

ME@MSU

DEPARTMENT OF MECHANICAL ENGINEERING

ME Going Global: Opportunities Increase International Scope



Globalization is having a major impact on the engineering profession, and the Department of Mechanical Engineering in the MSU College of Engineering is keeping abreast of that trend with international opportunities for student studies and faculty research and teaching, as well as humanitarian projects that include both students and faculty.

Global Engineering Concentration

The department recently created a global engineering concentration, which allows students to broaden their experience with other cultures and simultaneously work toward their degree. "The Global Engineering Concentration in Mechanical Engineering adds a world perspective of the engineering profession to our curriculum," says Alejandro Diaz, professor and interim chair of the ME department. "The experience will make our students more competitive in the marketplace and more attractive to their future employers."

To complete a BSME with the global engineering concentration, students must complete the requirements for the BS degree in mechanical engineering, including 12 credits overseas. To date, host institutions are located in France, Taiwan, Germany, Korea, and the United Kingdom. See related article on page 7 about these institutions.

Developing a Passion for International Outlook

Students are also learning about globalization through a new course offered by the college – EGR 291, "Going Global." This course examines the intertwined roles of economics, engineering, and the environment. Ron Rosenberg, associate dean for special initiatives for the college is the instructor for the new course, which was piloted in fall 2008.

This semester, several ME students took the course as an elective. "This course really opens your eyes to what is happening around you," says Mike Duncan, an ME sophomore. "It has made me interested in areas that I would never think about before this class." The course also offers an opportunity for students to investigate international problems and make presentations. "I have always loved doing presentations even though I wasn't amazing at giving them," says ME junior DeAnna Doan. "This class has allowed me to get so much practice at talking in front of people and I am improving with each presentation I do."

International Collaborations

MSU and the College of Engineering put great emphasis on collaboration, especially for research. This involves collaboration between MSU colleges as well as collaboration with other universities across the country and around the world. The ME department has many examples of international collaborations.

Professor Ranjan Mukherjee, who received a prestigious Fulbright Scholarship in 2008, used the funding this spring by spending one semester in the Department of Mechano-Informatics at the University of Tokyo. He worked on the problems of mobile robotic solutions for wheelchair-bound residents of long-term care facilities, and impedance control of robotic manipulators. In addition, Mukherjee gave seminars at various Japanese universities, including Kyoto University, Tohoku University, and of course the University of Tokyo.

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The department is going through a period of transition. My term as interim chair began at the close of summer when Professor Eann Patterson stepped down to take over as director of the department's Composite Vehicle Research Center (CVRC). Professor Patterson made very important contributions to the department in his five-year tenure as chair, many of them chronicled in previous editions of this newsletter. He will continue to make important contributions in his new role, and I wish him and the CVRC the best and look forward to the center's continuing success.

An important focus of my work as interim chair is to look after the department while a

national search for a new department chair takes place. The search started this summer, headed by the ME Chair Search Committee under the leadership of Professor Steve Shaw. The committee was busy working through the summer, and we expect to invite the first candidates to visit the MSU campus soon. The target date for the arrival of the new department chair is fall 2010.

As a long-time member of the ME faculty, I have watched from up close how the department has developed over the past 20 years. Much has changed in this time. One particularly notable change is the significant expansion in our research portfolio, not only in size, but more crucially in its scope, becoming much more multidisciplinary in nature. While maintaining a fundamental set of core mechanical engineering research areas, our work now also reaches into new, emerging fields in biological and medical sciences, multi-scale physics and materials science, nanotechnology, and energy-related areas.

