



Collaboration / Zusammenarbeit

By Susan Ladika

-STEM FIELDS-

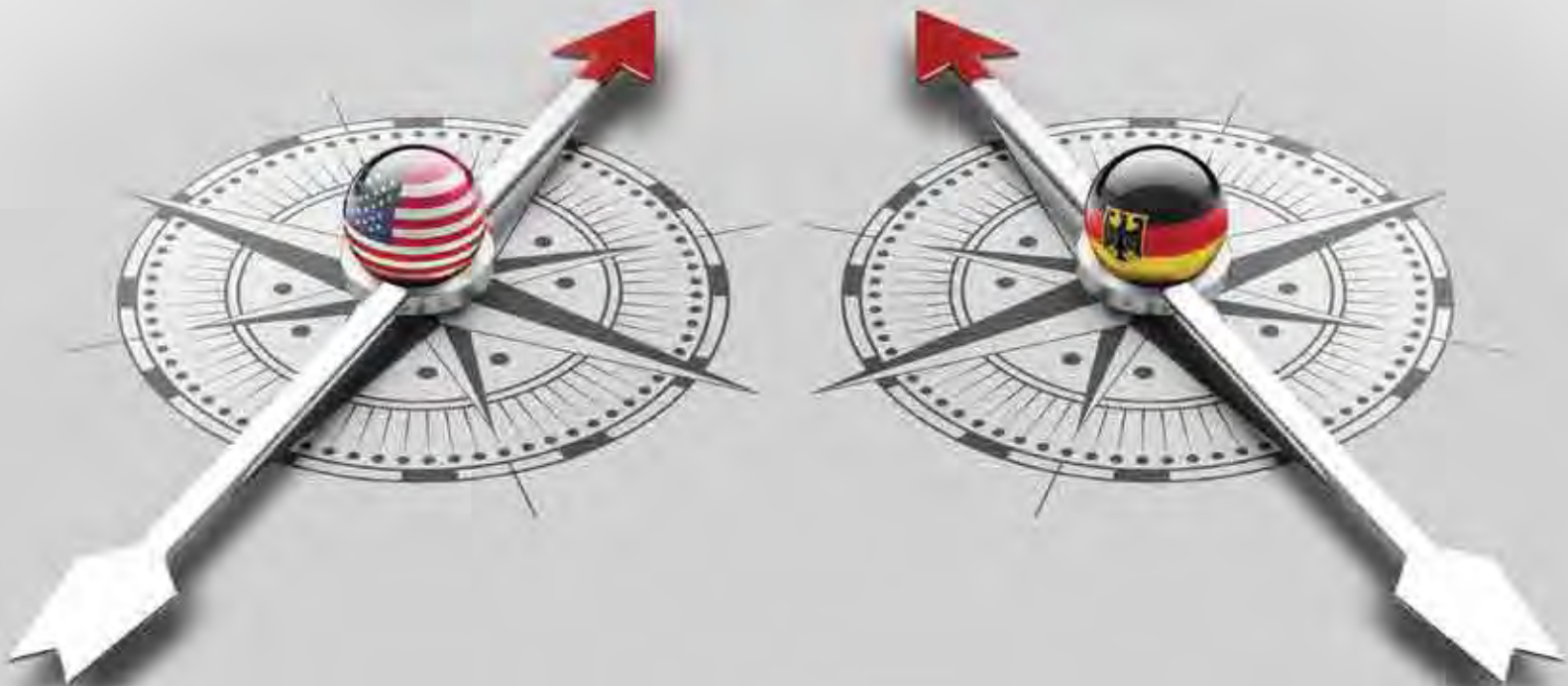


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science



technology



engineering



mathematics

Higher education institutions in the United States and Germany are teaming up to create and sustain academic partnerships in the STEM fields—science, technology, engineering, and mathematics.

WORKPLACE STRESS TAKES A TOLL ON EVERYONE. But extreme stress can cause nurses to make more errors when caring for patients. “A little bit of stress is good. It keeps people on their toes. A lot of stress becomes overwhelming. Once someone is overwhelmed with stress, their ability to make good decisions declines,” says Karen Frith, a nursing professor at the University of Alabama in Huntsville (UAH).

