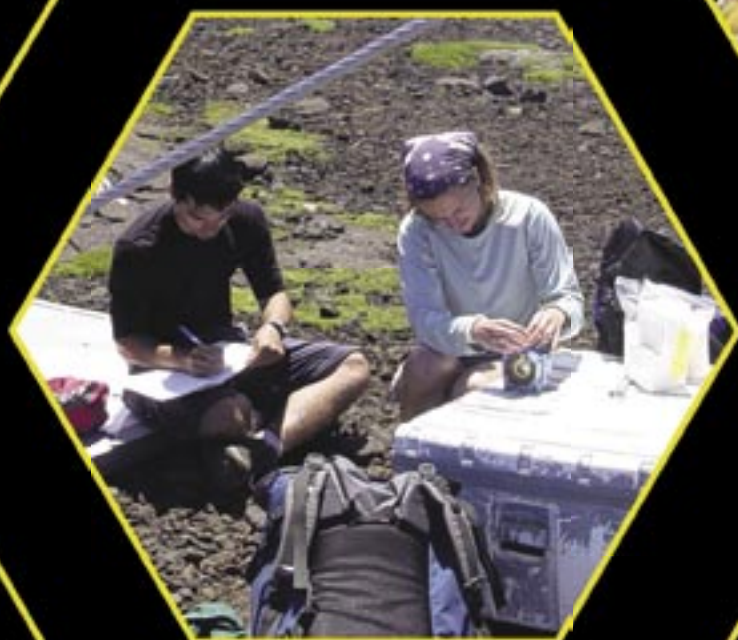


Civil and Environmental Engineering

MichiganTech



Department
2006
Review

Message from the Chair



I am pleased to present this first Department Review for the Department of Civil and Environmental Engineering. The past year has been productive for the department, with many exciting developments—which are featured in this report.

As of the fall semester, our department had 25 faculty members—12 full professors, 10 associate professors, three assistant professors, and three lecturers. The faculty's expertise bridges the civil engineering specialty areas of construction, environmental geotechnical, material, structural, transportation, and water resources engineering. All of our tenured/tenure track faculty possess a doctorate degree in their specialty area, and 17 are licensed as professional engineers.

CEE is an innovative leader in the International Sustainable Engineering movement, utilizing a three-pronged approach with the *Master's International Program*, *International Senior Design* program, and the *Engineers Without Borders (EWB)* student chapter. *EWB* completed an international project in Bolivia, and continues to work toward sustainability through materials use. CEE leads the nation in our work with ultra-high performance concrete, as well as concrete and asphalt mix designs for the advancement of materials with greater longevity.

CEE research also includes water and wastewater treatment, surface water and air quality, hydraulics, hydrology, water resources, structural analysis, geotechnical engineering, transportation design, and construction engineering.

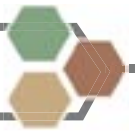
The past academic year demonstrated the ongoing success of our Enterprise Program, with 63 students involved in the *Pavement, Design, Construction, and Materials Enterprise*; the *Aqua Terra Tech Enterprise*; or the *Sustainable Solutions Enterprise*. These enterprises provide students with opportunities to work together to solve real-world engineering, design, and communications problems. Our students also compete in various national and regional competitions including concrete canoe, steel bridge, environmental design, construction bidding, and asphalt mix design.

As always, CEE continues to serve the public with a variety of outreach programs. The *Local Transportation Technology Program (LTAP)* and the *Technology Development Group (TDG)* work in tandem to serve as a clearinghouse for information related to state-of-the-art technology in the construction and maintenance of roads and bridges. The *Tribal Transportation Technology Program* performs a similar service to all Native American tribes east of the Mississippi River. The *Center for Science and Environmental Outreach* partners with local intermediate school districts to provide expansive and diverse K-12 educational programs across the Upper Peninsula.

With our diverse faculty, generous funding, active student body, alumni support, and innovative research and outreach, the future is bright for CEE. Our department and alumni are hard at work, creating solutions that will change our world and society.

We invite you to read this review and share your ideas. As we strive for a sustainable future, we welcome your challenges, contributions, and collaboration.

Neil Hutzler, PhD, P.E., D.E.E.
Professor and Chair



Mission

The Department of Civil and Environmental Engineering provides an educational, professional, and intellectual experience that enables a diverse body of students, alumni, faculty, and staff to contribute to society through teaching, research, practice, and service.

Vision

The Department of Civil and Environmental Engineering will develop internationally prominent educational and research programs that will benefit all of our constituencies and, in doing so, we will become an international Department of Choice.

Guiding Principles

We will continually work to engage our students, faculty, and staff in the integration, creation, and dissemination of knowledge through teamwork, personalized instruction, research, and outreach. We will value diversity. We will measure our success by the success of our graduates and by the growth in the Department's prestige.



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Faculty of Civil & Environmental Engineering



Theresa M. Ahlborn, P.E.
Associate Professor
PhD, University of
Minnesota, 1998



Bernard D. Alkire, P.E.
Professor
PhD, Michigan State
University, 1972



Martin T. Auer
Professor
PhD, University of
Michigan, 1979



*C. Robert Bailod, P.E.,
D.E.E.*, Professor
PhD, University of
Wisconsin, 1968



Brian D. Barkdoll, P.E.
Associate Professor
PhD, University of
Iowa, 1997



William M. Bulleit, P.E.
Professor
PhD, Washington State
University, 1980



George R. Dewey, P.E.
Associate Professor
PhD, University of
Kansas, 1991



David W. Hand
Professor, PhD,
Michigan Technological
University, 1991



Ralph J. Hodek, P.E.
Associate Professor
PhD, Purdue
University, 1972



Richard E. Honrath
Professor
PhD, University of Alaska-
Fairbanks, 1992



*Neil J. Hutzler, P.E.,
D.E.E.*, Professor &
Department Chair
PhD, University of
Wisconsin, 1978

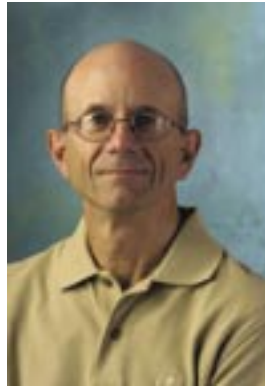


William H. Leder, P.E.
05'-06' Roland A. Mariucci
Practitioner in Residence,
M.S., Massachusetts
Institute of Technology

Faculty of Civil & Environmental Engineering



Yue Li
Assistant Professor
PhD, Georgia Institute
of Technology, 2005



Dennis J. Magolan, P.E.
Lecturer, M.S.,
Michigan Technological
University, 1983



Kris G. Mattila, P.E.
Associate Professor
PhD, Purdue
University, 1995



James R. Mihelcic
Professor
PhD, Carnegie Mellon
University, 1988



Amlan Mukherjee
Assistant Professor
PhD, University of
Washington, 2005



Kurtis G. Paterson, P.E.
Assistant Professor
PhD, University of
Iowa, 1993



Judith A. Perlinger
Associate Professor
Doctorate, Swiss
Federal Institute of
Technology, 1994



*Linda Phillips, P.E.,
P.M.P., C.D.T.,*
Lecturer, M.S., Michigan
Technological
University, 1984



L. Bogue Sandberg, P.E.
Professor
PhD, Vanderbilt
University, 1975



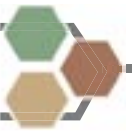
Sheryl Sorby
Professor and Associate
Dean of Engineering
PhD, Michigan
Technological
University, 1991



William J. Sproule, P.E.
Professor
PhD, Michigan State
University, 1985



Noel R. Urban
Associate Professor
PhD, University of
Minnesota, 1987



Faculty of Civil & Environmental Engineering



Thomas J. Van Dam, P.E.
Associate Professor
PhD, University of
Illinois at Urbana-
Champaign, 1995



Stanley J. Vitton, P.E.
Associate Professor
PhD, University of
Michigan, 1991

Adjunct Faculty Members



David W. Watkins
Associate Professor
PhD, University of Texas
at Austin, 1997



Warren K. Wray, P.E.
Professor
PhD, Texas A&M
University, 1978



John S. Gierke
Associate Professor
Dept. of Geological &
Mining Engineering
& Sciences
PhD, Michigan Tech