To keep up with the evolving nature of scientific discovery, our faculty has also changed, becoming much more intellectually diverse, engaging much more in multidisciplinary efforts with researchers across the university and indeed, across the nation and across the globe. It is on the strength of these connections to emerging fields in science where we can build our brightest future. The curriculum is also evolving to reflect the fast pace of changing technology and the new face of engineering in a "flat world." We offer students a broad range of opportunities to experience engineering from a global perspective, including a number of new student and research exchange programs with outstanding international universities and several humanitarian projects in developing countries, some of them featured elsewhere in this newsletter. These are times of exciting change in the department. The outlook is bright and I look forward to sharing this excitement with our new chair next year. 🌟

Alumni@ ME

MSU Alumni Association Awards



Lynn M. Bechtel, a vehicle engineer with General Motors Corporation, received the Alumni Service Award.

The MSU Alumni Association recently honored ME graduates Lynn Bechtel and Bill Demmer at the Grand Awards Ceremony in October at the Kellogg Hotel and Conference Center.

Lynn M. Bechtel (BS '91) received an **Alumni Service Award**, which is granted to alumni who demonstrate continuing volunteer service to MSU and/or meritorious public service on a local, state, national or international level.

Bechtel is a vehicle engineer at General Motors Corp. and is a team coordinator for GM university relations. She has been invaluable to the College of Engineering, serving on the advisory board of the Department of Mechanical Engineering and the college's Alumni Association Board (as chairperson from 2005 to 2008). A life member of the MSU Alumni Association, she has served in student recruitment efforts, in advisory capacities, and as a donor since 1993. She was primarily responsible for facilitating the donation of a Chevrolet Silverado that is used for towing the college's racing trailer to competitions around the country.

The **Philanthropist of the Year Award** was presented to the **Demmer Family**, including John Demmer and his late wife Marnie; son Bill Demmer (BS '70) and his wife Linda; son Ed Demmer and his wife Laura; and daughter Marguerite Demmer and her husband Bradford. The Philanthropist

Award is given to candidates who have demonstrated outstanding philanthropic responsibility towards MSU. Bill Demmer is president and CEO of DEMCO Research and Development in East Lansing.

The family collectively made a gift to name the Demmer Family Hall of History in the Skandalaris Football Center. Over their lifetime, John and Marnie supported the Mildred B. Erickson Scholarship, the Formula SAE car racing team, intercollegiate athletics, broadcasting services, and the John and Marnie Demmer Shooting Sports Education and Training Center. Bill and Linda have pledged to name a gallery in the new Eli and Edythe Broad Art Museum, a gift that is second only to the Broads' naming gift for the project. Ed and Laura have made a gift to name the head coach's office in the Duffy Daugherty Building expansion. 🌟



Scott Westerman III, president of the MSU National Alumni Board (standing in the center), presented John Demmer (seated) and his family with the Philanthropist of the Year Award. Bill and Linda Demmer are on the right; Ed and Laura Demmer are on the left.

ME Going Global (continued from page 1)

Diaz has spent time at the Technical University of Denmark (DTU), where he worked with Professor Ole Sigmund on methods for design and optimization of electromagnetic metamaterials. DTU's dean of graduate studies and international affairs, Professor Martin Bendsøe, visited MSU earlier this year to explore establishing an MSU-DTU student exchange program.

The research for international partners is ongoing. Professor Eann Patterson recently spent several days in China visiting the Institute of Aerospace Science and Technology at Shanghai Jiao Tong University, the Automotive Energy Research Center at Tsinghua University, and the Institute of Mechanics, Chinese Academy of Sciences. The purpose of the visit was to look at areas of synergy in research and to develop a framework for collaboration in the education of graduate students.

Humanitarian Projects

Humanitarian projects also enhance the globalization of the department, and no one is more passionate about these kinds of projects than ME Professor Brian Thompson. He firmly believes that engineers should be involved in sharing knowledge with others around the globe. For many years he has worked with various groups to install solar ovens in Tanzania. This past summer Thompson and ME senior Mathieu Rich from Midland, Mich., were part of an interdisciplinary MSU team involved in a community engagement program in the Peruvian Andes.

