring Frontier of Magnetism in High Magnetic Fields</td>
</tr>
<tr>
<td><strong>Prof. Sasaki: Low Temperature Condensed State Physics</strong></td>
<td>Emergent Properties of Correlated π-electrons in Flexible Assembly of Organic Nanostructures</td>
</tr>
<tr>
<td><strong>Prof. Tsukazaki: Low Temperature Physics</strong></td>
<td>Exploration for Low Temperature Physical Phenomena at Solid Interfaces</td>
</tr>
<tr>
<td><strong>Prof. Fujita: Quantum Beam Materials Physics</strong></td>
<td>Elucidate Origins of Novel Phenomena Through Probing Structure and Dynamics</td>
</tr>
<tr>
<td><strong>Prof. Onose: Physics of Crystal Defects</strong></td>
<td>Spins Make Materials Functional</td>
</tr>
<tr>
<td><strong>Prof. Fujiwara: Crystal Physics</strong></td>
<td>Crystal Growth for the Future of the Human Being Society</td>
</tr>
<tr>
<td><strong>Prof. Sugiyama: Chemical Physics of Non-Crystalline Materials</strong></td>
<td>Inorganic Materials with Complex Structures</td>
</tr>
<tr>
<td><strong>Prof. Konno: Materials Science of Non- Stoichiometric Compounds</strong></td>
<td>Nano-Space Imaging for Structure and Properties of Metals and Oxides</td>
</tr>
<tr>
<td><strong>Prof. Miyasaka: Solid-State Metal-Complex Chemistry</strong></td>
<td>Design of Coordination Polymers Toward the On-Demand Control of Their Correlated Electrons/Spins and Chemical Reactions</td>
</tr>
<tr>
<td><strong>Prof. Uda: Crystal Chemistry</strong></td>
<td>Lead New Growth Methods with Optimizing Interfacial Energies by Applying External Fields</td>
</tr>
<tr>
<td><strong>Prof. Kubo: Materials Design by Computer Simulation</strong></td>
<td>Solution of Energy and Environmental Problems and Realization of Safe and Secure Society by Computer Simulation</td>
</tr>
<tr>
<td><strong>Prof. Aoki: Actinide Materials Science</strong></td>
<td>Heavy Fermion Physics of Actinide and Rare-Earth Compounds</td>
</tr>
<tr>
<td><strong>Prof. Nagai: Irradiation Effects in Nuclear and Their Related Materials</strong></td>
<td>Towards Revealing Irradiation-Induced Defects and Controlling Their Function</td>
</tr>
<tr>
<td><strong>Prof. Akiyama: Environmentally Robust Materials</strong></td>
<td>Elucidation of Effects of Hydrogen on Material Properties and Design of Environmentally Robust Materials</td>
</tr>
<tr>
<td><strong>Prof. Kasada: Nuclear Materials Engineering</strong></td>
<td>Materials Resistant to Extreme Environments Open the Door to the Next Generation Base Load Power Plants</td>
</tr>
<tr>
<td><strong>Prof. Furuhara: Microstructure Design of Structural Metallic Materials</strong></td>
<td>Advanced Microstructure Control for Developing New Structural Metallic Materials</td>
</tr>
<tr>
<td><strong>Prof. Takanashi: Magnetic Materials</strong></td>
<td>Materials Fabrication for Spintronics by Artificial Nanostructure Control</td>
</tr>
<tr>
<td><strong>Prof. Chiba: Deformation Processing</strong></td>
<td>Development of Highly Functional Structural Materials by Advanced Processing</td>
</tr>
<tr>
<td><strong>Prof. Kato: Non-Equilibrium Materials</strong></td>
<td>Development of New Functional Materials by Nonequilibrium Process</td>
</tr>
<tr>
<td><strong>Prof. Ichitsubo: Structure-Controlled Functional Materials</strong></td>
<td>Development of Novel Functional/Structural Materials Through Structural Control or Phase-Transformation Process</td>
</tr>
<tr>
<td><strong>Prof. Yoshikawa: Advanced Crystal Engineering</strong></td>
<td>Novel Functional Crystals, Crystal Growth Technology and Advanced Sensors for Future</td>
</tr>
<tr>
<td><strong>Prof. Orimo: Hydrogen Functional Materials</strong></td>
<td>Materials Science of “HYDRIDES” for Energy Applications</td>
</tr>
</tbody>
</table>
International Research Center for Nuclear Materials Science

Outline
International Research Center for Nuclear Materials Science (IMR-Oarai) is open for the collaborative studies on irradiated-materials and Actinoids elements from all over the world. These research fields cover fundamental studies and R&D on various materials for light water, next-generation and fusion reactors as well as on novel quantum phases in f-electron systems, nuclear fuels and wastes.