David R. Hokanson, P.E.,
Trussell Technologies,
Inc., PhD, Michigan Tech



Zhanping You, P.E.
Assistant Professor
PhD, University of
Illinois at Urbana-
Champaign, 2003

Photo Unavailable

Alex S. Mayer, P.E.
Professor
PhD, University of North
Carolina, 1992



Lawrence L. Sutter
Associate Professor
School of Technology
PhD, Michigan Tech



Qiong Zhang
Sr. Research Engineer
CEE Dept.
PhD, Michigan Tech

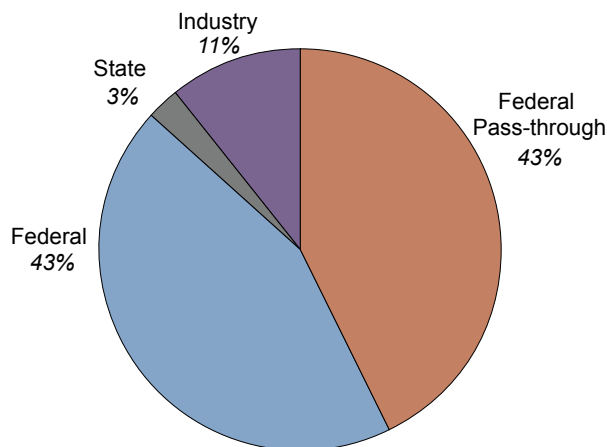
Enrollment and Expenditures Data

Research expenditures for the fiscal year 2005 exceeded \$4,100,000, with active research areas that include studies on durable highway structures, construction materials, engineering for sustainability, and atmospheric sciences. Reaching far beyond these areas, CEE research also encompasses water and wastewater treatment, surface water and air quality, hydraulics, hydrology, water resources, structural analysis, geotechnical engineering, transportation design, and construction engineering.

As of the fall of 2005, the department had 25 faculty members: 12 full professors, 10 associate professors, three assistant professors, and three lecturers.

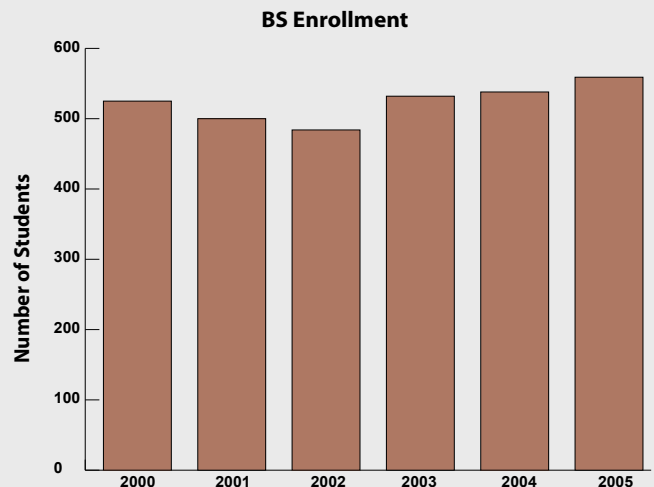
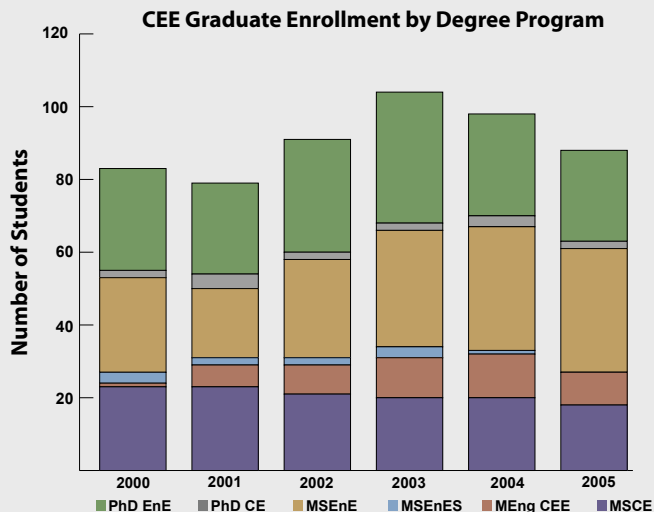
The Fall 2005 total enrollment was 647 students: 559 undergraduates and 88 graduate students. Of the total, 496 of the students were enrolled in civil engineering programs (460 undergrads and 36 grad students), while 151 students were enrolled in environmental engineering programs (99 undergrads and 52 grad students). Over the past two years, we have granted a growing number of degrees: 116 BS and 15 MS degrees in Civil Engineering, 24 BS and 12 MS degrees in Environmental Engineering, one PhD in Civil Engineering, and three PhD's in Environmental Engineering.

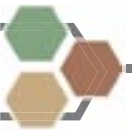
Fiscal Year 2005 Research Expenditures by Funding Category



Research Expenditures

Year	Total
2000-2001	\$5,256,651
2001-2002	\$4,937,379
2002-2003	\$4,336,943
2003-2004	\$4,323,922
2004-2005	\$4,100,800





CEE Professional Advisory Committee

CEEPAC

Active committee members and company affiliation



Mr. Harland Couillard
U.P. Concrete Pipe Company



Ms. Tamera Fenske
3M Prairie du Chien



Mr. Christopher Kaempfer, P.E.,
Kaempfer & Associates, Inc.



Mr. Thomas Keranen, J.D., Thomas M. Keranen & Associates, P.C.



Ms. Kristine Krause, P.E.
Wisconsin Energy Corporation



Mr. William Leder, P.E.
Lea + Elliott, Inc. (retired)



Mr. Max Schmiege, P.E.
CH2M Hill



Mr. Marvin Sorvala, P.E.
Bonestroo, Rosene, Anderlik, & Associates, Inc. (retired)



Ms. Kerry Sutton Maloney, P.E., Michigan Concrete Paving Association



Mr. Rick Wilcox, P.E.
Wilcox Associates, Inc.



Mr. William Winiarski, P.E.
Rowe, Inc.

Michigan Tech Transportation Institute

Center for Structural Durability

The Center for Structural Durability (CSD) is one of six unique programs within the Michigan Tech Transportation Institute affiliated with the CEE Department. Directed by Dr. Tess Ahlborn, a licensed engineer, the CSD is a collaborative effort between Michigan Tech and Wayne State University, conducting research and providing technical assistance for the Michigan Department of Transportation. Its primary mission is to contribute implementable research that produces durable highway structures.

CSD research projects focus on bridge loading analysis, bridge beam deterioration, alternative reinforcement for bridge decks, high performance materials and repair techniques, and the performance of overhead sign structures. *Preparing students to create the future*, a goal of Michigan Tech, is also expressed through the CSD, which educates students who will work to support continued economic growth and sustainable infrastructure.



Future Research Paths at Benedict Laboratory

Ultra-high performance concrete (UHPC)—three times stronger than concrete currently used—is a material containing fibers that eliminate the need for reinforcement steel. Initial research in other countries has shown that it does not crack or degrade under freeze-thaw cycles. Currently, Michigan Tech is the only university in the U.S. that can cast, cure, and test UHPC. Showing off her sample, Dr. Ahlborn is naturally excited about its future: “This concrete represents an innovative way of thinking, and it would mean a whole new way of building bridges if we can implement it.”

Before implementation can happen, however, standards for testing UHPC must be established. With the Michigan Tech *Concrete Initiative*, the CSD will provide leading-edge research, supported by its recent acquisition of the new Benedict Laboratory facilities. Central to this initiative, the Benedict Lab is a collaboration of the CSD and the *Transportation Materials Research Center (TMRC)*. With its three floors and 15,000 square feet of working space and storage, ongoing research opportunities will abound. The basement floor is designated for mixing and making samples, the first floor for testing, and the second floor for preparation of samples. In addition, a basement room is specifically set up for the production of UHPC.

Collaborative Partnerships and Colleagues

A key component in the research performed by the CSD and an underlying facet within the CEE Department, collaboration brings the students and faculty together in special ways. Dr. Ahlborn describes this relationship: “Students are your junior colleagues; we have such unspoken respect for each other. I chose to return to Michigan Tech as a faculty member because I thought I could make the most impact here. What I didn’t realize was the impact the students would have on me.”

