

# Marquette University ENGINEERING



*Discovery  
Learning*  
Winter 2003

### 3 College Overview

### 4 Discovery Learning

Mark Nagurka, Ph.D.  
Norman Kirchner, student  
Kern Family Foundation



### 6 Discovery through Research

Jack Winters, Ph.D.  
Rehabilitation Engineering Grant

### 8 Discovering Strong Partners

Sanja Micanovic, Co-op student  
Briggs & Stratton Corporation



### 10 Discovering How to Help

Daniel Zitomer, Ph.D.  
Michael May, alumnus  
Service Learning in Latin America



### 12 Discovering the Way

Nancy Mutsch, student  
Undergraduate Education Grant  
Jen Bowman, grad student  
Graduate Education Grant



### 14 Amazing Discoveries

Michael Johnson, Ph.D.  
Richard Povinelli, Ph.D.  
Undergraduate Research Training Grant

### 16 Discovering Ethos

Nicholas Nigro, Ph.D.  
Ethics for Engineers

We would appreciate your feedback about *Marquette Engineering* magazine. Please send your comments to G.E.O. Widera, Acting Dean [geo.widera@marquette.edu](mailto:geo.widera@marquette.edu) • 414-288-6720

## Marquette University College of Engineering

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Cooperative Education and  
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**Publications Committee**  
Lisa Waples, Chair  
Francis X. Jacoby  
Richard W. Marklin, Ph.D.  
Sue Michaelson  
Daniel Zitomer, Ph.D.

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Marquette University  
College of Engineering  
Olin Engineering Center  
1515 W. Wisconsin Ave  
PO Box 1881  
Milwaukee, WI 53201-1881

Phone: 414.288.7080  
Fax: 414.288.7082

[www.eng.mu.edu](http://www.eng.mu.edu)  
e-mail: [news@eng.mu.edu](mailto:news@eng.mu.edu)

**Designer/Editor**  
Andy Haas  
[www.andyhaasdesign.com](http://www.andyhaasdesign.com)  
**Photographer**  
John Nienhuis  
[www.johnnienhuis.com](http://www.johnnienhuis.com)

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*There is nothing permanent except change.*

—Heraclitus

As a nation, we were stunned by the tragedy that swallowed the seven fallen Columbia astronauts. While our grieving will continue for some time, our nation's scientists and engineering must determine what went wrong, fix it, and move on. That's what the astronauts would have wanted. Fresh on the heels of 9/11, we have experienced another life-changing event.

As engineers, we are change oriented. Change is a way of life. It's a part of our reality: problems and people change. And we now must adapt to changes, as a nation trying to detect the technological trip-up that proved fatal to Columbia.

Change also occurs within the College of Engineering. Dr. G. E. O. Widera has been appointed Acting Dean since Dean Douglas Green resigned his deanship. A national search is underway for a permanent dean. The Search Committee is chaired by Dr. Raymond Fournelle, Professor of Mechanical and Industrial Engineering, and includes two alumni representatives: Mr. Mike Farrell, President of National Engineering Advisory Council, and Mr. Tom Warden, Past President of the Engineering Alumni Association.

Dr. Widera has been at Marquette for 12 years and has held posts as Interim Dean, Senior Associate Dean and Chair and Professor of Mechanical and Industrial Engineering. Prior to joining Marquette, he served as founding head of Mechanical Engineering at the University of Illinois – Chicago. When Provost Madeline Wake announced Dr. Widera's appointment as Acting Dean, he said, "The College of Engineering is a great college and I will devote all resources and energies to maintain its high quality in the Jesuit tradition."

Engineers influence technological change and the College of Engineering is full of examples. Change occurs through the process of discovery. Quite simply, students learn best by doing. Through the generosity of the Kern Family Foundation, the College has formalized what it has been doing informally for years, namely, fostering discovery learning. Their support has enabled the College to establish a Discovery Learning Center where students can have access to the tools and resources to try out *their* engineering ideas. Some will work; some will fail. In both cases, the students will learn.

Several faculty members have attracted external grants. Dr. Jack Winters recently landed a major grant from the U.S. Department of Education to establish a Rehabilitation Engineering Research Center on Accessible Medical Instrumentation. Dr. Jon Jensen is spearheading a new grant to attract nontraditional students into engineering. Drs. Mike Johnson and Richard Povinelli recently received funding from the National Science Foundation to support the training of undergraduates in conducting research. These examples provide strong and convincing evidence that our faculty scholars are highly recognized among the most rigorous of peer reviews.

These faculty, along with their colleagues and students, will never stop trying to affect change, because, in the words of Bruce Barton, ...

*When you are through changing, you are through.*

For further information, contact G.E.O. Widera, Acting Dean  
College of Engineering • [geo.widera@marquette.edu](mailto:geo.widera@marquette.edu) • 414-288-6720

The mission of the Marquette University College of Engineering is to prepare undergraduate and graduate students for successful careers based on a strong ethical and moral foundation, to advance the state of the art in engineering, to serve the professional and technical communities and to contribute to our global society.



