



## **An international research program in Quantum Materials & Devices for undergraduate students, graduate students, and postdocs**

### **Program Description**

Global Quantum Leap (GQL), funded under the National Science Foundation AccelNet program, seeks to advance the state of **quantum information technology** by forging linkages between international research networks on quantum computing and nanoscale science and engineering. GQL has established linkages to quantum and nanofabrication networks in both Asia and Europe. GQL activities focus on promoting collaborative research and on various training activities for young researchers.

One of our first programs is our **International Research and Training Experience (IRTE)**. This is a summer, 10-week-long, structured research experience for selected undergraduates, graduate students, and postdocs with one of our international partners. This is a cohort program; a small group of participants will travel together to one site, working on separate but related projects, and support each other in this technical and cultural adventure. IRTE is built on a similar program for undergraduates that has been conducted for over 10 years within the National Nanotechnology Coordinated Infrastructure (NNCI).

We will begin in Summer 2022 with a group to the **National Institute for Materials Science (NIMS)** in Tsukuba, Japan. NIMS is the largest research center for Materials Science in Japan, with a broad technical program spanning structural materials, electronic materials, biotechnology, and chemistry. Tsukuba, located about 50 km north of Tokyo, is the “Science City” where most of Japan’s national laboratories are located. NIMS has world-class facilities for materials research.

Each participant will undertake a separate independent research project as part of the NIMS research program, under the direction of a NIMS senior scientist, but typically working closely with a graduate student or postdoc. It is thus very much like an international version of an NSF research experience for undergraduates (REU) program.



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**GLOBAL QUANTUM LEAP**  
International Research and Training  
Experience (IRTE)

This program is open to **advanced undergraduate, graduate students, and postdocs** with interest/experience in Materials and Devices for Quantum Information Systems. We expect there will be a broad selection of quantum materials projects to choose from.

Applications will be **available here in October 2021** with participant selections made by December 2021. Applicants will be able to view available projects, rank order them according to interest, and apply via a simple application. We anticipate selecting a cohort of 6-8 students for this program. We believe that a diverse cohort of participants, including students at various levels of education and ability, will enhance the effectiveness of the program. We thus welcome all applications. When applications open, additional information on available projects will be posted on the GQL website. Notice will be posted widely including on social media and email lists. This program covers only assigned projects at NIMS. Individual “ad-hoc” projects for graduate students and postdocs can be arranged with specific research groups in all our partner networks in Japan and Europe. Announcements for such ad-hoc projects will also be posted on the GQL website. In Summer 2023, we look forward to expanding this program to include our European partners.

**Undergraduates should have prior research experience (e.g. REU) and an interest in quantum information systems and devices in order to participate in the program.**

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## FAQs

**What is NIMS like?** NIMS is a major national laboratory, with over 1500 employees across three sites within Tsukuba. It is a world-class research facility. Operationally, it feels very “academic-like”. Each senior scientist oversees a research group of a dozen or so junior researchers, postdocs, and graduate students (many senior scientists have joint academic appointments elsewhere). The atmosphere is fairly informal.

**What about housing?** Because of the large number of government research centers and visiting scientists in Tsukuba, the Japanese government provides excellent housing. Participants will stay in single or double-occupancy apartments at Ninomiya House, only a few hundred yards from the main NIMS site. Housing will be paid for directly by the program.

**What about travel to Japan?** We expect the group will travel together to Tsukuba, typically in late May. The group will be accompanied by an NNCI staff member who will return to the U.S. after a week. The program will book and pay for travel directly.

**What preparation will I receive prior to the program?** GQL will develop a series of webinars, video calls, and interactive exercises during the spring to assure that participants are well prepared for their adventure and prepared to get the most out of their intercultural experience. Participation (a few hours a month) will be required.

**But I don't speak Japanese!** Fortunately for us, English is the common language of science throughout most of the world. Almost all senior scientists at NIMS speak excellent English. Many groups are multinational with participants from throughout Asia and Europe. English is often the only common language within a research group. We have found that language is not a barrier to research or socialization.

**What about COVID?** COVID is obviously the big variable. Similar programs in Japan were canceled in both 2020 and 2021. With the advent of vaccines, we are on our way out of the crisis. But time will tell. We will continually evaluate the situation and will change course as necessary to conduct an effective but safe program.



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**Can I visit other parts of Japan?** Our partners in Japan are proud of their country and culture and encourage exploration. You are expected at NIMS, 5 days a week M-F, but you will be free to travel on weekends and holidays. Japan has an amazing public transit system that will take you to most places in Japan in less than 5 hours. You could spend every weekend exploring Tokyo or explore a different prefecture every weekend, and still be back in Tsukuba by Monday morning! We may also arrange group “field trips” to other universities and research facilities.

**What is the schedule?** The program will last ~10 weeks, typically from the last week in May to mid-August.

**I am a graduate student. Do I need my thesis advisor’s approval?** Yes! (see below). We believe this program will provide the skills and connections; and international experience. We hope that your faculty advisor will agree that it can be an important skill and career-building experience. For graduate students with an interest in this program, your FIRST reaction should be to sell it to your thesis advisor whose approval will be critical to your participation.

### What about a stipend?

**Undergraduates:** In addition to travel and housing payment, the program will pay undergraduate participants a generous stipend (details to follow, but similar to REU programs).

**Graduated seniors who are accepted to graduate school but have not yet begun:** Same as above (undergraduates). Graduated seniors who will not enroll in graduate school in the fall are not eligible.

**Graduate Students:** The program will pay for the house and travel only. With the expectation that you will be assigned to a project related to your thesis project, that the experience will benefit your research project and career, and that collaboration may evolve from this interaction, **we would expect that you would continue to be paid by your university on your research assistantship/fellowship.** Your advisor would need to affirm this arrangement when recommending you. Additional approval may be necessary for NSF fellowships and other non-university fellowships.

**Faculty:** We will entertain applications from faculty to travel with the team to NIMS for the purposes of exploring collaboration opportunities. Travel and housing only provided. Please send us an e-mail for additional information.



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## GLOBAL QUANTUM LEAP

International Research and Training  
Experience (IRTE)

**What about food?** Interesting food is an enjoyable part of the adventure and an important part of socialization. Your apartment will have a simple kitchen, there is a cafeteria at NIMS where most people eat lunch, and there are many options for dinner. Just be flexible. Most food is reasonably priced. You won't find any big cuts of meat. On the other hand, it is difficult to be a strict vegetarian in Japan unless you prepare your own.

**What can I accomplish, scientifically, in 10 weeks?** We, as well as your hosts, have considerable experience in "right-sizing" projects for the 10-week period. You will have a distinct part of an ongoing research project where you can make an individual intellectual contribution. This program is built on a previous undergraduate program through the NNCI in which 81 projects over 12 years produced approximately 30 co-authored publications.

**What are the passport/visa requirements?** Participants are expected to ensure they have the proper passports and visa in order to participate. Please make sure to arrange to have your documents early!

**Can I participate remotely?** No, this is an in-person, hands-on research experience, and so travel to NIMS will be required to participate.



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