Two key projects for this program included the development and installation of a solar water heater at a hospital in Huamachuco and the creation of a domestic solar water heater that was used as a teaching aid to show families how they could create this kind of equipment in their own homes. Most homes do not have hot water for bathing and laundry and there are many water quality issues. The prototype was set up in a school for children with special needs.



Professor Craig Somerton (with hat) led a group of ME students on a humanitarian project to Guatemala.

Thompson says that the biggest challenge on this kind of project is disseminating information. "We have to get the information out into the community and show people how they can build, for example, the solar water heater," says Thompson. "The mechanical engineering part is easy."

In another humanitarian project, which began in the fall of 2008 as part of a capstone project, two teams of ME students developed a vaccine refrigerator for remote regions in developing countries. "Many of the vaccines used to control diseases require cold temperature for preservation," says ME Professor Craig Somerton, who was the faculty adviser for the project. "Current transportation and storage methods in remote regions rely on ice packs that last just a few days. In order to maintain the optimal temperature range of 2° to 8° C for vaccine preservation, these regions need reliable long-term refrigeration where electricity is not consistently available."

This spring, the second team created a design that could be easily and affordably constructed, and they built two prototypes, which were exhibited at the spring 2009 Design Day. Then, during a 13-day trip to Guatemala, the team built the refrigerator in Quetzaltenango (commonly known as Xela) with locally available materials and tested it in a real-world scenario. The final product includes a comprehensive set of instructions for building the device that is distributed online for free. ME students on the fall 2008 design team included Bo Hurles, Brian Kunkel, and Bryce Thelen. The spring 2009 team included Nabeel Aslam, Kevin McPhail, Ryan McPhee, Brent Rowland, and Eric Tingwall.

"Globalization has become part of every engineer's vocabulary," says Diaz. "Knowledge of how design, manufacturing, and marketing are accomplished by multi-cultural teams working across international boundaries is becoming an essential part of the engineering experience." 🌱

— Jane L. DePriest



Mathieu Rich (right), an ME senior, and Austin Melcher (far left), a CHEMS junior, were helped by two Peruvians in establishing a solar water heater at a hospital in the northern Andean town of Huamachuco.

Faculty and Staff @ ME

Interim Chair



Professor **Alejandro Diaz** has been appointed the interim chairperson of the Department of Mechanical Engineering. Diaz, who has a BS, MS, and PhD in aerospace engineering

from the University of Michigan, joined the ME faculty at MSU in 1986. His research interests include optimal design of structures and materials, topology optimization, and the use of finite element methods in design.

His most recent work involves the design and optimization of electromagnetic metamaterials with RF applications, vibration control and energy harvesting in flexible space structures, and the realization and applications of negative stiffness in electro-mechanical and structural systems. Diaz is a fellow of the American Society of Mechanical Engineers and vice president of the International Society for Structural and Multidisciplinary Optimization.

Director of CVRC



Professor **Eann Patterson** is now the director of the Composite Vehicle Research Center, which designs and tests composite structures for lightweight, environment-friendly,

durable, and safe vehicles. Patterson served as chair of the ME department for the past five years. He came to MSU from the University of Sheffield, England, where he was head of the Department of Mechanical Engineering. Patterson's PhD in load and stress distributions in axially loaded threaded connections is from the University of Sheffield. His research expertise includes experimental and fracture mechanics and computational biomechanics. Patterson is a fellow of the Institution of Mechanical Engineers and the Society for Experimental Mechanics.

New Faculty



David L. S. Hung recently joined the department as an associate professor in the research faculty. He earned his PhD ('98) and ME ('93) in mechanical engineering

from Carnegie Mellon University. His bachelor's degree is from Iowa State University of Science and Technology. Hung's research interest focuses on spray atomization, flow sensing diagnostics, and sustainable energy systems, including areas such as internal combustion engines, alternative power systems, and renewable fuels for vehicle and aviation applications. He is currently working on a number of government-funded research programs which aim at fostering the use of ethanol-based fuels for vehicle transportation. Before joining MSU, he held positions in the automotive industry for more than a decade where he was responsible for developing gasoline direct injection systems and optical diagnostics for in-cylinder fuel mixture preparation and combustion measurements.