Now professors from UAH’s College of Nursing and from the school’s College of Engineering are teaming up with professors from the Institute of Preventive Medicine and from the Center for Life Science Automation at the University of Rostock in Germany to gauge the impact stress has on nurses.

Eventually they’d like to develop a system that gives real-time feedback to nurses to help them manage their stress levels.

The UAH and University of Rostock effort is just one of the many partnerships between U.S. and German institutions working in the STEM fields of science, technology, engineering, and mathematics. These collaborations can range from joint research projects to joint degrees as the schools work to share expertise, collaborate on projects, and expose their students to new perspectives.

By bringing together different approaches, researchers “can advance science faster because we have more minds working together,” Frith says.

UAH and the University of Rostock launched their partnership in 2010. It seemed like the perfect match as Alabama professors were studying the use of biosensors to monitor nurses and German professors were assessing the variability of stress over 24 hours, says Emil Jovanov, associate professor in UAH’s Department of Electrical and Computer Engineering.

At UAH, Jovanov has developed wearable sensors that have been used to measure nurses’ heart rate, heart rate variability, and physical activity, with data processed on a smartphone. The device continues to monitor the wearer to see how these measurements change throughout the course of the day.



Rostock researchers also are monitoring the stress levels of those in various professions, such as surgeons and high-tech laboratory technicians, Frith says.

Later this year, the two universities plan to begin a pilot program in which data gathered in Alabama will be transmitted to Rostock for analysis, using an algorithm developed in Rostock. Jovanov worked with Rostock PhD students who came to Alabama to write a common program to analyze the data, Frith says.

Although there's still a long way to go, Frith would like to ultimately see their research on stress be used to help hospitals make nurse staffing decisions, and they would like to see wearable sensors used to "monitor stress and give an alert that a nurse is beginning to need some help."

They'd also like to be able to provide real-time feedback so nurses can learn to reduce their stress levels by doing things such as taking short breaks or doing breathing exercises, Jovanov says. That could help "improve physical health and mental health and satisfaction with work."

Because there are so many areas to research, "you can't research all fields, so you find partners who do similar work," says Kerstin Thurow, director of Rostock's Center for Life Science Automation. By working together, "it's a very nice opportunity to broaden the

research horizons that you usually don't have on your own."

The collaboration also takes place on many other levels. German students have studied in Huntsville and U.S. students have done work in Rostock. Professors at both universities have coadvised on five dissertations and have done presentations together at international conferences.

As part of the collaboration, Thurow taught a graduate-level class on biosensors at UAH in the summer of 2012. "I had to learn a lot of things about how a university course works in the United States compared to Germany."

During her time in Huntsville, Thurow found that because U.S. students—unlike German students—have to pay tuition, the students in Huntsville generally have higher expectations of their professors and want more in-depth explanations than their German counterparts.

And she was surprised when UAH students requested homework—something that isn't done in Germany. She found that assigning homework gave her a good way to gauge what students understood during the lectures and what needed reinforcement.

Despite those differences between U.S. and German students, there are far more similarities. Thurow found, "students are students all over the world."

Elena Michel, a Michigan State University student, is preparing a solution in a lab at Heinrich Heine University in Düsseldorf, Germany.