In addition to student contributions, a group of dedicated faculty offer their guidance. Dr. Yue (Robert) Li, an Assistant Professor in structural engineering, brings great expertise to the CSD. Dr. Li has experience with joint industry projects, model testing and instrumentation, and computer simulation methods. With an MS in Civil Engineering and a license in structural engineering, Chris Gilbertson supervises the graduate students and their laboratory activities. Rounding out the group, Dr. William Bulleit and Dr. Bogue Sandberg are senior faculty advisors who provide invaluable support in their mentoring roles.



Dr. Tess Ahlborn, CSD Director



“I have always been fascinated by bridges,” states Dr. Tess Ahlborn. Her office is lined with photos—the most impressive being the Golden Gate Bridge. Ultimately, it was bridges that brought her to Michigan Tech to get her BS and MS degrees in Civil Engineering. After becoming a licensed engineer and building several bridges herself, she decided to share her knowledge with others.

After completing her PhD at the University of Minnesota, Ahlborn returned to Michigan Tech in 1995 and now teaches *Reinforced Concrete Building Design* and *Prestressed Concrete*. Most importantly, Ahlborn continues to work on integrating aesthetics and sustainability into highway structures. She adds, “I’d like to take students to Switzerland to study the bridges of Maillart and Menn—talk about structural art!” Pointing to the computer-generated bridge on her office wall, Ahlborn stresses the importance of building different styles of bridges and their impacts on communities. She passionately proclaims, “I would love to design a bridge that will last 500 years instead of the standard 75 year designs—one that would bring exclamations of appreciation for its form!”

Transportation Materials Research Center

The TMRC contains a plethora of specialized equipment—stereo optical, petrographic, X-ray, and environmental scanning electron microscopes. These microscopes have enabled advance research methods at the Transportation Materials Research Center (TMRC). In fact, according to the Director of TMRC, Dr. Thomas Van Dam, “State-of-the-art equipment in five laboratories with full-time staff and unbiased technical expertise has made Michigan Tech the premier place for doing concrete petrography.”

The *TMRC* is pioneering new research on a broad range of construction materials, including cement, asphalt, aggregate, and geotechnical materials. Sustainability is an issue when developing these materials, as in the project with LaFarge, the largest cement producer in North America. In partnership with Ralph Hodek, an Associate Professor in Geotechnical Engineering, Van Dam and the *TMRC* will examine cement kiln dust, a by-product of cement production. Producers recycle some of this dust but most of it ends up in landfills. Yet, the dust has very interesting properties—perhaps some that could be used in stabilizing soils for transportation structures.

Another focus is the improvement of concrete durability. Currently, the *TMRC* is establishing a procedure that uses a high resolution, flat-bed scanner to capture images of concrete through various treatments. By overlaying these images, they can complete phase identification and digital image analysis. Ongoing projects include studies that examine the impact of aircraft deicers on concrete pads, the effects of magnesium chloride and calcium-magnesium acetates on concrete durability, and causes for specific pavement failures occurring in lower Michigan. Van Dam adds, “Our goal is to make infrastructure more economical, longer lasting, and sustainable.”



Diverse Backgrounds Yield Effective Results

“The key to a successful program is building a team with diverse backgrounds and being able to secure funding,” according to Dr. Van Dam. The CEE Department has done both. The *TMRC* started in 1998 under Dr. George Dewey, as a research partner with MDOT. Its evolution has continued through partnerships across many fields: Dewey, faculty advisor for the *Pavement Design, Construction, and Materials Enterprise*; Dr. Larry Sutter, Associate Professor in the School of Technology; and Karl Peterson, Research Scientist and PhD student, have all moved the Center forward in new directions.

Because of its collaborative nature, the *TMRC* studies concrete, hot-mix asphalt, and various other materials in numerous projects utilizing microstructural characterization techniques. Dr. Van Dam describes their work: “Our labs look at everything from wood fiber composites, polymers, and diatoms, to little organisms in Lake Superior.” Peterson completes much of the forensic research using high-tech microscopes, developing innovative procedures that make the testing much easier and more efficient. The *TMRC* has all the equipment necessary to carefully prepare the specimens as well as the trained expertise to evaluate and assess the results.



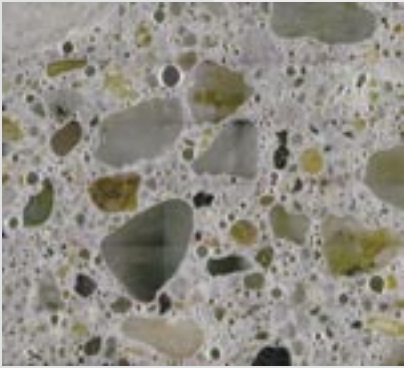
Dr. Thomas Van Dam

Dr. Thomas Van Dam plays myriad roles at Michigan Tech—among them, professor, researcher, and co-director of MTU's Non-Conductive/Volatile Materials Characterization Facility. Recently, he assumed the role of Interim Director of the University Transportation Center. Under the new transportation bill, SAFETEA-LU, Congress has named Michigan Tech as one of the University Transportation Centers earmarked for a significant research grant, which will be allocated in the spring of 2006.

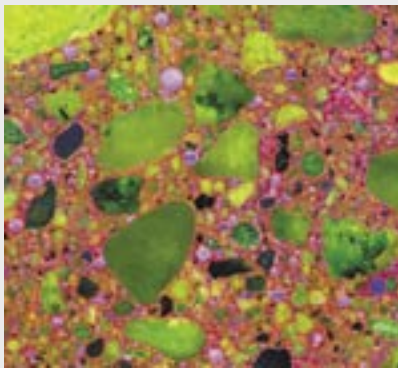
The New Benedict Laboratory

Amidst the huge aggregate storage bins that span several floors, there are operational pan and mortar mixers used for mixing up batches of concrete, and a freeze-thaw chamber donated by MDOT. Additional equipment like laboratory scales, cure chambers, hydraulic jacks, mechanical testing equipment, and a drum mixer will be added as funding permits. General donations to the *Concrete Initiative* are being accepted through the Michigan Tech Fund.

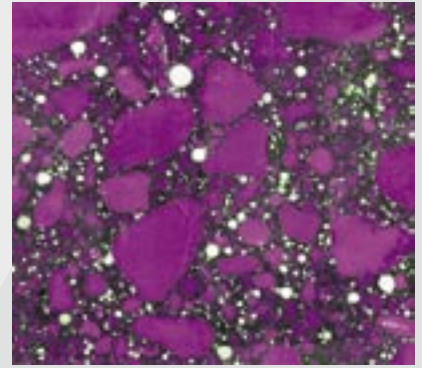
Van Dam is also Co-Director of the *Master's International Program*, where he shares his own Peace Corps experiences from his work in Tanzania and recent water projects in Kenya. He completed his PhD at the University of Illinois after consulting in pavement evaluation. Arriving at Michigan Tech in 1995 at a time when there was limited equipment, Van Dam teamed up with many others to establish the current funding and expanded facilities for the *TMRC*. Van Dam exclaims, "Our job is to create. That creation can involve new ideas or imaginative approaches to doing something. That's what I love—working in an environment that facilitates this kind of collaboration."