Hung is active in the Society of Automotive Engineers (SAE) and the Institute of Liquid Atomization and Spray Systems (ILASS). He is leading a task force in the SAE Gasoline Fuel Injection Standards Committee that includes an industry-wide team of automotive fuel system and spray measurement experts to develop and improve new and existing engineering standards.

Promotions



Tamara Reid Bush has been appointed as an assistant professor. She is the co-principal investigator for the Advancing Diversity through Alignment of Policies and Practices

Research, which is supported by a \$3.98 million ADVANCE grant from the National Science Foundation. She is also director of the Biomechanical Design Research Laboratory, which is focused on the measurement of kinematic and kinetics to objectify human interactions with

mechanical devices. She earned her PhD and MS in mechanics at MSU, both with an emphasis in biomechanics. She is a member of the American Society of Biomechanics and the American Society of Mechanical Engineers. She enjoys activities such as water-skiing, windsurfing, and swimming, as well as photography.



Gaetano Restivo has been appointed as an assistant professor in the research faculty. He is the assistant director of the Composite Vehicle Research Center. His PhD, MS, and BS

degrees are from the University of Palermo, Italy. He also holds an MS in structural engineering from the University of California in San Diego. Restivo's research interests include experimental stress analysis, optical methods, digital photo elasticity, 3-D applications, mechanics of composite materials, and nondestructive evaluation. He likes to spend his free time traveling and visiting new places. He also enjoys swimming and listening to music (including Italian opera).

Yasundo Takahashi Education Award



Ronald C. Rosenberg, professor and associate dean for special initiatives, received the Yasundo Takahashi Education Award from the Dynamic Systems and Control Division (DSCD)

of the American Society of Mechanical Engineers. The award is given biannually to a DSCD member for either excellent sustained contributions or for an outstanding major, singular contribution to education in areas of interest to the DSCD. Rosenberg has been chair of the ME department and associate dean for research and graduate studies in the College of Engineering. He is the co-author of a research monograph, two textbooks, and the ENPORT software, all of which present engineering system dynamics from a multipoint perspective. Rosenberg recently developed a new undergraduate course – "Going Global."

ASC Fellow



Professor **Alfred Loos** was elected fellow of the American Society for Composites (ASC) at the 24th Annual Technical Conference of ASC. The conference was held in September at the University of Delaware in Newark, Del. A fellow of ASC is a distinguished member who has made genuinely outstanding contributions to the composites community through research, practice, education and/or service. Loos also is the current president of ASC. His research interests include composites, thermoplastic, and Vacuum Assisted Resin Transfer Molding (VARTM).

NSF Grant Focuses on Human Movements



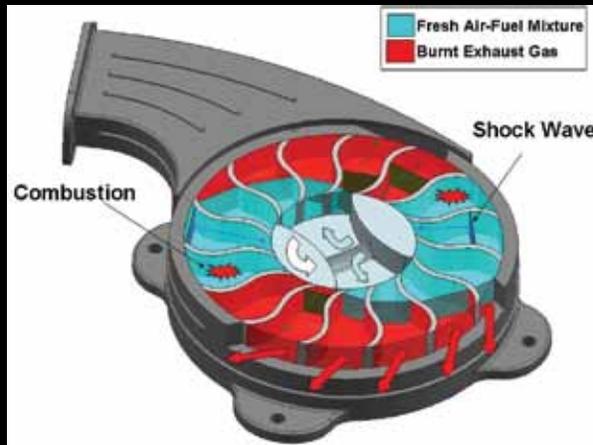
Professor **Ranjan Mukherjee** has received a grant from the National Science Foundation as part of the American Recovery and Reinvestment Act (ARRA). Focusing on human movements such as walking, running, and stair-climbing, Mukherjee's research will attempt to more fully understand the advantages of impulsive forces and apply them in bipedal locomotion and other robotic systems. His research through this grant will be funded through July 31, 2012. 🌸