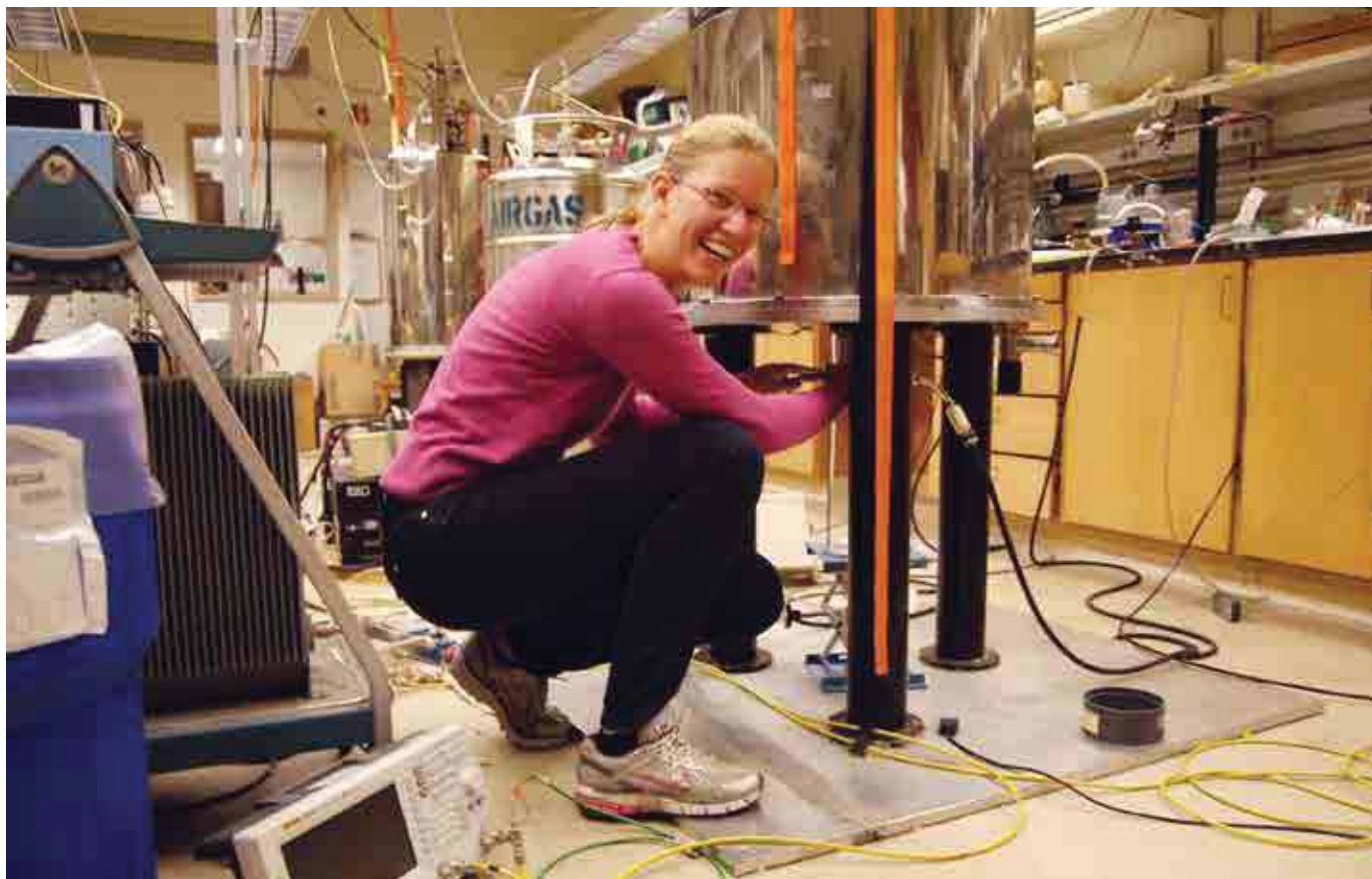


PHOTO CREDIT: HEINRICH-HEINE UNIVERSITY DÜSSELDORF



Sustaining Connections Across Disciplines and Borders

Spending time living, working, or studying in different cultures can bring huge advantages, says Jeffrey Reimer, chair of the Department of Chemical and Biomolecular Engineering at University of California, Berkeley. He took a sabbatical in Germany in the mid-2000s, and it “opened my eyes to the opportunities that happen when you’re in a different culture. The creative process is really driven by differences.”

That made him decide he wanted to be able to provide similar experiences to his students. So he jumped at the chance to join a partnership known as ACalNet, or the Aachen-California Network of Academic Exchange. The program brings together RWTH (Rheinisch-Westfaelische Technische Hochschule) Aachen University with the University of California, Berkeley, the University of California, Santa Barbara, and the University of California at Los Angeles.