*What is there that confers the noblest delight? What is that which swells a man's breast with pride above that which any other experience can bring to him? **Discovery!** To know that you are walking where none others have walked; that you are beholding what human eye has not seen before; that you are breathing a virgin atmosphere. To give birth to an idea, to discover a great thought—an intellectual nugget, right under the dust of a field that many a brain-plough had gone over before. To find a new planet, to invent a new hinge, to find a way to make the lightnings carry your messages. To be the first—that is the idea.*

—Mark Twain  
[Samuel Langhorne Clemens]  
1835–1910

**T**he seeds of true discovery lie in imagination. If the mind can imagine it, hands should be able to create it. The journey, however, between a student's idea and creation is not always taken because the tools, time and workspace aren't available.

#### The Grant

Well no more! Thanks to a generous three-year grant from the Kern Family Foundation, Marquette University College of Engineering is the proud new home of the Discovery Learning Center—a place where students can explore *their* ideas and discover firsthand the principles and practices of engineering.

#### The Center

"The Discovery Learning Center (DLC) supports student-generated projects to develop prototypes or proof of concepts," explains G.E. Otto Widera, Acting Dean for the College of Engineering and director of the DLC.

The DLC is equipped with state-of-the-art tools and machinery, software and hardware (see boxed list on page 5). To receive DLC support, students must first undergo rigorous laboratory safety training and then secure faculty endorsement for their written proposals. A supervisor is present at all times when students are using the equipment in the laboratory.

"The DLC affords students a unique opportunity to discover engineering by conducting their own projects," said Dr. Widera. "Rather than rely only on traditional pedagogy where professors disseminate information to students, the DLC relies on

androgogy, where students pursue their own learning pathways, with professors serving as facilitators." Thus, the DLC supplements, not supplants, their engineering education experience.

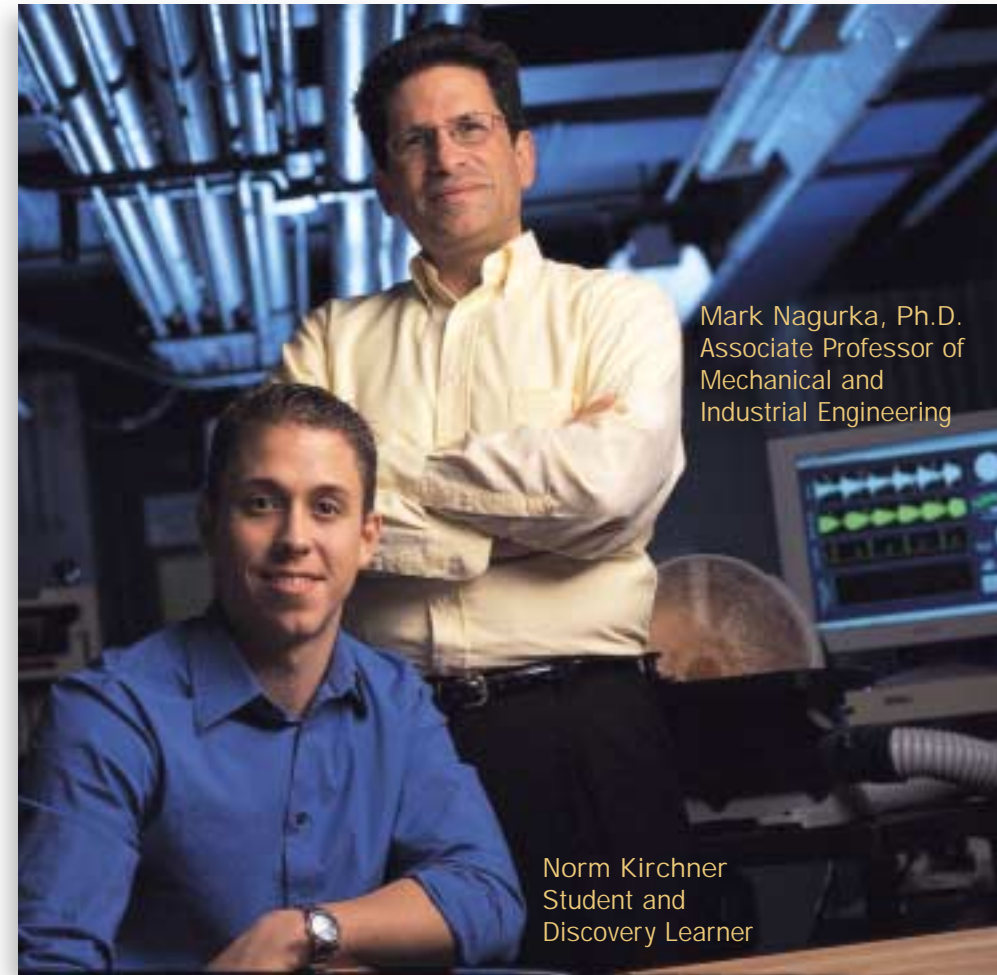
Housed in Haggerty Hall, as the newly opened DLC continues to become fully implemented and its philosophy is increasingly adopted, the DLC pathway will be wholly integrated in the curricula, whereby classroom learning experiences and syllabi will be revised to take full advantage of this rich resource.

