



NanoJapan 2013 students and Junichiro Kono (green shirt, front row) participating in a Taiko drumming workshop during the three-week orientation program in Tokyo.

Courtesy of the NanoJapan Program

EDUCATION

NanoJapan: An International Research Experience

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Fostering international research skills among the next generation of nanoscience researchers.

Science and engineering research increasingly rests on international collaboration, yet few U.S. undergraduates participate in international experiences. In 2011 and 2012, only 3.9 percent of U.S. students who studied abroad majored in engineering, 8.6 percent in the physical and life sciences, and 1.7 percent in mathematics and computer science. The NanoJapan Program was developed to address this situation. By training students in cutting-edge research in optics, photonics and materials for 12 weeks in Japan, NanoJapan aims to increase the number of U.S. students who pursue graduate study and who are prepared to effectively collaborate as part of international research teams.

Program development and design

NanoJapan is an educational initiative of a U.S. National Science Foundation Partnerships for International Research and Education (PIRE) grant awarded to Rice University. We collaborate with five U.S. universities and Japanese laboratories in optics, photonics and materials. The grant was awarded in 2006 and received a five-year renewal in 2010, allowing us to establish long-term research partnerships that build upon existing relationships and foster new ones in the area of terahertz studies of nanostructures.

The program introduces students to international research early, in hopes that the experience will shape their future academic and career choices. The program

begins with a three-week orientation in Tokyo that combines language instruction, an orientation to Japanese life and culture, and seminars by prominent researchers. Students are then integrated into an existing PIRE team, advised by one Japanese and one U.S. professor. The capstone experience is presenting a research poster at the Rice Quantum Institute Summer Colloquium.

In the first five years, Junichiro Kono, the PIRE principal investigator, served as the U.S. co-advisor to all NanoJapan students. While this arrangement helped ensure a solid foundation for the program, other PIRE researchers expressed interest in working more closely with NanoJapan students.

In the sixth year, we started pairing each student with a Japanese professor and a U.S. co-advisor. The U.S. co-advisor counsels the student not only on the research project but also the culture of the host lab. This model strengthened integration into the ongoing PIRE international research projects, allowed for more personalized advising and broadened the student's network to include both Japanese and U.S. researchers. The international co-advising model could be extended to domestic research experiences by providing opportunities for students working in U.S. labs to be co-advised by an international collaborator working on their research project.

Participants and impact

According to program outcomes, students identified three major themes regarding the impact of NanoJapan: enhancing confidence as a researcher; a better understanding of what graduate study and research is like; and developing a network of U.S. and Japanese researchers and student peers.

Japanese professors also report that the U.S. students' enthusiasm and motivation for research positively impacts the lab. Prof. Masayoshi Tonouchi of Osaka University shared, "[The NanoJapan students] never hesitate to ask questions to our colleagues. Seeing these good attitudes, our Japanese students also get more active, and even

change their attitudes for their research in a good way. This is definitely a big benefit for our laboratory."

Since 2006, Japanese labs have sent many students to the U.S. PIRE labs for short-term internships. This structure proved invaluable when the 11 March 2011 tsunami forced us to reverse the program design and bring 14 U.S. and 25 Japanese students to the U.S. for the '2011 Reverse NanoJapan.' Rice University's research facilities were made available to the Japanese students whose research had been suspended due to energy shortages and, at the same time, the U.S. students were still able to work side-by-side with Japanese students.

The road ahead

NanoJapan is funded through 2015. We continue to seek ways to sustain the program, while exploring opportunities for similar collaborations in France and Germany. We are awaiting the release of the next NSF PIRE call, and plan to submit a proposal for continued funding. We are also seeking alternative funding sources, including corporate or foundation support, and will explore the option of running NanoJapan as a traditional faculty-led study-abroad program.

NanoJapan has shown that providing undergraduate students with access to cutting-edge international research collaborations can foster students' interest in graduate study and desire to remain internationally engaged. We look forward to seeing where this experience will take our alumni in future. [OPN](#)

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Courtesy of the NanoJapan Program

Members of Prof. Satoshi Kawata's lab at Osaka University welcome Rutgers University Student Preeya Kuray.



NANOJAPAN BY NUMBERS

OUR STUDENTS:

130 students have enrolled from **42** universities since 2006

35% of students are women

15% of students represent diverse ethnic groups

OUR ALUMNI:

75% are pursuing or have earned a STEM graduate degree

11 received NSF Graduate Research Fellowships

4 received Goldwater Scholarships

1 received a Churchill Scholarship

1 received a Hertz Fellowship