Also involved are Schlumberger-Doll Research Center in Cambridge, Massachusetts, CAT Catalytic Center at RWTH Aachen, and Forschungszentrum Juelich in Juelich, Germany.

Launched last year, the program is designed to facilitate the exchange of students and researchers between the university partners, as well as the research centers, so joint research projects and

collaborations can be established. ACalNet connects the disciplines of natural science and engineering, with a focus on nuclear magnetic resonance and catalysis.

The idea was launched at RWTH Aachen, which has won attention from the Excellence Initiative, designed to promote outstanding research and improved quality at German universities. The school also has focused on “increasing international visibility and internationalization,” says Bernhard Bluemich, professor of macromolecular chemistry at RWTH Aachen.

Bluemich wanted to have the opportunity to work together with his long-term colleagues at the three California universities, with an aim toward sustained collaboration, joint publications, and obtaining research funding. The partnership is supported by DAAD, or *Deutscher Akademischer Austausch Dienst*, (the German Academic Exchange Service) through 2016.

By being able to collaborate internationally, “it really concretizes for students that science truly is an international community,” Reimer says. “The skills they learn are important and useful around the world. They can go anywhere around the world and be successful.”

Research partners were included in the program “so that students can take advantage of the opportunity to collect research experience in a commercially driven environment,” Bluemich says.

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The first student to travel from Berkeley to Aachen was Ruobing Song, who spent three months in Germany in the summer 2013. Song, a native of China, graduated in December with a degree in chemical engineering and is spending the summer at Schlumberger-Doll Research Center—an ACalNet partner—before heading to Columbia University in the fall to work on her PhD in chemical engineering.

In Aachen, Song found herself working in a group of international students from such diverse places as Africa and South America, all of whom were working on similar research involving nuclear magnetic resonance. The time in Germany allowed her to “get to know the field a little bit better.”

She believes her experience abroad helped her get the internship at Schlumberger-Doll Research Center. “All my experiences before—in Berkeley and Germany—taught me all the skills I need to work here.”

Involving Both Undergraduate and Graduate Students

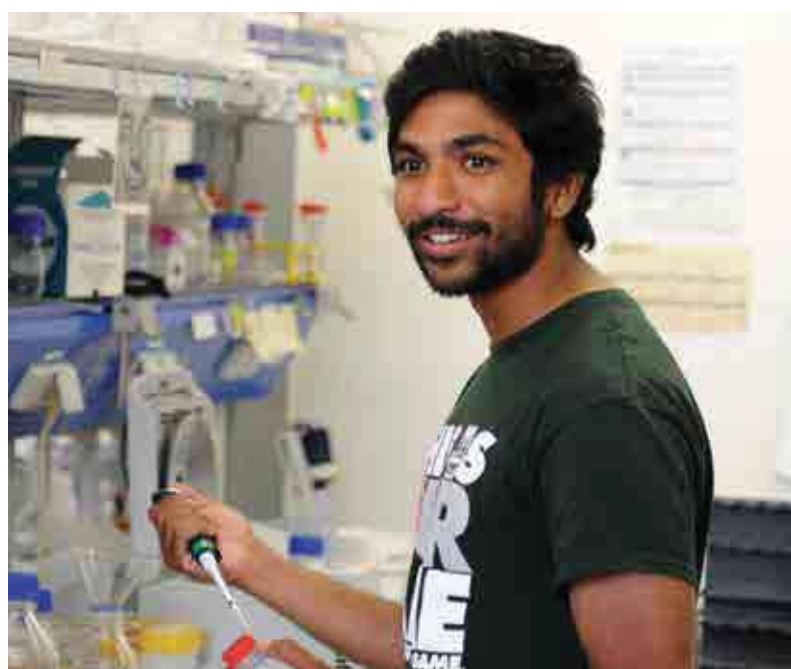
Another partnership stressing research skills is between Michigan State University (MSU) in East Lansing and Heinrich Heine University Düsseldorf (HHU). The collaboration encompasses both undergraduate and graduate students. MSU undergraduates spend 11 weeks in Düsseldorf as part of a molecular biology research internship in the summer, while HHU undergraduates attend MSU for a full academic year, taking courses, and conducting laboratory research.