#### The Team

One of the first projects to begin the journey of discovery was proposed by Norman Kirchner, a senior student studying electrical and computer engineering, and his faculty mentor, Mark Nagurka, Ph.D., associate professor of mechanical and industrial engineering. The team, pictured at right and on the front cover, are—in their own way—reinventing the wheel! Their experiment utilizes a bicycle wheel, common bike equipment like an "old fashioned" odometer and a generator light, along with cutting-edge software and the lab space and equipment, to study physical behaviors, such as the way the wheel slows down.

#### The Discovery

Dr. Nagurka explained that in measurement courses, he teaches first-order and second-order behavior, which are math models of physical systems. Using these measurement principles, he wanted to show mechanically, not electronically, how sensors work and transfer their signals into



Mark Nagurka, Ph.D.  
Associate Professor of  
Mechanical and  
Industrial Engineering

Norm Kirchner  
Student and  
Discovery Learner

*As with most design projects at Marquette University, students must design their product and also build it. Up until now—unless we knew someone at a machine shop or someone with a workshop in their basement—it was difficult to find the resources to build our projects. The DLC offers students a controlled atmosphere where we have access to the tools as well as proper training on the use of them.*

—Norm Kirchner

a computer. This turned out to be a perfect premier project for the DLC.

"What we learn from this will migrate back into the classroom," said Dr. Nagurka. "The Discovery Learning Center will be a great resource to prototype and test new ideas." He acknowledges that not all ventures will be successful, but failure, too, is part of learning and discovery. "This hands-on opportunity is a very necessary part of the education process," said Dr. Nagurka. "Despite all the power of computers, software and CAD drawings, there is nothing that replaces the challenge and reward of building something, touching it and seeing it work."

#### Beyond Discovery

The Discovery Learning Center serves as a hub for the gathering of individuals to focus their collective talents on achieving common goals. "Today, teamwork skills

are crucial, and the lack of such skills is usually detrimental to a career," said Dr. Widera. Through their collaboration, faculty and students further define and live the deeper meaning of a "community of scholars." As the Center and the demand to use it grows, so do plans to enhance it. Further resources will be sought to expand the physical facilities and increase the laboratory's capacity to accommodate even more student-generated projects.

This continuum of imagination, discovery and learning is giving Marquette students a significant advantage as they go into industry or on to further education. •

Alumni wishing to donate additional equipment to the DLC are asked to contact Dr. Widera at [geo.widera@marquette.edu](mailto:geo.widera@marquette.edu)

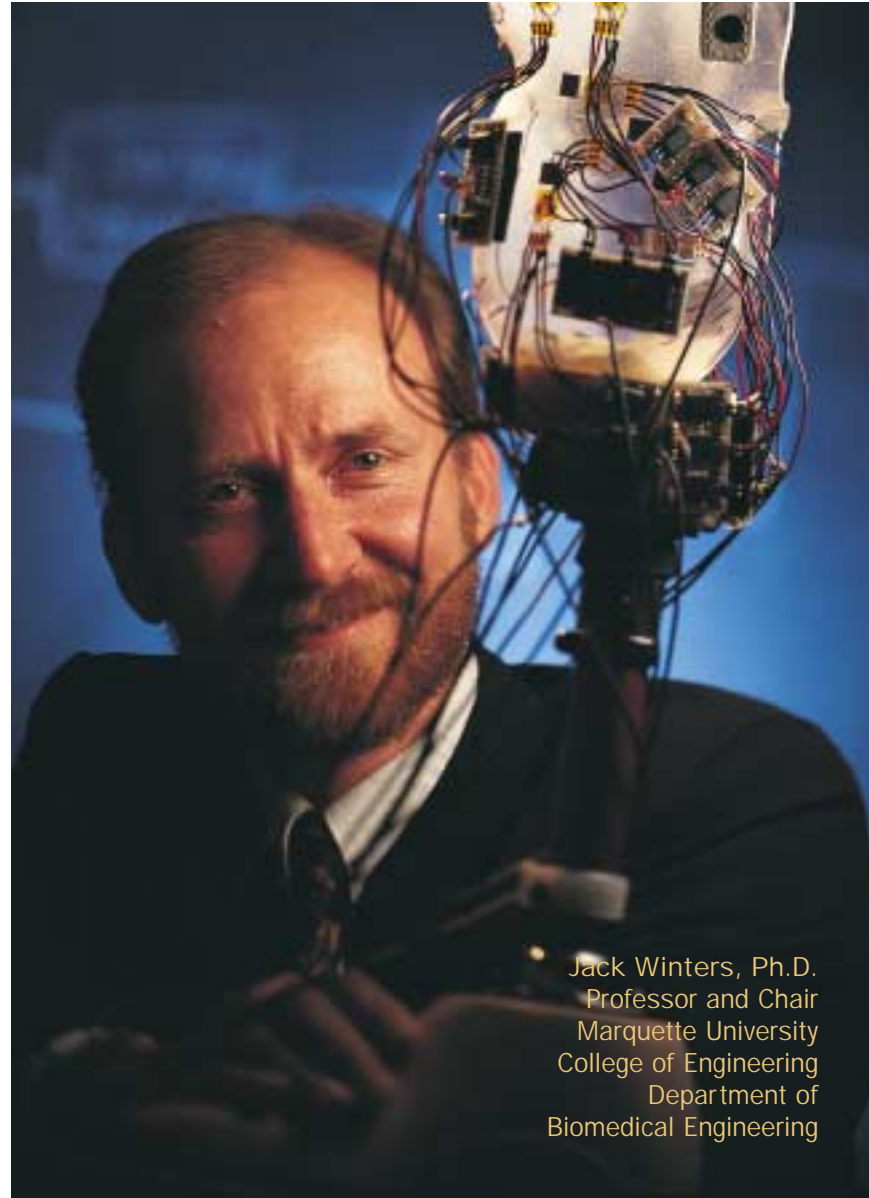
#### The growing inventory of equipment in the DLC includes:

- Geared Head Lathe Mill/Drill
- Vertical Bandsaw
- Grinder
- Disk Sander
- Miter Saw
- Drill Press
- Jointer
- Wood Planer
- Table Saw
- Integrated National Instruments Computer and supporting LabView, CAD, CAE, and other software packages
- Wide selection of power and hand tools
- Printed Circuit Board
- Milling Machine

# discovery through research

## rehab grant

6



Jack Winters, Ph.D.  
Professor and Chair  
Marquette University  
College of Engineering  
Department of  
Biomedical Engineering

*Here at Marquette, we provide the technical expertise, but do so with a unique melting pot of talents and perspectives that enables us to target innovative new user-centered solutions to old problems*

—Jack Winters, Ph.D.

Through a generous grant from the U.S. Department of Education's National Institute on Disability and Rehabilitation Research, faculty and students at Marquette, along with their consortium colleagues, will be able to evaluate methods and technologies to increase the usability and accessibility of diagnostic, therapeutic, and procedural healthcare equipment for people with disabilities. The five-year, \$4.5 million grant was awarded so Marquette and its

partners could establish the Rehabilitation Engineering Research Center (RERC) on Accessible Medical Instrumentation. The grant will be managed through the Department of Biomedical Engineering. The Co-Directors of this RERC are Jack Winters, Chair of the Department of Biomedical Engineering at Marquette and Molly Follette Story from Human Spectrum Design in California.

This RERC will work closely with consumers, healthcare practitioners, hospitals and manufacturers to increase access to and utilization of medical instrumentation and services by individuals with disabilities.

It is guided by the vision that all persons should have access to healthcare instrumentation and services and to employment in the healthcare professions regardless of disability. Centered at Marquette, this RERC is one of 22 national RERC Centers of Excellence that

are administered through the National Institute on Disability and Rehabilitation Research of the U.S. Department of Education and is the first to specifically address the critical need for new medical instrumentation technologies that move toward the ideal of a society where healthcare is universally accessible to all people.

#### Goals

Here at Marquette, we provide the technical expertise," notes Dr. Winters, "but do so

with a unique melting pot of talents and perspectives that enables us to target innovative new user-centered solutions to old problems. For instance, since receiving the award, we've filled three positions with well-qualified individuals who also happen to have one or more disabilities." An example is Sarma Danturthi, Ph.D., who recently moved from Maryland to take the position of senior biomedical engineer. In addition to expertise in biomedical engineering and computer programming, he lives with a hearing disability. Dr. Danturthi has been involved in research and development activities that yielded commercial products for children who are deaf.

#### In Good Company—Our Partners

Project partners in Milwaukee include the University of Wisconsin-Milwaukee's Center for Rehabilitation Sciences and Technology and IndependenceFirst, the metro-Milwaukee area independent living center.

The RERC also partners Marquette with four organizations in California, including Western University of Health Sciences' Center for Disability Issues and the Health Professions (CDIHP), the University of California at San Francisco and Berkeley's Ergonomics Lab, Human Spectrum Design, L.L.C., and Kaiser Permanente. CDIHP was established in 1998 and focuses on improving the treatment and overall quality of life of people with disabilities. The UC Ergonomics Lab targets human factors and product usability research and evaluation. Human

Spectrum Design provides special expertise in the universal design of products. Kaiser Permanente is America's largest not-for-profit health maintenance organization, serving 8.1 million members.

#### The Research

Many research and development projects will occur under this grant. Examples include conducting a needs analysis for people with disabilities, both as recipients and providers of healthcare services; performing usability analyses to determine what makes certain medical instrumentation either exemplary or problematic, yet essential for good healthcare; developing innovative solutions for medical instrumentation interfaces that radically advance the concept of universal access to medical products and services through use of wireless telecommunications, smart sensors and Web-based information technologies.