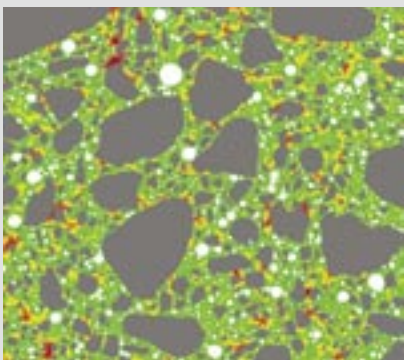
Reference 5x6 mosaic of images from stereo microscope



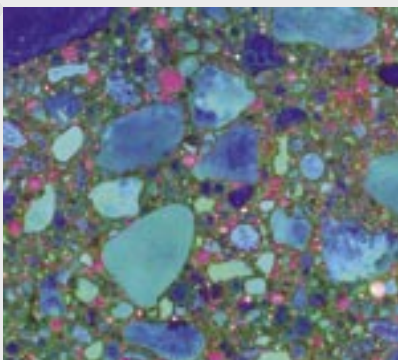
False color composite RGB image of scanner images



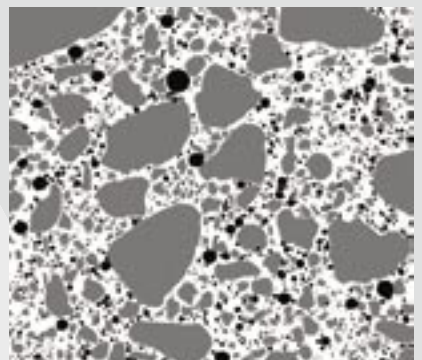
Scanner data input into classification algorithm



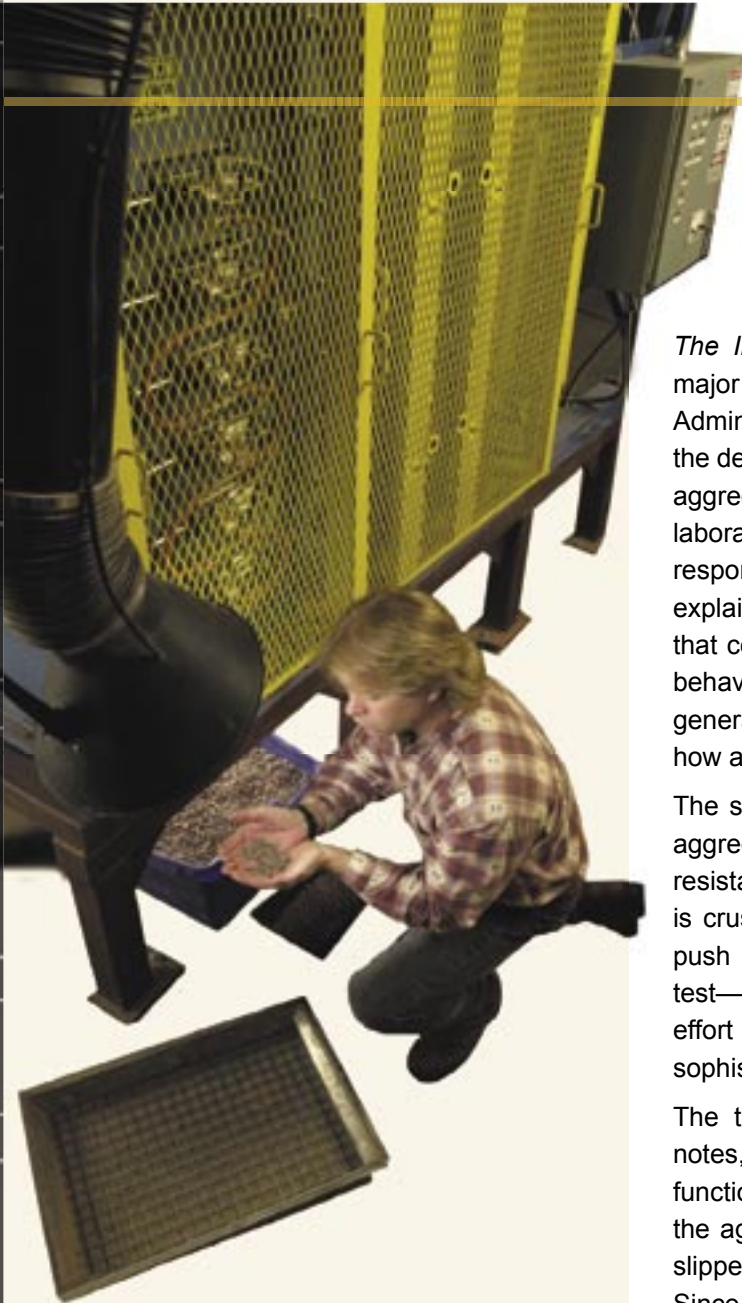
Distance to nearest air void image



Principal component image from scanner input



Classified output image



The Institute for Aggregate Research

The Institute for Aggregate Research is implementing three major research projects funded by the Federal Highway Administration (FHWA). One project is focused on improving the design of roads: specifically, it addresses the stiffness of the aggregate base. The first step was the creation of innovative laboratory test equipment that can accurately measure the response of the base. Director of the Institute Dr. Stanley Vitton explains, “We needed to develop additional test equipment that could make more accurate measurements of how the soil behaves under stress. We have built that equipment and have generated some fascinating results that are going to reshape how aggregate stiffness is measured throughout the US.”

The second project deals with asphalt pavements. When fine aggregate is round like marbles, the asphalt doesn’t have much resistance to rut formation in the road. If that fine aggregate is crushed and very angular, it tends to interlock and doesn’t push out as much, resulting in fewer ruts. There is an FAA test—fine aggregate angularity—that Vitton will address in an effort to “create more scientifically robust standards and more sophisticated ways of testing.”

The third project will study the friction of roadways. Vitton notes, “The ability to stop on asphalt pavements is primarily a function of the aggregate. The problem with our roads is that the aggregate tends to polish over time, and then it becomes slippery, has reduced friction, and is more difficult to stop on.” Since increased friction often leads to increased noise, the Institute will also address the issue of roadway noise.



New Student Chapters and Coursework in the Field

Dr. Vitton is the faculty advisor for two new student organizations: the *International Society for Explosive Engineers (ISEE)* and the *National Stone, Sand, and Gravel Association (NSSGA)*. The *ISEE* will be the only chapter in the country affiliated with Civil Engineering and will focus on explosives as a means to make aggregates. In fact, the CEE department now offers blasting certification for students, and Vitton has introduced a course entitled *Aggregate Engineering*, which will cover the complete cycle of aggregate production.



Dr. Stanley Vitton

Dr. Stanley Vitton is a renaissance engineer: he has built his own portable wind tunnel, patented seismic instruments for predicting tornado touchdowns, and studied elusive earth tides. Vitton’s core expertise lies in Geotechnical Engineering—he earned his PhD from the University of Michigan after completing his Master’s degree at Michigan Tech in Mining Engineering. Vitton left the area for 18 years and worked for Shell Oil’s Mining Company on projects in the western US, eventually returning to his hometown and alma mater 11 years ago.

Results With Impact

Deep within the hallways of Dillman's third floor are offices bustling with activity—activity not normally found in a civil and environmental engineering department. The 17 Michigan Tech employees there (11 are Michigan Tech grads!) are focused on civil engineering technology transfer (T2), along with development and implementation of management systems for public infrastructure.

Michigan Local Technical Assistance Program (LTAP)

LTAP is a state and federally funded program serving local agencies with responsibilities for roads, streets, and bridges. Housed under the Michigan Tech Transportation Institute, *LTAP* engages in a wide variety of technology transfer activities, from organizing statewide conferences such as the County Engineers Workshop, to topic-focused trainings such as erosion control, maintenance welding, and presentation skills. Directed by Terry McNinch, *LTAP* also publishes a quarterly newsletter, *The Bridge*, which highlights new technologies and addresses issues that impact local agency engineers, maintenance workers, and decision-makers. The program's success is due to the diverse background of its staff, who have degrees in civil engineering, technical communication, computer science, and information systems.

RoadSoft-GIS: A Transportation Infrastructure Management Solution

Transportation Asset Management. Today it's a buzz word, but implementation in Michigan actually began back in the early 1990s when the *LTAP* staff, MDOT, counties, and cities saw the need for roadway management system software. MDOT provided the funding and *RoadSoft®* was born.

Over the years, the staff of the *Technology Development Group (TDG)*, also directed by McNinch, has turned *RoadSoft* into a full-featured GIS-based management system. Over 200 local agencies in Michigan currently use the software, which is provided to public agencies at no cost. In November 2005, the Michigan Transportation Asset Management Council selected *RoadSoft* as the statewide analysis tool to assess the performance and future investment needs of 44,000 miles of federal aid streets and highways. This analysis will be part of the recommendations made by the Council to the Michigan Legislature.



