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Volume 86, Number 44  
pp. 57-60**Employment Outlook****International Internships****Research opportunities abroad offer students unique opportunities for career development, personal growth, and intercultural exchange**[Kenneth J. Moore](#)

**INCORPORATING** an internship into a student's educational program isn't a new idea, but international internships have been few and far between. Cheryl A. Matherly, associate dean for global education at the University of Tulsa, says that many science students write off going abroad because they think that they won't be able to find the time. Chemistry and engineering students do, however, have opportunities to gain international experiences, which are increasingly important in the workplace as the chemical industry becomes more globalized.



Benjamin Lu

Getting Oriented During orientation, NanoJapan participants traveled to Mount Nantai, in Nikko. From left, Raj, O'Connell, Amal El-Ghazaly, Andrea Barrett, Daryl Spencer Jr., Tiffany Kuo, Tolulope Ogubekun, Shiv Gaglani, Norman Pai, and Keiko Packard, the culture instructor for the orientation.

This past summer's NanoJapan had 80 applicants from universities across the U.S., but only 16 students were selected for the program. "We are looking for students with a strong interest in a relatively narrow field of research"—carbon nanotubes, nanoscale semiconductor devices, and nanophotonics—says Sarah R. Phillips, the co-PI on the grant who deals with recruitment, applications, and program planning for NanoJapan. "We are also looking for students with a strong interest in Japan, living there and learning the culture and language," she says.

"The grant funding required a heavy educational component and a strong commitment to international science to develop globally savvy scientists and engineers," Matherly says. NanoJapan requires a three-week orientation in Tokyo that includes an introduction to nanotechnology. "Students have varying levels of experience in courses and research, and for many this is their first opportunity to study nanotechnology," Phillips says.

**THE FIRST TIME** in a research environment might be difficult for some students, but moving to a country in which English is not the primary language can be much harder. English is spoken in the more than a dozen participating university labs that host the students, Matherly says. And the NanoJapan program includes Japanese culture and language courses during orientation to aid interns in their work and personal lives while they are in Japan. However, NanoJapan participant Christopher O'Connell, a mechanical engineering student at the University of Rhode Island who studied ink-jet printing of carbon nanomaterials at Tohoku University, in Sendai, says even his prior two years of Japanese courses were "not nearly enough for fluent conversation. But the challenge of the language barrier made the experience more exciting."

According to students C&EN interviewed, the cultural and educational challenges posed by international experiences gave them a sense of personal accomplishment and independence and helped them plan their career paths. Employers say they value students' ability to survive and thrive in challenging situations such as adjusting to life in a foreign country.

During an internship abroad, students have to be more self-reliant than those who are merely studying abroad, Matherly says. When "studying, you have all the cultural challenges, but you know how to be a student. When interning, you have to be a scientist, and you have to cook for yourself and wash your clothes but also do this in a place where you can't read the names on the bottles to figure out what goes in the washing machine."

Matherly is a co-principal investigator (co-PI) on the National Science Foundation grant that funds [Rice University's NanoJapan program](#) and was previously director of Rice's Career & International Education center before moving to Tulsa. The three-year-old program offers a 10-week research experience in Japan to first- and second-year undergraduate engineering students. The program includes culture and language courses in addition to academic research.

"There are few programs for freshmen and sophomore science and engineering students," Matherly says, "and there are few programs to attract them to graduate studies in physical sciences." NanoJapan specifically targets students who are interested in nanotechnology, she says, "to give them a meaningful and substantial research experience and to do it at a time when they still have an opportunity to do something about it—select courses, have more research experiences, or study a language. We built the program as a career catalyst."

**"U.S. participants, without exception, have considered this the experience of a lifetime."**



Courtesy of Marguerite Desko  
Eye-Opener Desko, pictured here at Wat Arun, in Bangkok, Thailand, gained insight into the country's culture during her IREU.

"The difficulty in communicating is what I missed the most" after returning from Japan, says NanoJapan participant Aanchal Raj, a second-year electrical and computer engineering student at Carnegie Mellon University who studied quantum tunneling in nanomagnets at Tohoku. "It was a fun challenge." For her, the language barrier and cultural differences allowed her to understand the difficulties foreign students face in the U.S.

Many students express that same sentiment, Matherly says. "The students remember what a fish out of water they felt like when they arrived," she says, and so they are more sensitive to the experience of foreign students.

One of Raj's main reasons for applying for a NanoJapan internship was the international aspect of the research experience. "To be a leader in science requires much more than just technical expertise," she says. "It requires entrepreneurship and skills in leadership, communication, and, most of all, cultural awareness with the ever-increasing global collaboration. And that's what NanoJapan offers."

Indeed, global collaboration is the goal of the German Academic Exchange Service's (DAAD's) Research Internships in Science & Engineering (RISE) and RISE Professional programs. The RISE program brings Canadian and American undergraduate science and engineering students to German university labs to do research with a doctoral student adviser. And the RISE Professional program places recent bachelor's graduates and current master's and Ph.D. students at research facilities within German chemical companies such as BASF. Each research experience is conducted in English, lasts about three months, and includes a stipend for living expenses. This past summer, DAAD initiated a pilot language grant program for a number of its RISE students to take German-language courses before starting their internships.

Funded by a variety of government sources, DAAD offers many opportunities for educational exchange to and from Germany. The RISE programs were created to help balance the exchange figures, says Martina Ludwig, whose role in the North American department at DAAD's headquarters, in Bonn, includes working with RISE program participants.

Since the initiation of RISE in 2004, the number of applications has increased dramatically, says Peter Kerrigan, deputy director of DAAD's office in New York City. "RISE is probably the most popular of our grant programs," he says. Students at the RISE Professional level have many choices for practical research experiences, he adds. "Our goal is to make this the most attractive option for practical experience," he says.