DOE Awards ME \$2.5 Million to Build Advanced Hybrid Engine

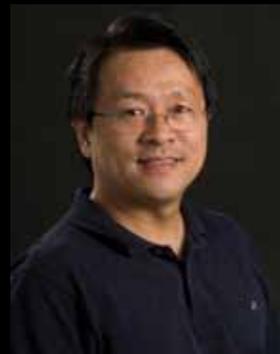
ME professors **Norbert Mueller**, **Patrick Kwon**, **Indrek Wichman**, and **Tonghun Lee**, in collaboration with electrical engineering faculty **Elias Strangas** and **Fang Peng**, are the recipients of a two-year, \$2.5 million grant from the U.S. Department of Energy's Advanced Research Projects Agency. The research team plans to begin work immediately to produce a vehicle-size engine/generator known as a wave disk generator (WDG) by building on existing modeling, analysis, and lab experimentation. The WDG would be smaller, lighter, and cheaper to produce than a traditional car engine.

"Our goal is to enable hyper-efficient hybrid vehicles to meet consumer needs for a 500-mile driving range, lower vehicle prices, full-size utility, improved highway performance, and very low operating costs," says Mueller, who is the principle investigator for the project. "The WDG also can reduce carbon dioxide emissions by as much as 95 percent in comparison to modern internal combustion vehicle engines."

To read the full story and view a video interview with Mueller, visit <http://news.msu.edu/story/7036>. 🌸



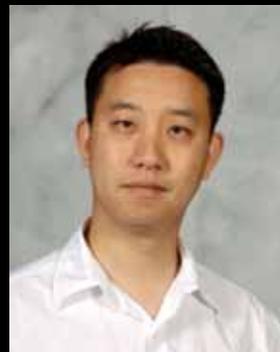
Norbert Mueller



Patrick Kwon



Indrek Wichman



Tonghun Lee

ME Graduate Student Fellowship Endowment

The increasing complexity of the world's problems as well as the improvements in the quality of life around the globe demand a level of technical expertise that more and more often goes beyond what can be accomplished with a bachelor's degree. In some countries an advanced degree for engineers is required and students are supported as they pursue advanced studies. This leaves the United States at a competitive disadvantage and at risk for missing out on the innovations and discoveries that drive economic success.

The ME department recently undertook a campaign to increase funding from alumni for its Graduate Student Fellowship Endowment. A postcard campaign highlighting the work of various graduate students was conducted this summer and a letter requesting contributions was distributed this fall. All ME alumni and other interested parties are encouraged to give as much as possible to this fund, including ongoing giving or monthly contributions.

To make contributions to this endowed program, visit www.egr.msu.edu/me/graduate/student-endowment/economy. 🌸

Students @ ME

Alumni Distinguished Scholars



Justin Mrkva

Justin Mrkva from Toledo, Ohio, and Sylvia Reiser from Albuquerque, N.M., both freshmen majoring in mechanical engineering, are among the 17 high school graduates from throughout the county who are Michigan State University's newest Alumni Distinguished Scholars (ADS). These scholarships are considered to be among the most competitive in the country and are



Sylvia Reiser

valued at about \$90,000 for in-state students and \$150,000 for out-of-state students, covering full tuition, room and board, books, and a stipend for up to eight semesters of study. These 17

students were selected from more than 1,100 high school seniors who applied to MSU and took an intensive general knowledge exam. Scholars were selected by a committee of faculty and administrators based on results of the scholarship exam, high school programs and achievements, other standardized test scores, and interviews with the finalists. All of the scholars are also members of the MSU Honors College.

Their reasons for coming to MSU are myriad for these academically talented students. "I chose MSU because of the healthy balance between undergraduate academics and the research programs," says Mrkva. For Reiser, MSU had everything she wanted in a university. "I chose MSU because it offers so many great opportunities, from academic programs to campus sports and clubs," says Reiser.