Michigan's Local Technical Assistance Program



Terry McNinch and the LTAP/TDG Staff

Terry McNinch came to Michigan Tech in 1980, earned his BS in Scientific and Technical Communication in 1992, and joined *LTAP* as a technical writer. In 1998, he assumed the *LTAP/TDG* director position, at the same time earning his MS in Rhetoric and Technical Communication. Proud of what the *LTAP/TDG* staff has been able to accomplish, McNinch states, "Having a staff that can turn ideas into reality and then generate even more good ideas is the key to the *LTAP/TDG* success."

Diane Benda, *Staff Assistant & Writer*
Chris Codere, *Office Manager*
Tim Colling, *Assistant Director*
Mary Crane, *Software Engineer*
Steve Kangas, *Software Engineer II*
Nick Koszykowski, *Software Engineer II*
Nancy Moore, *Software Engineer*
Luke Peterson, *Software Engineer I*
Chris Pinnow, *Applications Programmer*
Mike Pionke, *Software Engineer II*
Jason Poll, *Programmer & Analyst*
Scott Pollins, *Software Engineer*
Robbie Potter, *Office Assistant*
John Ryyanen, *Staff Assistant & Technical Writer*
Gary Schlaff, *IT Production Manager*
Devin Seppala, *Office Assistant*
Fernando de Melo e Silva, *Civil Engineer*

Sustainable Development in Engineering



The Sustainable Futures Institute

The Sustainable Futures Institute has been developed from the grass roots level—students, staff, and faculty have worked together on their mission to “create and disseminate new tools, methods, knowledge, and technologies that promote, enable, and support environmental, economic, and societal sustainability principles.”

Established in 2003, the *SFI* is comprised of approximately 60-80 faculty and staff, headed by Co-Directors Dr. James Mihelcic from Civil and Environmental Engineering and Dr. John Sutherland from Mechanical Engineering – Engineering Mechanics.

The *SFI* has become an education and research leader on sustainability initiatives related to water, air, and energy; environmentally conscious manufacturing; green engineering; public policy; and other areas. Pre-college education is also a priority. The development of an *Environmental Curriculum* for middle and high school students, in collaboration with the Western Upper Peninsula Center for Science, Mathematics and Environmental Education, has several lesson plans that focus on green building strategies, alternative transportation systems, and more efficient use of resources. The *SFI* is also working to enhance classroom and workplace diversity by partnering with Southern University and A&M College in Baton Rouge, Louisiana.

Students Make the Difference

Dr. Mihelcic proclaims, “Many students are coming here because they can work on their graduate certificate in Sustainability. They are from all over the US and the world—Wyoming, Washington, Papua New Guinea, Mexico, and many other places—which is quite exciting!”

Josh Cowden, originally from Wyoming, came into the CEE department in 2003 with a Bachelors degree in Zoology. A part of the *SFI* since its beginning, Cowden has found its student-centered approach impressive. He adds, “The best thing has been being able to meet others who are engaged in this topic, but who are addressing the issues very differently. We all benefit from each other’s learning.”

Cowden has been exploring domestic rainwater harvesting technologies for urban areas, urban metabolism, and the impact of urbanization on hydrology. In his PhD program, he will be doing hydrological modeling based upon his research on urban slums located around the world. Summing up his experience, he states, “*SFI* has definitely broadened my outlook on life. I believe *SFI* is going to be a very powerful force in the future direction of Michigan Tech.”



International Mondialogo Award

An international student from Papua New Guinea, Helen Muga has been with the *SFI* for two years now. Her research is focused on Sustainable Systems, and she will be researching pathogen removal in decentralized wastewater treatment systems, integrating it with water reuse. With a background in Chemical Engineering, she reiterates Cowden's evaluation of the *SFI*'s multidisciplinary approach: "It has enabled me to work with professionals from diverse backgrounds, which has expanded my knowledge base considerably." When she completes her PhD, Muga would like to continue to implement projects in developing world, and become instrumental in educating young engineers.

Helen Muga was one of the team of *SFI* students who received the *International Mondialogo Award*, sponsored by DaimlerChrysler and the United Nations Education, Scientific and Cultural Organization (UNESCO). Another team member, Dan Nover, is based at Pardo State University in the Philippines as part of Michigan Tech's Master's International Program. The *SFI* members received this prestigious honor in 2005 for their research supporting the use of sustainable construction materials in the developing world.

Muga notes that this was initially a Senior Design project which they took to the next level, as she explains, "We were looking at substituting natural materials from the environment into cement, and determining whether the cement was of comparable strength. We collaborated with Dan Nover, who was in the Philippines, because there was availability of these natural materials—volcanic and rice husk ash."

Dr. James Mihelcic

"Sustainability needs to be integrated throughout the whole curriculum so that students naturally address it with every decision that they make—they need to consider the carrying capacity, impact on community, appropriate technology, and environmental impact. I believe that we are making progress on this goal."

Dr. James Mihelcic is Vice President of the *Association of Environmental Engineering and Science Professors (AEESP)*. He has devoted extensive professional time in the Dominican Republic, Jamaica, Vanuatu, and Honduras working on community-based engineering projects. Dr. Mihelcic was awarded the *AEESP-Wiley Interscience Award for Outstanding Contributions to Environmental Engineering & Science Education* and has also received the CEE Department's *Outstanding Faculty Award*.



Center for Water and Society



Established in June of 2005 under the *Sustainable Futures Institute*, the *Center for Water and Society* has over 50 members from various departments at Michigan Tech.

Director Dr. Alex Mayer describes its purpose: “The mission of the *Center for Water and Society* is to provide multidisciplinary perspectives and tools to manage local, regional, and international water-related problems.” The Center is overseen by an advisory committee of faculty from diverse backgrounds, including Social Sciences and Humanities. Mayer has designed and introduced the course *Water and Society*, and a degree program in this area is also in the works. Outreach through the *Western Upper Peninsula Center for Science, Mathematics and Environmental Education*, as well as a through a proposed Water Extension, will provide expertise and education for regional communities and students, addressing important water issues. Mayer notes, “For example, one vision for the *Center for Water and Society* is to become a Think Tank to resolve Michigan water issues.” The *Center for Water and Society* is currently planning a seminar series and a symposium around these topics. For more information, go to www.mtcws.mtu.edu.

Dr. Judith Perlinger

Dr. Judith Perlinger and her research group are creating novel methods for quantifying trace concentrations of pollutants in the atmosphere and their deposition to surfaces, including lakes. Perlinger and her group have designed, fabricated, and are now testing these tools and methods in Lake Superior, which are presently being compared with conventional methods of measurement. These innovative tools enable a more accurate and comprehensive understanding of the pollutant atmospheric transport process.

With a background in air and water quality, Dr. Perlinger teaches the foundation, chemical processes, and regulations and policy in Environmental Engineering. Her graduate courses focus on assessing organic contaminant behavior in the environment and boundary layer meteorology. Pictured at left, students are directly involved in fieldwork, taking measurements with these cutting-edge tools on the USEPA's R/V Lake Guardian.

Dr. David Watkins

There is evidence that the global climate is becoming more variable, and with that comes more extremes. Dr. David Watkins, an Associate Professor in water resources, perceives pressing needs and opportunities around the world: “What is exciting is to address those issues within the context of sustainability—looking for solutions that are economically efficient, socially equitable, and that also protect the environment.” His research work in decisions support systems for water resources management in the industrialized world looks at the state-of-the-art technology that is available for forecasting, addressing uncertainties, and making water management decisions that hedge against contingencies while also being economically efficient and environmentally sound. The challenge arises in taking those technologies and adapting them so that they are appropriate in developing world situations.

Center for Science and Environmental Outreach

Up to 225 elementary students and parents attend Family Science Nights sponsored by the *Western Upper Peninsula Center for Science, Mathematics and Environmental Education*. “Where else can children dig for fossils and examine real dinosaur scat or design a wastewater treatment process, all in a forty minute lesson?” exclaims Education Program Director Joan Schumaker Chadde.

The mission for the Western UP Center is to enhance the teaching and learning of mathematics, science, technology, and environmental education in 20 school districts of the five western counties of the UP. With an office at Michigan Tech, the Center provides a variety of education, skill-building, and community service opportunities for CEE students. Through the *Communicating Science* course that Chadde teaches, students gain actual teaching experience when they plan, develop, and conduct activities for Family Science Nights.