#### Student Opportunities

Several Marquette graduate and undergraduate students have started working on these grant projects and others will begin this summer. But the reach goes well beyond Marquette students. Students will continue their discovery through a national student design competition conducted by the RERC that targets innovative approaches for enhancing the accessibility and usability of medical instrumentation. The competition will be coordinated through the Biomedical Engineering Program at the University of Connecticut. •

*The National Institute on Disability and Rehabilitation Research (NIDRR) provides leadership and support for a comprehensive program of research related to the rehabilitation of individuals with disabilities. All of their efforts are aimed at improving the lives of individuals with disabilities from birth through adulthood. Rehabilitation Engineering Research Centers (RERCs) conduct programs of advanced research of an engineering or technical nature designed to apply advanced technology, scientific achievement and psychological and social knowledge to solve rehabilitation problems and remove environmental barriers. RERCs seek to find and evaluate the newest technologies, products, and methods that ultimately can benefit the independence of persons with disabilities and the universal design of environments for people of all ages.*

7

# discovering strong partners

## co-op students learn by doing

8

*Briggs & Stratton Corporation, with headquarters in Milwaukee, Wisconsin, is the world's largest manufacturer of air-cooled gasoline engines for outdoor power equipment. They design, manufacture, market and service these engines for original equipment manufacturers (OEMs) worldwide. Their engines are incorporated into products for both the consumer market and industrial/commercial applications.*

*Marquette consistently offers well-prepared students for Co-op employment which often leads to a full-time career at Briggs & Stratton upon graduation. Marquette engineering students have a well-rounded academic exposure and are able to contribute as full-time engineers right away.*

—Ken Derra  
Project Engineer and  
Co-op Department Coordinator  
Applied Research Department  
Briggs & Stratton Corp.

**B**riggs & Stratton Corporation started sponsoring engineering Co-op students before many of the current ones were even born.

The celebration

Briggs & Stratton recently celebrated 30 years of student programs as they exist today. The Marquette Engineering Co-op Program is proud to number among them. Since 1972, 69 percent of their Co-op students have been hired by Briggs & Stratton and continue working throughout the company's operating divisions playing vital roles in engineering, project management, sales, marketing and management. In fact, the first three Co-op students hired by Briggs & Stratton are still employed there!

Everyone wins

This long-standing relationship that Marquette has enjoyed with Briggs & Stratton has been a win-win-win situation for the University, the students and Briggs & Stratton, according to Sue Michaelson, Director of Engineering Cooperative Education and Special Programs at Marquette's College of Engineering. "Marquette enjoys the partnership and professional recognition of a strong, national company. Marquette Co-op students receive excellent practical work experience and responsibilities and Briggs gets quality work performance from the students," she said. "All this, in turn, leads to enhanced recruitment and retention of graduating engineers," said Ms. Michaelson. During her nearly 20 years of running the Co-op program at Marquette, Ms. Michaelson has seen Briggs & Stratton develop a Co-op culture within their entire corporation in which former Co-op students who are now full-time engineers supervise and mentor

current Co-op students and pass on their engineering expertise.

One Co-op student's story

Such is the case with Sanja Micanovic, a senior majoring in Electrical and Computer Engineering who has co-oped for two terms and has rotated through six different departments under the direction and mentorship of seasoned engineers, many of whom are Marquette graduates and former Co-op students themselves.

Sanja's experience at Briggs & Stratton reflects that of many of Marquette Engineering students who choose and are chosen by Briggs & Stratton as Co-op students. Her story begins many years ago and half a world away. Originally from Bosnia and Herzegovina, Sanja decided to attend Marquette because of her brother Goran's experience. "He graduated in 1996 with a bachelor's degree in electrical and computer engineering and an MBA in 2000. He now has a wonderful job in Milwaukee as a software developer for a consulting group," explained Sanja. "He also told me about the great Co-op program that would give me a chance to experience what it is like to work in the industry as an engineer."

And he was right! Sanja has had an excellent experience at Briggs & Stratton. "I have had a chance to see what it means to work as an engineer, what my responsibilities, challenges and work assignments will be and what an engineer faces at work every day," she said. It also provided an opportunity to apply the knowledge that she gained from her classes like circuits, analog or digital electronics and apply that information to solve real-world applications related to small engine production.



Sanja Micanovic  
Marquette University  
College of Engineering  
student and Co-op at  
Briggs & Stratton,  
Milwaukee

It works the other way, too, according to Sanja. "By working in several different departments at Briggs throughout my Co-op terms, I learned a lot of new things and some of them I was able to use back in the classroom," she said. For example, last summer she worked in an ignition/alternator lab and was able to use that experience in her analog lab during the most recent fall semester at Marquette.

The combination of Co-op and a Marquette Engineering education have prepared Sanja well for her future career. "These experiences have developed and sharpened my problem solving skills. Marquette has educated me well in modern and well-equipped laboratories using up-to-date technologies taught by very knowledgeable faculty," Sanja said.

The single most important thing she learned while working as a Co-op is that to become a good engineer, one needs to have good experiences. "With more experience, I am more likely to do a good job and less like-

ly to make mistakes," she said. The more experienced engineers are, she believes, the more knowledge and more profitable solutions they will come up with.

The Future

Sanja's story illustrates the ongoing relationship students have with Briggs. In addition to the past 30 years, Marquette also had Co-op students at Briggs & Stratton from 1929 to 1943, when the Co-op program was suspended because of World War II. Since being reinstated in 1972, a total of 121 Marquette Engineering students are or have been Co-op students at Briggs. Of that total, 10 are current students and 25 of these "Marquette Co-op alumni" are employed at Briggs, representing more than 301 years of combined full-time service!

The university and College of Engineering join in celebrating this partnership and look forward to many more years and many more students who can thank Briggs & Stratton as a partner in their education. •

9

# discovering how to help *service learning*

**Top:** Former students Michael May and Nicholas Skiffington conducting Guatemala Bridge site (pictured far right) survey in January 2002. Teammate Melissa Frank not shown.