Main Facilities
- Hot-Cells for neutron irradiated materials
- Nanostructural analysis tools (TEM (JEOL ARM200F, JEOL 2100 plus), 3D-AP (CAMECA LEAP-3000XHR), Positron annihilation etc.)
- Compact-diverter plasma simulator with Ion-Gun TDS
- Tetra-arc furnace with Czochralski puller
- Top loading dilution refrigerator with He liquefier for dHvA exp.

Distinct points of IMR-Oarai
- Neutron-irradiation using BR2 in SCK/CEN
- Integrated experiments from nanostructural analysis (TEM, 3D-AP etc.) to mechanical property tests (Charpy impact, tensile, Vickers hardness, nano-indentation) for irradiated-materials
- Single crystal growth of Actinide compounds and physical property measurements

Application
- Yearly scientific proposal application for domestic user is Mid. December.
- Call for urgent proposal and overseas user application opens 4 times/year.
- About 80-90 proposal is accepted every year.

Website
http://www.imr-oarai.jp/eng/
HFLSM: High Field Laboratory for Superconducting Materials

Outline

HFLSM is the world leading laboratory for High-$T_c$ based cryogen free high field magnet technology. It was founded in 1981 for Superconducting Material for Fusion Research and reformed to be a laboratory for materials science in high magnetic field. The central subject are studies of superconducting and magnetic materials, magnet technology and material process in high magnetic fields.

Main Facilities

- 25T Cryogen free superconducting magnet
- 28T Cryogen free hybrid magnet
- 31 T Hybrid magnet

Distinct points of HFLSM

- Cryogen free magnets offers non-stopping high quality magnetic fields for users.
- Established instrumentation in various physical measurements.
- Supporting collaboration with skilled material scientists of IMR.

Application

- Yearly scientific proposal application for domestic user is Mid. December.
- Call for urgent proposal and overseas user application opens 4 times/year.
- Magnet time request is possible in every two months for approved proposal.
- About 105 proposal is accepted every year. Rejection rate is low, but magnet time priority and support depends on the review score.

Website

http://www.hflsm.imr.tohoku.ac.jp/cgi-bin/index-e.cgi
CRDAM: Cooperative Research and Development Center for Advanced Materials

Outline

CRDAM, originally founded as Laboratory for Developmental Research of Advanced Materials in 1987, is carrying world-leading materials research and providing supports in wide range of production and characterization of materials to research communities not only in Japan but worldwide.

Types of Collaborative Research

- a) Collaboration with researchers in CRDAM (including visiting professorships)
- b) Usage of the equipment installed at CRDAM

Main equipment in the supporting station

- Materials Synthesis Station - To produce various kinds of materials
- Performance Evaluation Station - To evaluate various states/properties of materials
- Crystal Making Research Station - To prepare mother alloys or single crystals

Application

- Yearly scientific proposal application for domestic user is due in Mid. December.
- An urgent proposal can be accepted by request.
- Call for overseas user application opens 4 times/year.
- About 100 proposals are accepted every year. Rejection rate is low.
- A few excellent researches are commended every year.

CCMS: Center for Computational Materials Science

Outline

CCMS is the world leading computational materials research center and it was founded in 1994 for materials design using supercomputer. Our center provides a computational resources to materials research community and promotes the development of the software for supercomputer as well as its application to materials science.

Main Facilities

1. Supercomputer (Large-Scale Parallel Computing Server)
   Model: Cray XC50-LC
   320 nodes, 0.91 PFLOPS, 219.8 TiB memory
2. Supercomputer (Accelerator Server)
   Model: Cray CS-Storm 500GT
   29 nodes, 2.12 PFLOPS, 21.8 TiB memory
3. Parallel Computing & Informatics Server
   Model: HPE ProLiant DL 360
   29 nodes, 0.1 PFLOPS, 16.3 TiB memory

Application

✓ Yearly scientific proposal application for domestic user is Mid. December.
✓ An urgent proposal can be accepted each time by request.
✓ About 30 proposals are accepted every year. Rejection rate is low, but the allocation of time-node amount depends on the review score.