In addition, the Center offers a diverse range of six-week after-school classes for students in grades 1-8, taught by Michigan Tech students. Another popular Center-sponsored program is the annual Western Upper Peninsula Science Fair for students in grades 4-9.

Western UP Center Partnerships and Projects

Forming strong and productive partnerships, the Center has formed a central collaboration with the CEE Department and regional Intermediate School Districts (ISDs). Chadde works in tandem with Kristine Bradof, the Community Programs Coordinator of the *Center for Science and Environmental Outreach*.

In 2003, the Department of Environmental Quality selected the Center to develop three Michigan Environmental Education Curriculum units for middle school students: *Ecosystems & Biodiversity*, *Water Quality*, and *Energy Resources*. This project spawned the development of 18 interactive web modules for students in grades 4-9 in partnership with Michigan Tech’s *Techalive* under the leadership of Dr. Marty Auer.

Joan Schumaker Chadde Education Program Coordinator

Joan Schumaker Chadde reflects the dynamic activity she promotes: her world is filled with creativity, opportunity, and the freedom to combine her favorite interests in natural resources, water quality, and education. Chadde earned an MS in Water Resources in 1984 from the University of Wyoming. She returned to Michigan in 1995, and completed her secondary science teaching certificate through Michigan Tech in 1998.

Education Excellence Awards

The Center received two *Education Excellence Awards* for its Family Science Night Program and Kids Make A Difference Program from the Michigan Association of School Boards. In 2005, the Center received the *Lake Superior Binational Environmental Stewardship Award* for outstanding Youth Programs, recognizing the educational outreach programs delivered to students, teachers, and communities from 2002-2004.



Atmospheric Sciences

The PICO-NARE Station

“Impossible” is a word that Michigan Tech professors and students do not find in their vocabulary. “An impossible site to establish a field station,” is how researchers first described the location of the current PICO-NARE station in the Azores. That opinion did not stop Dr. Richard Honrath and CEE students from forging ahead to build a high-altitude station on Pico—the central island in the midst of three island groups located between North America and Portugal.

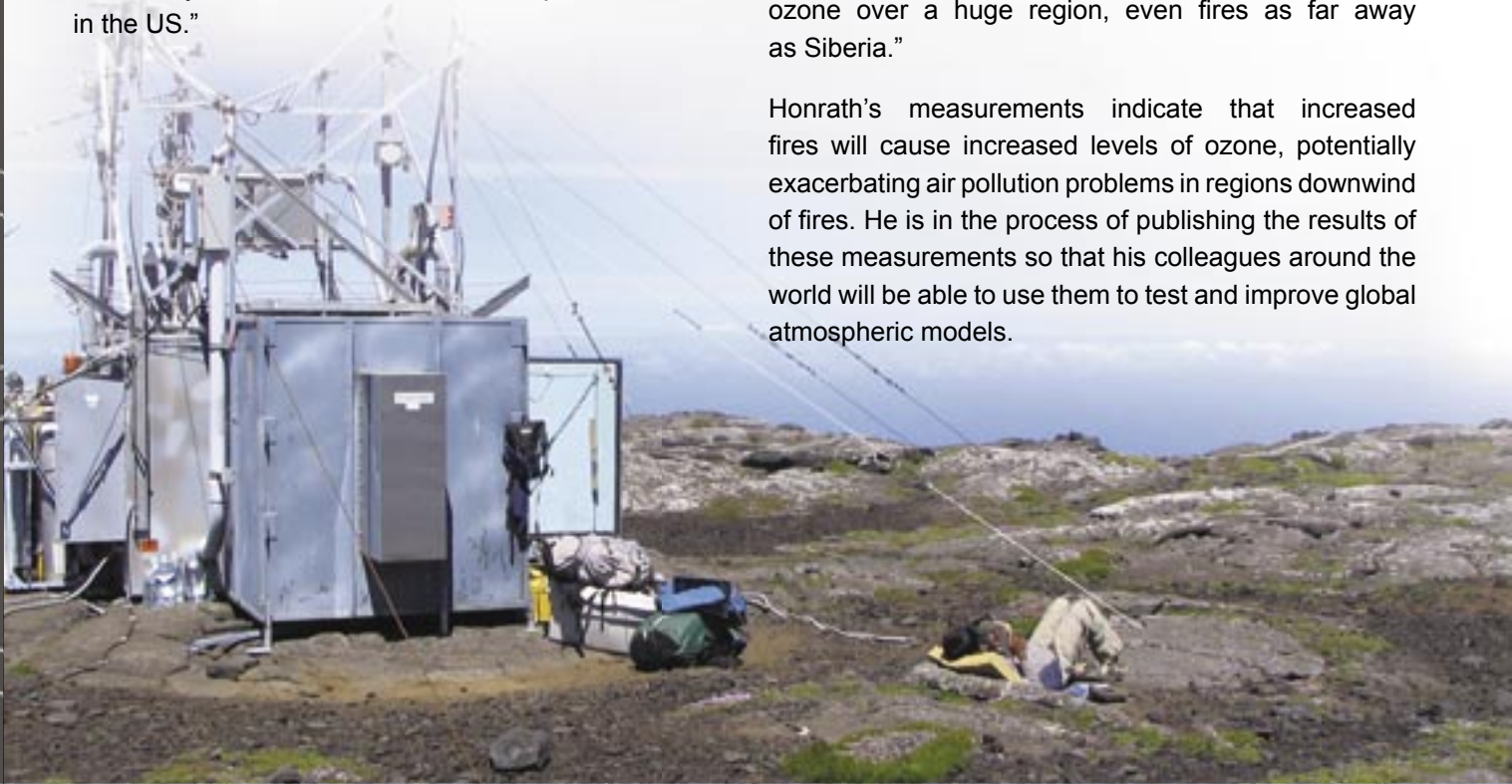
Pico Mountain has been the perfect spot to study air pollution from North America that has aged, after traveling over the Atlantic Ocean. Honrath states, “There are some chemical reactions that happen quickly and cause ozone problems over the east coast; but there are some pollutants in the air that are continuing to react as the air is traveling over the Atlantic. These affect the global atmosphere and pollution levels in Europe the same way that Asian emissions affect pollution levels in the US.”

Several PhD students—Maria Val Martin, Chris Owen, and Kateryna Lapina—have spent time at the PICO-NARE station, studying issues related to pollutants in the air. Most often, the station instrumentation operates automatically, and data is transmitted via cell phone modem, which is posted on the Michigan Tech website at www.cee.mtu.edu/~reh/pico.

Levels of carbon monoxide and ozone have been recorded since 2001. Higher levels of ozone have been found in the Azores than were expected based upon measurements made closer to North America. Currently, Honrath is working with researchers who use global atmospheric chemical models in an effort to fully understand and explain these results.

Most compelling about the research is the correlation between even higher levels of carbon monoxide and forest fires happening each year in Alaska, Canada, and Siberia. Honrath explains, “The emissions from those fires travel around the world, and in years where there are many fires, a lot more carbon monoxide is produced. We also found that forest fires will affect ozone over a huge region, even fires as far away as Siberia.”

Honrath’s measurements indicate that increased fires will cause increased levels of ozone, potentially exacerbating air pollution problems in regions downwind of fires. He is in the process of publishing the results of these measurements so that his colleagues around the world will be able to use them to test and improve global atmospheric models.



Upcoming Research

Recognizing that long-term data records are extremely valuable, Honrath has spent part of his recent sabbatical creating an avenue to make certain that these measurement studies at Pico continue—he is working on donating the PICO-NARE station to the Portuguese government. In turn, the government will make it a global atmosphere watch station, which Honrath acknowledges, “will be an excellent, long-term resource for the scientific community.”

With changing priorities, Honrath has recently submitted a proposal to return to Greenland to study the photochemistry that takes place in snow. A CEE study in 1999 revealed a variety of interesting chemical reactions that happen in snow, including the release of NO_x, which is a chemically active form of nitrogen oxide. Honrath adds, “There is an international polar year coming up in 2007 – 2008, so there will be a large amount of research in the polar region on these atmosphere-snow chemical interactions.”