Caterpillar Scholarship

Anoosheh Niavarani, a PhD student, has been chosen by the Society of Women Engineers to receive the Caterpillar Scholarship for the 2009-



Anoosheh Niavarani

strong engineering potential.

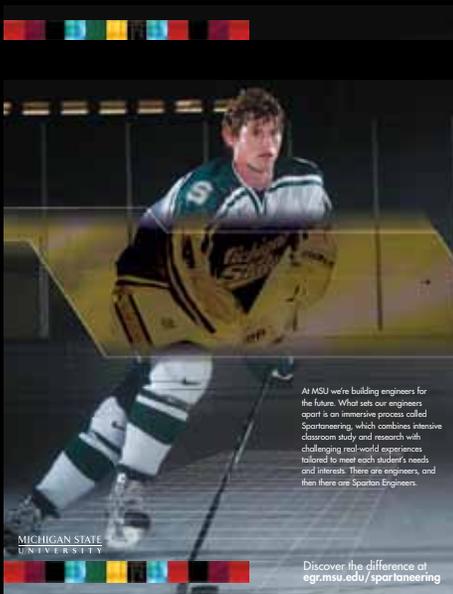
Niavarani's research focuses on slip boundary condition of nano-fluids with molecular dynamics methods in the Computational Fluid Dynamics Lab. Nikolai Priezjev is her adviser.

Solar Car Racing Team

The MSU Solar Car Racing Team is finally making progress toward its goal of racing a solar car. That goal sounds simple, but the team has struggled over the years. However, this summer the team made a great leap forward as it took a solar-powered vehicle to the Formula Sun Grand Prix in Texas. The vehicle passed various

2010 academic year. The Scholarship Selection Committee reviewed over 1,000 applications this year and selected graduate students who have demonstrated outstanding academic achievements as well as

Spartan Engineers. Built Better.



Trevor Nill, an ME sophomore from Novi, Mich., is a forward and center right wing on the MSU varsity hockey team. Nill is one of several engineering student athletes who are featured in ads developed by the college that appear in MSU sports programs. The theme of the ads is "Spartan Engineers. Built Better." The idea is to show parents, future students, alumni, and

others that engineering students can balance academics, internships, other college activities, and sports.

Nill chose engineering because he ultimately wants to help people by solving their problems. Eventually he would like to specialize in biomechanical or biomedical engineering.

This past summer Nill completed an internship at Michigan Orthopedic Services, where he helped build prostheses. "The technicians taught me a lot," says Nill. "There are so many engineering concepts that can be applied in that kind of work." He is impressed that the college puts heavy emphasis on internships and hands-on experiences to help build resumes. "You may know math and physics but you have to learn how to apply those skills outside the classroom."

His love of hockey came at an early age. He learned to skate on lakes near his home almost as soon as he could walk. The hockey interest also is spurred by the fact that his father, Jim, is the assistant general manager of the Detroit Red Wings; Jim played 10 years in the NHL. "My dad is my biggest hockey influence, as well as my idol," says Nill. "He always had good pointers for me, and he never forced me to play hockey." Sports runs in the family. Trevor's mother, Rebecca, played soccer at Lindenwood College. Nill says that the Spartan hockey team this year is young, "but we are going to give it our all, work hard, and see what comes with it."

Nill credits his parents with helping him balance a demanding academic and athletic schedule. "My parents raised me to do homework first, and then play," says Nill. "So I try to do my homework before hockey practice, then come home and relax." 🌟

scrutineering stages, but at the last stage it could not pass the dynamics scrutineering.



Photo by Kurt Stepmitz/MSU University Relations

The MSU solar car appeared in the 2009 Homecoming parade and won the “Best Group” category.