Meanwhile, graduate students from both MSU and HHU spend time at plant research labs in the other country, working on topics that contribute to their doctoral theses, says Barb Sears, professor emeritus of plant biology at MSU.

The collaboration was born in 2010 after Andreas Weber, a German native who had been an associate professor in the Department of Plant Biology at MSU, was offered a position at HHU. Wanting to maintain ties with MSU, he was able to get funding through the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) for graduate-level collaboration and DAAD for undergraduate-level collaboration.

On the graduate level, the DFG “believes it’s very important for the education of German scientists that they have a more international view,” Sears says.

And students at all levels get a better understanding of the importance of lab work. Leonie-Alexa Koch, a student from HHU, studied at MSU during the school year and is staying through the summer to work on her bachelor’s thesis in a neurobiology lab. She thinks this experience will give her a leg up in the future. After she did a poster presentation at the Society of Toxicology conference this year in Phoenix, a representative from a German pharmacology firm approached her. They were impressed because “normally you don’t have that much lab experience for a bachelor’s student; normally they only look at master’s students.”



Aditya Voruganti, a Michigan State University student, is working on an experiment at Heinrich Heine University in Düsseldorf, Germany.

The experience not only hones research skills, it also helps bring students together, Sears says. While in Germany, MSU undergraduates form a tight-knit group with one another and with the German students who will be heading to MSU. They do research together and take a systems biology course together, along with socializing together and helping the other group acclimate to life in a new country. “They really form some wonderful friendships,” Sears says.

The experience also introduces German students to life on a U.S. college campus. “They feel like they have an understanding of what American culture is all about,” Sears says.

And for the U.S. students, “it helps them become better citizens of the world,” she says.

Andreas Weber, now head of the Institute for Plant Biochemistry at HHU, says through the exchange program, “you see them going out as kids and coming back as adults. They have a much better vision of what they want to achieve in their lives.”

The program also works to strengthen ties between the two schools and the students involved. “Collaboration works best if people know each other and trust each other,” Weber says.

MSU student Andrew Lapinsky spent last summer in Düsseldorf as part of the exchange program. Although the genetics major, who graduated in May, had spent two years working in a research lab before heading abroad, he gained new experiences in the German lab.

He thinks his time abroad helped make him more versatile, and he’s now beginning a job with Pfizer Inc. in the company’s genetics lab. During his time in Germany, Lapinsky learned “science is a universal thing. It can bring people together.”

Some Partnerships Offer Dual Degrees

The Fachhochschule (University of Applied Sciences) Luebeck and the Milwaukee School of Engineering have an even more intensive collaboration, with students in the International Studies Mechanical Engineering (ISM) program graduating with a dual degree from the two schools.



Students earn bachelor's of science degrees from both schools after their four years of study. Before graduating, they must complete an undergraduate thesis tied to their yearlong senior capstone project.

The schools began collaborating in 1995, first with a double degree program in electrical engineering, then in business, and the mechanical engineering program followed in 2005, says Juergen Blechschmidt, the professor who is program director for the ISM program in Luebeck.

Those who are interested enroll as mechanical engineering students, and in their second year can apply to take part in the program. They need to pass an assessment test to be admitted to the program, which is funded by DAAD.

All students study at their home university for their first two years. Their third year is spent in Luebeck, and their final year is spent in Milwaukee, where they work on their capstone project.

Through the program, students experience engineering from two country's perspectives, seeing the similarities and differences between the two, Blechschmidt says. They also experience "international cooperation between two universities as something 'normal'."

Faculty members who take part have intense discussions and share information on teaching, research, and how knowledge is transferred to industry, he says.

Maike Ketelhut, an ISM graduate from Luebeck, currently is working on her master's degree in mechatronics at the Hamburg University of Technology (Technische Universität Hamburg-Harburg).