RISE was certainly attractive enough to turn heads at NSF and the American Chemical Society. NSF was interested in establishing a multisite International Research Experience for Undergraduates (IREU) program that would send U.S. students abroad and bring foreign students to the U.S., ACS Committee on International Activities Chair Nina I. McClelland says. "Both the U.S. and Europe are suffering from the same syndrome: Only a small number of university-bound students are electing careers in science. The prospect to promote international collaborations is very appealing to all ends," she says.



Courtesy of Aanchal Raj  
Mountaineers Raj climbed Mount Fuji at night with other NanoJapan participants. During their descent, they walked down through the clouds.

When Christian Schaffer, director of the RISE programs, attended the 2006 ACS fall national meeting in San Francisco, the idea for an ACS/NSF/DAAD collaboration was presented to him, McClelland says. The pilot program ran in the summer of 2007, with 10 students from the U.S. and 10 students from Germany (C&EN, April 23, 2007, page 62).

"THE SUCCESS of the program led to its expansion," McClelland says. With reciprocity from DAAD, NSF provided three more years of funding for 2008–10. For this past summer, the program also received funding from the German Chemical Society and the European Chemistry Thematic Network. The extra funding allowed 15 U.S. students to travel to Germany this summer, and an additional three U.S. students went to schools elsewhere in Europe: one each to the University of Strathclyde, in Scotland; the University of Perugia, in Italy; and CPE Lyon, in France. Eighteen European students express placed at universities in the U.S., as well. Most students presented their summer research at the recent fall ACS national meeting in Philadelphia.

"Feedback from participants, organizations, and advisers has been overwhelmingly positive," McClelland says. "U.S. participants, without exception, have considered this the experience of a lifetime."

DAAD's Ludwig says most other RISE students express the same thing. "Feedback has been very enthusiastic so far," she says.

Solongo H. Wilson, who participated in the first year of the RISE Professional program in 2007 after receiving a bachelor's degree in chemistry from the University of Toronto, says she loved her experience that summer. "I knew doing research in academia was not for me because I need to see a result in a short period of time," she says.

Studying water saturation behavior of industrial oils for Hydac International, in Sulzbach, Germany, she had to deal with customers and run experiments on a deadline. "It's not like writing a report for school," she says. "It's a big step from theoretical chemistry."

After her 2007 internship, Wilson returned to Canada but kept in touch with her coworkers at Hydac. Her Hydac adviser eventually offered her a position, and she returned to Germany to start a two-year contract that began in January.

Like Wilson, some students use such internships as a way to get their foot in the door of a specific company, and the companies welcome that tactic as prerecruitment. "BASF's strategy is to form the best team in industry," says Dagmar Klinge, a scientist and engineer recruiter who deals with BASF's interns at the company's headquarters, in Ludwigshafen, Germany. "BASF attempts to keep in contact with excellent interns; the intent, of course, is to recruit them for BASF."

Klinge says the company has about 700 to 800 interns at its headquarters and at a nearby agricultural research facility in Limburgerhof. That is up from about 600 to 700 in 2006, and, she adds, the number is increasing. About two-thirds of the interns are science or engineering students, and 1 to 2% are from the U.S. BASF offers internships on its careers website, but it also collaborates with DAAD as part of the RISE Professional program. "We are quite pleased with RISE Professional," Klinge says. This past summer, the second summer of RISE Professional, BASF doubled the number of internships it offered to students in the program.

The nature of the project offered determines the degree level that BASF looks for, Klinge says. The company prefers master's students for its science internships, she adds, but BASF also considers undergraduates in their last year. Academic excellence is most important to the company, she says.

**WHEN STUDENTS** enter the job market, having an international research experience can tip the scales in favor of a candidate vying for a certain position, Klinge says. "Sometimes the experience to survive in a new environment is more important than the subject" the applicant researched during an internship, she says.

John Cherkauskas, vice president and director of Rhodia's Center for Research & Technology, in Bristol, Pa., agrees, saying that having international research experiences "can be the deciding factor in candidate selection," although it is just one facet in considering a candidate for a position. Rhodia looks for strong academic achievement, curiosity, and technical creativity when hiring students fresh on the job market, he says, but "a relevant scientific internship certainly helps."

"It's more important that a candidate with international exposure can convey some sense of synergy from their internship, academic training, and perhaps industrial experience," Cherkauskas says.

An internship abroad tells recruiters that you are adaptable, successful in difficult situations, and likely a good candidate for their firm. Marguerite (Meg) Desko, a recent Ph.D. graduate from Stanford University, says her IREU at Thailand's Mahidol University gave her the abilities to "communicate without language and be flexible at all times because things just never worked like they were supposed to" in Thailand. Her experiences there helped her think outside the box, she says, and now that she is looking for employment, her internship in Thailand is "an unusual experience that sticks out on your résumé; people remember you."

## Deadlines Loom

### NanoJapan

[nanojapan.rice.edu](http://nanojapan.rice.edu)  
Applications open on Nov. 15  
Deadline is Jan. 12, 2009

### RISE

[www.daad.de/rise/en](http://www.daad.de/rise/en)  
Applications open on Dec. 8  
Deadline is Jan. 31, 2009

### RISE Professional

[www.daad.de/rise-pro/en](http://www.daad.de/rise-pro/en)  
Applications opened on Nov. 1  
Deadline is Jan. 25, 2009

### ACS IREU

[www.acs.org/ireu](http://www.acs.org/ireu)  
Applications open in November 2008  
Deadline is Jan. 31 or March 1, 2009

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