“As we were attempting the dynamics tests we encountered problems with the NGM motor controller, namely uncontrolled braking and acceleration,” says Manila Ounsombath, the business manager for the team and an ME junior. “With our best efforts to correct the problem, the team decided the car was not safe to drive the track. However, it was the first time the team had successfully built a car and taken it to a race.”

Ounsombath and others on the team are

optimistic about being able to make it to the 2010 North American Solar Challenge race this summer. “We are focusing our attention on recruitment to ensure a strong and large team for the race,” says Ounsombath. Meanwhile, the team and its solar car appeared in the 2009 MSU Homecoming parade and won the “Best Group” category.

For more information on the solar car racing team, visit <http://www.egr.msu.edu/solar>. 🌱

Universities Around the World Broaden Students’ Outlook

Korea University in Seoul is the latest university to become part of the Study Abroad for Credit program in the Department of Mechanical Engineering. That means there are now five universities offering credits to MSU mechanical engineering students that could be applied to the global engineering concentration. A brief overview of each university follows.

Korea University is one of the great private universities in Korea. It is situated in the capital, Seoul, and has many new facilities for students. Recently, Korea University has been recognized for outstanding achievement in internationalization. For instance, many classes are taught in English in the department of mechanical engineering. Jongeun Choi, ME assistant professor, coordinates the Korea University Study Abroad program.

The **University of Edinburgh** in Scotland is one of Europe’s outstanding universities with a great tradition from its establishment in 1582. Many scholars have attended the university including such giants as Charles Darwin and Sir Arthur Conan Doyle. With respect to engineering, there is William John Macquorn Rankine, who proposed the Rankine cycle (principally used in the operation of steam power plants). Even though the university has a long history, the mechanical engineering facilities are modern, allowing the faculty and students to pursue research topics varying from wave energy to

microfabrication. Gaile Griffore, ME academic specialist and adviser, coordinates the Edinburgh study abroad program.

The **National Tsing Hua University (NTHU)** in Taiwan has a long and proud history. It was originally founded as an institute focusing on nuclear science and technology. Today, NTHU is a comprehensive research university offering degree programs in science, technology, engineering, humanities and social sciences, as well as management. NTHU has been consistently ranked as one of the premier universities in Taiwan and is widely recognized as the best incubator for future leaders in industry as well as academia. It is located in Hsinchu, Taiwan, and is well connected by public transportation to Taipei about 45 miles away.

The Department of Power Mechanical Engineering (PME) offers English-based courses, such as thermal and fluid science, mechanics of materials, kinematics of machinery, manufacturing processes, electric circuits, and microelectronics. Other courses emphasize mechatronics, signal processing, nano-micro systems, energy, and precision machines. ME professor Dahsin Liu is in charge of the study abroad program at NTHU.

Ecole Catholique d’Art et Metiers (ECAM) is a school of engineering for undergraduate and graduate students with a focus on mechanical, electrical, and automation engineering. Founded

in 1900 in Reims, France, it has been established in Lyon since 1940. Students enrolled in this study abroad program will take elective courses and perform an independent research project guided by a mechanical engineering professor. Some working knowledge of French is required. Andre Benard, ME associate professor, is in charge of this program.

With 260 institutes in nine facilities, **RWTH Aachen University** in Germany is one of Europe’s leading institutions for science and research. Currently around 31,400 students are enrolled in more than 100 academic programs. Over 5,000 of them are international students hailing from 120 different countries. The scientific education students receive at RWTH Aachen is firmly rooted in real-world applications.

The MSU/RWTH-Aachen Exchange Program provides an opportunity for students to earn five credits of independent study in a German research lab, explore industrial activities, and experience German culture and lifestyle. All students must have a working knowledge of German. ME professor John Foss coordinates this program.

For more information on ME Study Abroad for Credit programs, visit www.egr.msu.edu/me/undergrad/study-abroad. 🌱

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Nabeel Aslam, part of a team of ME students involved in a humanitarian project, worked with available equipment to help produce a vaccine refrigerator for remote regions. See story on page 3.