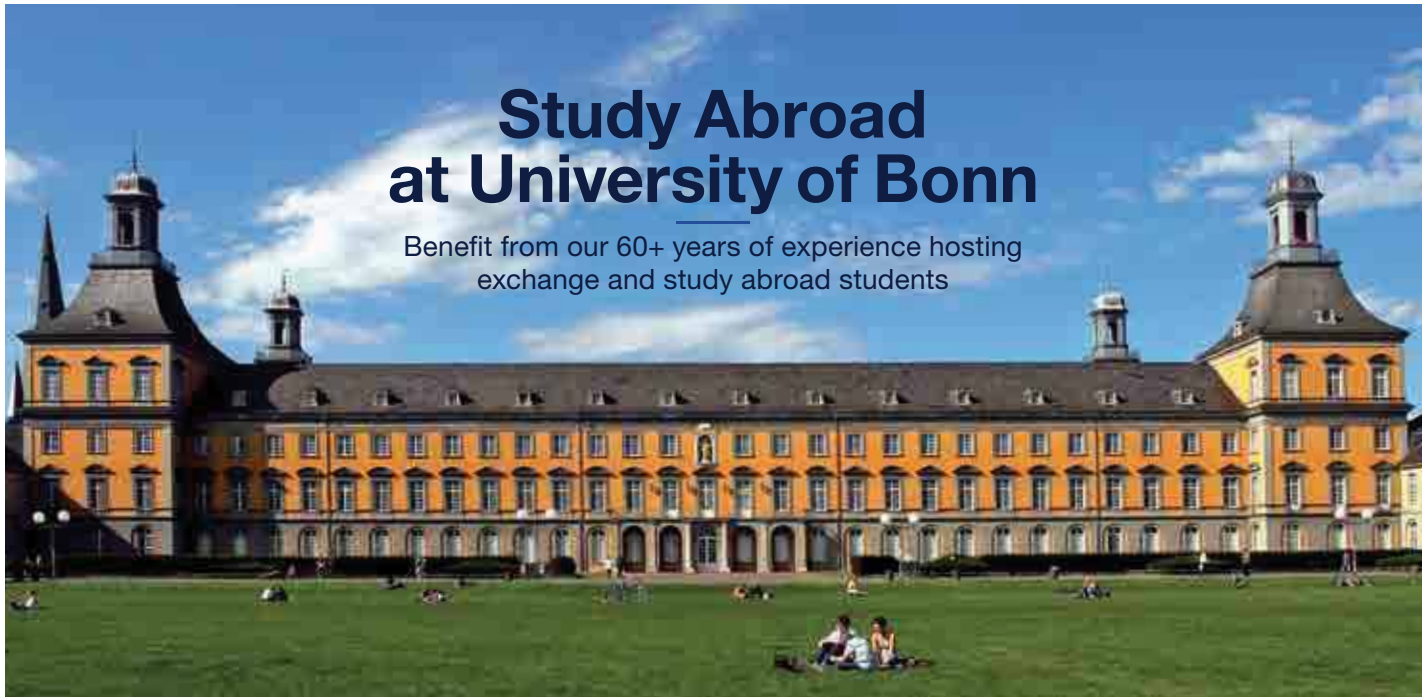
Because of her double degree, Ketelhut enrolled in an English-language master's program. By studying in English and spending time in the United States, "it shows that I'm willing to learn more about different cultures and am interested in working with an international team or in an international company."

Her time abroad also let her experience different ways of teaching and learning, and she recommends it as a way for students to "learn about a different culture and you realize many things about yourself that maybe you didn't know before."

Weber says that when students take the opportunity to study or do research abroad, "it gives you a bit more global perspective," and many of the world's problems stem from people not thinking globally. "If you have more people do this, the world would be better off."

IE

SUSAN LADIKA is a freelance writer in Tampa, Florida. Her last article for *IE* was "Women and Children First" about universities working to improve education for women and girls worldwide, which appeared in the March/April 2014 issue.



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