Website

https://www.sc.imr.tohoku.ac.jp/eng/index.html
CNSAM: Center of Neutron Science for Advanced Materials

Outline
CNSAM operates three neutron spectrometers in a research reactor facility JRR-3 under a general user program, and a state-of-the-art polarized neutron spectrometer at J-PARC/MLF. By utilizing the unique platform of the neutron instruments, our center aims at contributing to the development of materials science and neutron science.

Main Facilities
- Polarization Analysis Neutron Spectrometer (POLANO, TOPAN)
- High Efficiency and High Resolution Measurements (HERMES)
- Advanced Triple-Axis Neutron Spectrometer (AKANE)

Distinct points of CNSAM
- Structural analysis of functional materials including light elements.
- Integrated experiments of dynamical properties such as magnon, phonon and composite excitations in various systems.
- Multi-scale structure and dynamics in inhomogeneous systems

Application
- Yearly scientific proposal application for domestic user is Mid. December.
- Call for urgent proposal and overseas user application opens 4 times/year.
- We will newly start above user programs from FY 2019.
- The number of users for instruments at JRR-3 every year was total 200 individuals from 70 groups. (Statics before the earthquake 2011)

Website
http://www.imr.tohoku.ac.jp/en/about/divisions-and-centers/research-centers/02.html
The International Collaboration Center, abbreviated as ICC-IMR, was founded in April, 2008. The ICC-IMR promotes international collaboration in materials science. Its activities are coordinated with the National Joint Usage / Research Center System conducted by the research divisions and centers of the IMR. The ICC-IMR aims at creating a worldwide community of materials science researchers and contributing to educating young researchers in becoming world-leaders in their fields. The ICC-IMR is a gateway to facilitate diverse collaborations between international researchers and the scientific staff of the IMR. The ICC-IMR coordinates six different programs:

**ICC-IMR Programs**

1. **Visiting Professorships**
2. **International Workshops for exchange between IMR and other institutes**
3. **Integrated Project Research**
4. **Fellowship for Young Researchers and PhD Students**
5. **Material Transfer Program**

Note Short Single Research Visits is merged to the program of centers and laboratories

**Application**

Applicant groups should be organized by both faculty members of this institute and researchers from foreign research or educational organizations (industrial and commercial organization are not eligible). General technical staff or graduate students can be involved as investigators in each group. Staff inside Japan should follow the bases of the inter-university collaboration research program.

Application Period: 4 times a year
【Integrated Project Research】
Teams containing Japanese and foreign researchers, conducting joint research on development of material science are eligible for application. Applications should be represented by foreigner researchers. Accepted application will be granted total budget of 3 ~10 million JPY, this budget can be used for inviting foreign researchers, providing research equipment, consumption or travel expenses of researchers of this institute involved in the joint research and can be extended for 2 years. Project should be focused on international collaboration. 1~2 projects will be granted each year.

【Visiting Professorships】
Individuals staying for longer than a month can apply for a visiting professorship. Successful applicants are employed as formal visiting professors of IMR. Supporting period depends on score and application numbers. Qualifications: University professors, associate professors, lecturers or equivalent, foreign researchers. In addition to continuous stay type, there is a part-time staying type. In the latter, one can split the stay in several ones.

【International Workshops】
International workshops based on this institute can be held to promote international research on material science. Faculty members of this institute should represent applications and board members of the workshop should contain foreign researchers. Total amount of 1.5 million JPY can be spent on travel expenses of invited guests. It is preferred that each workshop be held in collaboration by other sponsors.

【Fellowships for Young Researchers】
Fellowship program sponsors foreign young researchers and PhD students in order to promote international collaborative research with and at the IMR by up to 200,000 JPY a month for a maximum of two months. This program does not apply to short stays for attending International Conferences. The application should be submitted by the young researcher’s supervising faculty member, who also acts as referee. The young researcher should be dispatched at the referee’s request.