**Bottom:** Just weeks ago, the team returned to complete the project. They are pictured pouring one of the abutments. The 30-foot long, 15-foot wide and 12-foot high bridge was fully complete within two and a half weeks (Jan 3 - Jan 21, 2003)!



photos by Michael May



*You are called to be men and women who reflect upon the reality of the world around you... to discern what is really happening in your life and the lives of others... to make decisions in the light of what is truly for the greater glory of God and the service of those in need, and then to act accordingly.*

—Peter-Hans Kolvenbach, S.J.

**I**t is one thing to design as an “academic” exercise, suggesting hypothetical solutions to problems that exist in other parts of the world. It is quite another thing to go to the problems and fix them.

It is the latter that sets Marquette apart...that extra effort and special people who make the difference. Heeding the call of Peter-Hans Kolvenbach, S.J. (above), Marquette faculty and students are honoring God by serving others in the context of a special topics course offered through the College of Engineering.

#### The Course

Daniel H. Zitomer, Ph.D., associate professor of civil and environmental engineering, has been involved with service learning since 1999 and has developed a special topics class: Health Environment and Infrastructure in Latin America, which combines classroom experience with international service trips.

The interdisciplinary course and Latin American serv-

ice projects stemmed from his observation of the importance of combining construction experience with classroom theory to increase student learning and understanding. “It would be difficult for students to build a bridge in the US,” he said, “but we can build a bridge in Guatemala that will be used and improve the living conditions of people. Theory combined with practice is a powerful teaching tool.”

He explains that the United States routinely provides the infrastructure for environmental protection, new roads, bridges, drinking water, wastewater treatment, and healthcare. However, in developing countries, the conception, design and implementation of infrastructure is an intricate, multi-disciplinary endeavor.

“Infrastructure development requires knowledge of culture, engineering, healthcare, ethics, environmental science, international affairs, law, government, communications, economics and other disciplines,” he said.

#### The Marquette classroom

The course explores the inter-relationship among these very aspects, with emphasis on Latin America and alleviation of poverty.

A myriad of topics are covered, from geography to philosophy and theology. “We discuss many things: Central American history; the impact of free trade and globalization on the poor; theology; Jesuit education and El Salvador; conflict and displacement in developing countries; Latin American politics; water supply and wastewater treatment in Guatemala and El Salvador; earthquake engineering and hazard mitigation in developing countries; cross-cultural healthcare; and public health,” said Dr. Zitomer. In addition, the needs of developing countries and the advantages/disadvantages of highly developed engineering and healthcare systems are highlighted.

#### The worldwide classroom

He takes the students to Central America to heighten their awareness of the world around them and their role in it. “I wanted to get the students and myself outside of the comfortable boundaries at home so that we could see more clearly the social implications of our work. Things that we are blind to in our own culture are put in sharp focus when we see them in the context of another location, culture, and economic reality,” said Dr. Zitomer. “For example,” he added, “we don’t think of a bridge as increasing the education and public health of a neighborhood, yet in rural Central America, construction of a bridge means that building supplies for a school can be delivered, and it means that the daily trip to gather clean water is shorter.”

#### Discovery

What do the students learn and discover about themselves and our world? “The students gain practical design and construction experience, awareness of the importance of infrastructure to quality of life, appreciation for the infrastructure in the US, appreciation for the civil engineering profession, and awareness of the culture of Central America,” said Dr. Zitomer. They also gain an understanding of how most of the people in the world live—including economic and social injustices, and the divergence between rich and poor, said Dr. Zitomer.

The service learning component of the class made a

lasting and ongoing impact on Michael May, a 2002 civil engineering graduate who now is a project manager for Traffic Analysis & Design, Inc.

In January of 2002, he and a group of others traveled to a site in the central highlands between the towns of San Martin Jilotepeque and Comalapa in the Department of Chimaltenango, Guatemala; each side of the roadway connecting the villages has a steep, sloped triangular-shaped channel. (See photos at left.) Vehicles were able to cross the river during the dry season, but during the rainy season, the river—which can swell to a staggering 9.5-feet in depth—made the roadway impassable and separated the two towns and surrounding areas for months at a time. “Our ultimate goal,” said Michael, “was to design a one-lane, reinforced concrete vehicular bridge to span Rio Pichiquej-Quemayá and connect the two towns year-round.”

Then, during the spring semester of 2002, that is exactly what he and his group did. They conducted more than 660-hours of design work, which included a site survey, testing of concrete and steel samples; an environmental analysis and hydrology study; placing the bridge within the strange topography; a full structural design; a formwork design; and a construction cost estimate and timeline.

#### Bridge Builder

Their plans were reviewed by a practicing structural engineer and their design was found to meet standards. In January 2003, Dr. Zitomer, several engineers and seven Marquette engineering students finished what they started, and completed the bridge, joining the two cities, rain or shine.