Dr. Richard Honrath

Unable to resist the solid reputation of CEE or the beautiful rural environment of Michigan Tech, Dr. Richard Honrath made his move here in 1992 after completing his PhD at the University of Alaska-Fairbanks. Since that time, he has discovered many elements that make Michigan Tech unique. He especially enjoys the flexibility that comes with a smaller school. Collaboration takes place more easily across departments. And, he notes, “We are still growing rapidly in terms of research activity; there is a great drive here to carry out innovative research.”

Honrath teaches courses in atmospheric and environmental chemistry, and air quality science and engineering. He also oversees the *Atmospheric Sciences Journal and Seminar Club*, which offers graduate students studying the atmospheric sciences perspectives from other universities. The close contact with CEE students and personal relationships that he develops are paramount to the work that he does.

The PICO-NARE station is located on the summit caldera of Pico mountain, an inactive volcano on Pico island in the Azores, Portugal (38 degrees, 28.226 minutes N latitude, 28 degrees, 24.235 minutes W longitude, 2225 m altitude).

New PhD Program in Atmospheric Science

Plans are in the works to formalize a new PhD program in Atmospheric Science. Faculty from the Physics, Geology, Chemistry, and Forestry Departments, along with Dr. Honrath and other CEE faculty will lend their expertise to this area. Excited about the opportunity to promote interdisciplinary research, Honrath proclaims, “This program will be quite cutting-edge in that it spans across gases, particles, and the natural and human impacts on the atmosphere, such as pollution and forest fires.”



International Expeditions

Master's International Program



The Master's International Program, International Senior Design, and Engineers Without Borders (EWB): three unique, service-based opportunities available through the Civil and Environmental Engineering department at Michigan Tech. Michigan Tech is the only university in the US to offer all three options, leading the way in global engineering education.

The *Master's International Program* at Michigan Tech is available in four departments: Forestry, Geological Sciences and Engineering, Civil and Environmental Engineering, and Education. The program is typically a year of coursework and then two or more years of training and service with the Peace Corps. "We are the only Civil and Environmental Engineering *Master's International Program* in the country," proclaims Dr. Mihelcic. Students have served in 16 different countries. In 2005, there were 24 students serving overseas and 12 more who started their coursework. Students have worked on engineering projects related to water supply and treatment, wastewater treatment, solid waste management, public health training, construction, and water resource management.

Lauren Fry came to Michigan Tech with a BS in Physics degree and completed the *MI Program* in Environmental Engineering in 2000. Her Peace Corps assignment was through the Ministry of Agriculture in Cameroon, West Africa. Working with local communities to implement water supply and sanitation projects, she built latrines and implemented four spring box projects. Fry explains, "A spring box is a concrete box that is built around natural springs to store water and protect them from pollution. Where I was living, there were a lot of natural springs already used for water collection, but they were open to a variety of pollution sources. This was a very simple and appropriate technology that could be implemented on a small scale and easily funded. The community supplied the local materials and labor to complete the project." These spring boxes provide potable water to communities of 300-500 people, and despite Fry's departure, local people continue her work because they understand the technology and are able to effectively solve any challenges that arise.

Dr. James Mihelcic, Co-Director of the *Master's International Program*, explains the importance of worldwide engineering experiences: "We need to graduate people who can successfully interact in a global economy so that they will be able to integrate culturally and have skills that will enable them to engineer sustainable development to solve important social issues like the eradication of poverty, improvement in health, or the empowerment of women."

Creating New Knowledge

“*Master’s International* is a research-based program dedicated to creating new knowledge, and many of our students go on to publish the results of their work in scholarly journals,” states Dr. Mihelcic. Fry describes her research focus: “I wanted to explore the relationship between my engineering project and the health of the community. I was able to show, by doing health surveys before and after building these spring boxes, that there was a significant decrease in the incidences of diarrhea. It was very exciting to see real statistics that demonstrated a direct positive impact on the community.” Fry is expanding on that topic in her PhD program at Michigan Tech: “*Master’s International* inspired me to go further, showing me the need for this kind of research. I would like to examine how public health is impacted by engineering infrastructure, and then connect that with global poverty.” Lauren Fry is editor of the International Engineering newsletter; for more stories, go to www.cee.mtu.edu/sustainable_engineering.

The *MI Program* also creates opportunities for students to become leaders in their fields. The people they work with in developing countries often look to them as experts. Students carry out the design and implementation of projects, as well as learn how to fundraise and organize communities. The professional development that comes with this experience is invaluable.

Dr. Kurt Paterson, a faculty advisor for *EWB*, reveals the power behind the innovative combination of service, learning, service learning, and research: “Students coming into CEE can begin their understanding of international engineering complexities through service projects in *Engineers Without Borders*. The next step would be classroom learning—exploring social, cultural, economic, and technical challenges via our *International Sustainable Development Minor*. Students can then apply this knowledge in an *International Senior Design* project. Lastly, to gain deep experiential learning, students can pursue international research through the *Master’s International Program*. These experiences will create a very different breed of engineer.”

Other Unique Opportunities

Another unique aspect is the language and cultural training that takes place. Students are becoming fluent in Spanish and French, and many have learned other languages. A first-year *MI* student, Beth Myre came to the CEE department with a degree in German and Linguistics. Her multilingual background will facilitate an easier immersion into a culture with a different language. After a year of engineering classes at the University of Cincinnati, Myre has jumped into her *MI Program* here, with recent courses like *Field Engineering in Developing Countries* and *Community Development and Planning*. She also went on the first *EWB* trip, and was deeply affected by the experience: “For me, the trip to Bolivia was the first chance that I have had to see engineering in action. It was the perfect introduction to the field. It also helped me really believe that I could be an engineer.” Myre recognizes how the international programs are all interconnected, noting that many students who take *International Senior Design* join *EWB* and approximately 75% of the *MI* students are also in *EWB*. She adds, “One of the most exciting things about being here is being surrounded by all these people who genuinely care about sustainable development and who are using engineering to improve people’s quality of life.”



International Senior Design Program

“Students enroll thinking they will do a senior design project to benefit people of the developing world; and they do. But in the end, many students also see the experience as life changing. It is more than a senior design project—it is a class on life. For me, it is a dream job because it goes straight to the heart in so many ways. —Linda Phillips, ISD Advisor

Construction work in underdeveloped areas is typically less complicated and often carried out with basic tools, creating excellent learning opportunities for undergraduate students. The *ISD* classes involve two weeks of volunteer construction work in the developing world to learn tools, techniques, and materials. Students also meet with people from the community and gather data for their design projects while in-country. Returning to Michigan Tech, students then generate feasibility analyses, preliminary designs, and final engineering design documents. In addition to engineering skills, they learn team building, creative problem-solving, and cross-cultural communication. The *ISD* program also uniquely incorporates the direct experience of Michigan Tech alumni, who work in tandem with students, providing valuable mentorship, passing along their professional and technical expertise to these future generations of engineers.

Linda Phillips

Linda Phillips has over 20 years of industry experience in the management of design and construction projects in both heavy and building construction. Phillips is a registered Professional Engineer, a Project Management Professional (PMP), and a Certified Documents Technologist (CDT). She received the CEE Department *Howard Hill Teaching Award* in 1999 and 2000. In 2004, Phillips advised the Bolivian ISD Team, *Equipo Septico*—Leslie DellAngelo, Chris Fehrman, and Kimberly Kimmes—that won third place in the *Parsons Brinkerhoff Environmental and Water Resource Student Design Competition*.

Projects and Construction

Linda Phillips, a lecturer at Michigan Tech since 1998, began the *International Senior Design* program in January 2001, with a trip to Bolivia with 12 students. To date, 105 students have participated, and of that group, 10 have returned to complete additional projects! This experience, however, is not limited to CEE engineers. Currently, Dr. Sandra Sandoval’s Spanish class is translating engineering reports into Spanish, so that they can be distributed to Bolivian “clients.”

The Walter Henry School in Santa Cruz, Bolivia, has been one of the ongoing construction sites for the *ISD* Program. Volunteers, students, and local labor have built new school rooms each year. This school has grown from seven to over 200 students! In 2005, two classes worked in Bolivia, adding another four rooms to the school. They also designed school septic systems, formulated plans for storm drainage problems, conducted a structural analysis, and performed a feasibility study for wetland reclamation. Three former *ISD* students returned as mentors: Marc Plotkin ‘01, Tim Elmore ‘02, and Tim Martin ‘03. To see other *ISD* projects, go to www.cee.mtu.edu/projects.