“Not everyone lives under pleasant conditions like we do in the States. In Guatemala, infrastructure only exists in the bigger cities and towns. People can be cut off from health care, safe living conditions and each other for months at a time. It’s an eye-opener to fathom the environment in which some people live, and it strikes a moral cord. I believe it’s our ethical responsibility to use our talents for the benefit of all humankind and the environment, regardless of location and personal interest,” said Dr. Zitomer. He walks away with pride for a job well-done, but even more importantly, touched forever by the experience which started as an idea and ended up a bridge. •

Construction of a bridge and a sewer in Guatemala are planned for January, 2004. For additional information, contact Dr. Zitomer via e-mail at: [daniel.zitomer@marquette.edu](mailto:daniel.zitomer@marquette.edu)

Sometimes the only thing standing in between a student and discovery is a means—logistical or financial.

In 1986, Marquette launched an undergraduate engineering education program in conjunction with Waukesha County Technical College, where students would take their first two years at WCTC and then transfer to Marquette for the remaining period.

*Enter Nancy Mutsch.*

*“Even though there are thousands of students, I feel that the faculty focus me, helping me do my best, getting me what I need, and often at times beyond regular office hours or class time.”*

Nancy Mutsch  
Civil Engineering  
student

Nancy, a mother with four grown children, decided to enroll at WCTC to ease back into school after raising her family for the past 23 years. “I always wanted to go to school,” said Nancy, “but taking care of my family was the most important thing.” With her oldest about to graduate from college and her youngest entering high school this fall, Nancy thought it was time to make her dreams come true.

#### All in the Family

“I used to sit on my dad’s lap when I was a little girl and watch him do his work,” explained Nancy of her civil engineer father, Robert Taugher (’51), now retired after a successful engineering career.

#### Making it Happen

After completing her WCTC courses, Nancy transferred to Marquette with the help of Jon Jensen, associate dean for new student programs. Dr. Jensen put together a financial aid package that included both some internal support and a scholarship funded by the National Science Foundation (NSF), as a part of a major Computer Science, Mathematics and Engineering Scholarship grant.

Dr. Jensen administers both the NSF grant and the program with WCTC, which is currently known as the 2+2 program. To date, Dr. Jensen has helped more than 50 individuals like Nancy successfully transfer to Marquette from WCTC.

#### Growing the Program

The Marquette/WCTC has attracted the attention of the federal government. More specifically, the US Department of Education awarded Marquette University a \$700,000 grant to encourage other underserved populations—members of minority groups, the financially disadvantaged, persons with disabilities and others—to consider careers in engineering or nursing. Dr. Jensen will also supervise this program in engineering. The initial grant activities will focus on designing ways to expand the 2+2 program and attract additional non-traditional students.

Look for many more students like Nancy to wear engineering hats in the near future. •

Graduate students working in areas critical for economic and national security may qualify for new federal government fellowships. These fellowships are sponsored by the U.S. Department of Education under its Graduate Assistance in Areas of National Need (GAANN) Program. Fellowship recipients must be U.S. citizens or permanent residents, meet departmental doctoral program admission requirements, have an interest in university teaching and research, and have financial need. Individuals from traditionally underrepresented groups (women and minorities) are especially urged to apply.

One such GAANN fellowship in the College of Engineering is held by Jen Bowman, who is an Electrical and Computer Engineering GAANN Fellow and graduate student. Jen earned her bachelor of science in electrical and computer engineering from Marquette in May 2001 with a minor in Spanish.

It is only natural that she is pursuing advanced education in the field. Engineering has been a way of life for Jen. She is a third generation Bowman (both her dad and grandpa, as well as uncles and cousins graduated from Marquette) and also has a younger sister who is a senior in Biomedical Engineering. “When I was a kid, I enjoyed playing with LEGOS and taking apart things,” she said.

#### The Fellowship

The GAANN fellowship, which is funded by a three-year grant from the U.S. Department of Education, provides for Jen’s educational expenses including books, research materials, a stipend and tuition. All GAANN fellows participate in special seminars, attend professional and technical meetings and gain valuable teaching experience. Last fiscal year, the U.S. Department of Education provided \$31 million in funds for the continuation of 201 GAANN fellowships—several of them at Marquette. The generous program provides fellowships through academic departments and programs of institutions of higher education, to assist graduate students with excellent records who demonstrate financial need

and plan to pursue the highest degree available in a field designated as an area of national need.

The areas of national need determined by the Department of Education include Biology, Chemistry, Computer and Information Science, Engineering,



Jen Bowman  
GAANN Fellow and  
Graduate Student

Geological Science, Mathematics and Physics.

“Since I started the GAANN program in Spring 2002, I’ve gained a greater appreciation for research and academic life and plan on pursuing my Ph.D. in the coming years,” said Jen.

Her research in the Department of EECE focuses on using Bluetooth™ Technology as the wireless medium between patient and processor and an ECG monitoring system. Dr. Dean Jeutter, professor of biomedical engineering, is her advisor, which further reinforces the multidisciplinary discovery of her project.

For more information about GAANN Fellowships in the Department of Electrical and Computer Engineering, please contact Dr. Ronald Brown at the College of Engineering at 414.288.3501. GAANN Fellowships are also available in the Department of Biomedical Engineering; Dr. Kris Ropella, 414.288.5460, administers the fellowship program. •



Michael Johnson, Ph.D.  
Assistant Professor  
Electrical & Computer Engineering

Richard Povinelli, Ph.D.  
Assistant Professor  
Electrical & Computer Engineering  
Director of Computer Engineering Laboratories

**W**e remember only 10 percent of what we read; 20 percent of what we hear and 30 percent of what we see. It has long been known that the best way to learn something—to really understand it—is to do it, immerse yourself in it. We remember up to 90 percent of what we do. \*

It is the “doing” then, that allow undergrads in the College of Engineering to grasp difficult concepts and discover first-hand the data that supports theories being researched in the College.

Unique opportunities exist in the College of Engineering that allow undergrad engineering students a chance to engage in actual research with faculty. One such research opportunity was made possible through a special Research Experiences for Undergraduates (REU) supplemental grant request submitted to the National

Science Foundation by Mike Johnson, Ph.D, assistant professor electrical and computer engineering and Richard Povinelli, Ph.D., assistant professor of electrical and computer engineering and director of Computer Engineering Laboratories.

#### The Main Grant

Dr. Johnson explains, “Richard and I are co-principal investigators on the main grant, entitled *Integration of Stochastic and Dynamical Methods for Speech Technology*. It’s a three-year grant from a new National Science Foundation program called Information Technology Research (ITR) which we received through the Intelligent Information Systems (IIS) Division of the Directorate for Computer and Information Science and Engineering (CISE),” he said.

The project is wholly supported by the NSF at

\$120,000 per year for three years, and supports two 12-month research assistants as well as funds for equipment and professional development. There are three additional graduate students whose research is related to the ideas in the grant and who have been participating on the project team.

#### The Grant for Undergrads

The REU grant is a separate add-on grant for \$15,000 each year, that specifically supports the involvement of undergraduate students with the research project. The REU grant provides funds to pay the students for 5-10 hours of work a week during the semester and about 40 hours of work per week during the summer.

#### The Research and Benefits

The main idea of the research is to apply ideas from chaos theory, specifically the field of dynamical systems analysis, to speech processing methods, with the goal of improving the accuracy of speech recognition systems.

“The undergraduate students are working on better understanding noise and its effects on these techniques,” said Dr. Povinelli. Engaging undergrads in this process is mutually beneficial. “They come back to us with usable results while getting valuable research experience, which in turn gives them an idea about whether they would like to pursue a research-related career,” he said.

Involving undergrads in the research process has far-reaching benefits according to Dr. Johnson. “The overall research project benefits from the diverse interaction among undergraduates, graduate students and faculty on the project team,” said Dr. Johnson. “Doing research with undergrads is simultaneously challenging and rewarding. There is a somewhat higher learning curve, as many of the techniques that we use have a lot of underlying mathematical theory to them. At the same time, though, this is a good thing, because we are forced to set aside the mathematics and re-address the basic questions of *What are we trying to do? Why are we trying to do it? and What basic experiments can we design to support (or reject) our ideas?*,” said Dr. Johnson, “which is something we should all do more often in research.” •

*The National Science Foundation (NSF) is an independent agency of the U.S. government, whose mission is to promote the progress of science; to advance the national health, prosperity and welfare; and to secure the national defense.*

*The National Science Foundation makes possible a number of opportunities for undergraduates to join research projects, allowing the students to experience first-hand how basic research is done, and to contribute consequentially. The principal support by NSF of such activities is through the Research Experiences for Undergraduates (REU) Program*



# discovering ethos *ethics for engineers*

“**W**e want to sensitize students as to the importance of good ethical practices when they go into the profession,” said Nick Nigro, Ph.D., professor of mechanical and industrial engineering and creator of the Engineering Ethics and Values (ENEV) Program. “We want them to hold the welfare of the public first and foremost ahead of any concern for quotas or deadlines or making a profit.” This code of behavior based on moral values is what ethics is all about.

The new ENEV program, which was launched this fall, enables the College to effectively integrate the traditions of ethics-based engineering into the undergraduate program through formal coursework and a colloquium that leads to a minor. It is especially timely, said Dr. Nigro, as a recent survey ranked professional ethics as one of the top five characteristics that employers look for in a candidate. •



Engineering students Sarah Drilling (far left), Richard Carlson (center left) and Emily Stockhausen (far right) meet with Professor Nick Nigro (center right) during a small group ethics discussion. They represent a group of students who have formally elected to study in the engineering ethics and values program which involved engineering students in a four-year elective program which will help them to understand the impact of social concerns and values on engineering ethics, recognize current engineering ethical issues and strengthen their moral resolve to act courageously on these issues once in the profession.



**MARQUETTE**  
UNIVERSITY

COLLEGE OF ENGINEERING

P.O. Box 1881

MILWAUKEE, WISCONSIN 53201-1881

[www.eng.mu.edu](http://www.eng.mu.edu)

#### Upcoming Alumni Events:

- March 1** Reception prior to the Marquette vs U of Alabama-Birmingham game
- March 16** Annual Green Mass. 9:30 a.m.  
The Chapel of the Holy Family  
Alumni Memorial Union

For more information on these and other events, please visit the College of Engineering Alumni Associations web site at [www.mu.edu/alumni/college/engineering](http://www.mu.edu/alumni/college/engineering)

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