“The biggest changes didn’t happen in Bolivia or a week after I got home. They happened weeks and months afterwards. I look forward to those specific or gradual changes with an open mind and a broader view of life. Thank you for allowing me to participate in your adventures.”

—Justin DeLorit, *ISD*
Environmental Engineering

Engineers Without Borders

The National Mission: "EWB-USA partners with developing communities to improve their quality of life through the implementation of environmentally sustainable, equitable, and economical engineering projects while developing internationally responsible engineers and engineering students."

A Michigan Tech chapter of *EWB* began in spring of 2005 with the efforts of two CEE students, Mary Warren and Amy Curtis. Luke Pachal, a Civil Engineering senior, has been involved since the beginning and is now serving as the president of the organization. Pachal states, "*EWB* provides an unbelievable, and unmatched, level of experience. The heart and soul that people put into it is really quite amazing." *EWB* is open to all students in any discipline, from freshmen to PhD candidates, and has already grown to approximately 75 members. Pachal adds, "It's really opened my eyes to see how what I do in the future is going to impact a community." Although he is graduating soon, Pachal plans to work with a local *EWB* chapter in his new location.

Dr. David Watkins



"In water resources planning, we often say that our goal is to do more good than harm. In working with students in *EWB*, it is very clear that the balance is tipped towards good, not only in terms of the help that we provide to communities, but also in the personal development of the students

and their potential to make positive contributions throughout their careers."

Dr. David Watkins is committed to making positive contributions to society in whatever realm he is working. Originally from Pennsylvania, Watkins completed his PhD at the University of Texas in 1997 and then worked for the Army Corps of Engineers before coming to Michigan Tech in 1999.





The First International Project

Laura Oman, an Environmental Engineering sophomore, joined *EWB* as a freshman and is now the vice president. Like Pachal, she is hooked on her experience with *EWB* and is inspired to develop future projects. Oman went to Bolivia in November 2005 with *EWB* faculty advisor Dr. David Watkins, Dr. Kurt Paterson, and six other students. This was *EWB*'s first implementation trip, and they built a sanitation system—designed by a previous International Senior Design team—for a rural elementary school in the village of Buen Samaritano, Bolivia. Oman reveals, "I learned about interacting with people from other cultures, even though I don't speak Spanish very well. You can really say a lot with your face, your gestures, and drawing in sand to get your point across."

Both Watkins and Paterson believe *EWB* is a crucial component in implementing the designs completed by *International Senior Design* students. Watkins notes, "These are sound, sustainable designs with appropriate technologies. Communities have knowledge and labor resources, but often don't have the financial resources necessary for construction. This is what prompted the start of *EWB* at Michigan Tech."



What's next for *EWB*?

-  A community project in Guatemala to develop safe drinking water
-  Partnership with the Copper Country Guatemalan Accompaniment Project
-  Raising funds and volunteers from local communities
-  Finding corporate sponsors for upcoming projects



International Railroad Engineering

In the early 1960s, there were 850,000 people in the US railroad industry; by 2004, this number had decreased to 200,000. During this period, most universities eliminated their railroad engineering courses and faculty. Today, an ever-increasing demand for freight rail transportation and the reality that many railroad engineers in management are close to retirement have created a critical need for more railroad engineers. Responsive to the changing world, Michigan Tech is becoming known nationwide for its international summer program in railroad engineering.

Dr. William Sproule and Pasi Lautala, a PhD student from Finland, are the coordinators of this unique program. Lautala has also begun developing partnerships between the industry and the university, which have generated much interest in Michigan Tech. According to Sproule, “Last year, five of the six largest railroad companies were on campus interviewing potential railroad engineers.”

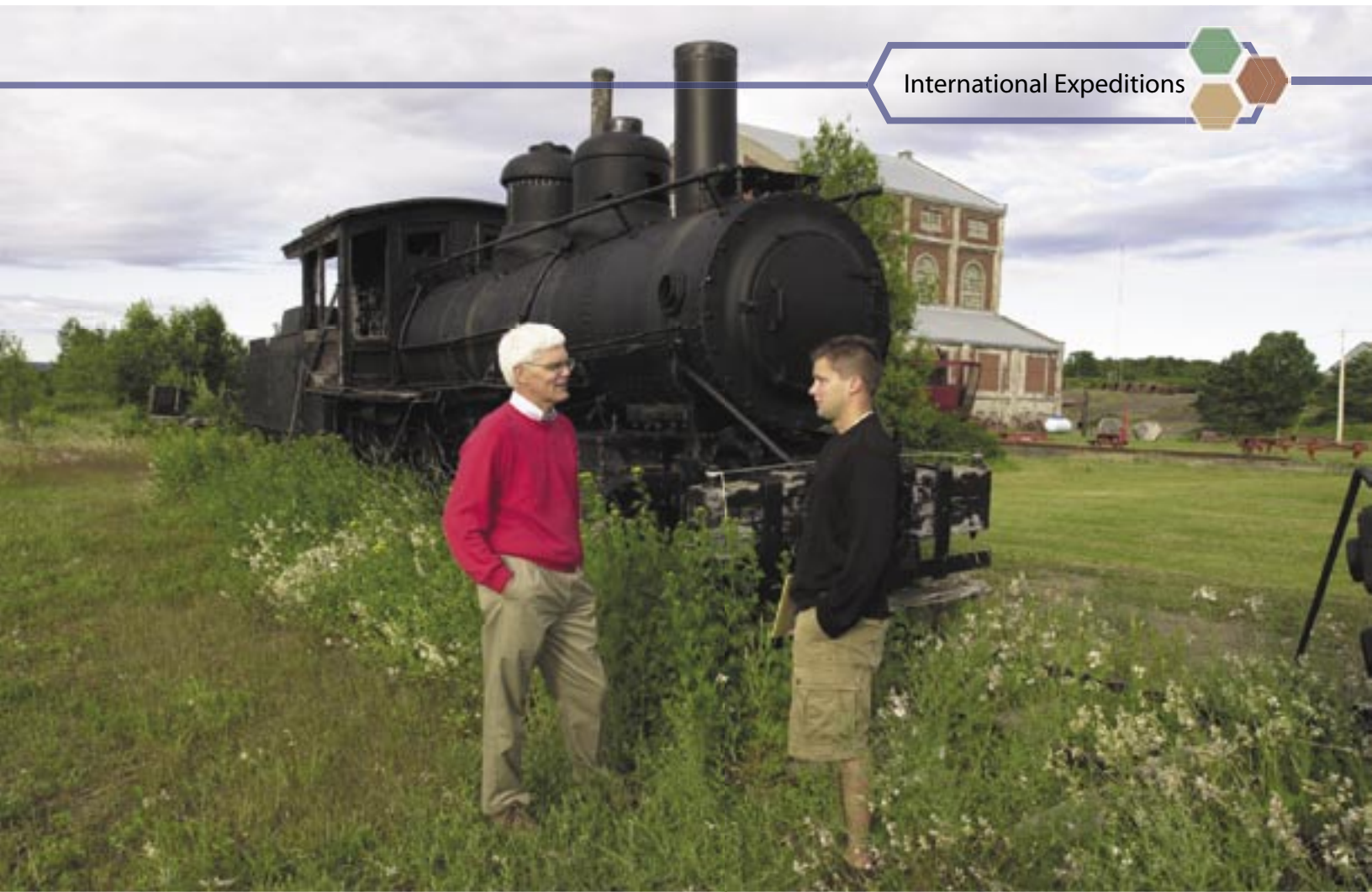
Pasi Lautala

Pasi Lautala consulted for the railroad industry in Chicago after he completed his Master's degree at Michigan Tech in 1997. In 2003, he returned to begin his PhD program and to create the summer railroad engineering program. Lautala says, “We received an incredible response from the railroad industry in the US. I decided to use my dissertation to address these important issues.” Lautala is creating another first for Michigan Tech—applying to the *American Railroad Engineers and Maintenance Association (AREMA)* to form the first student chapter ever for any railroad association.

A Finnish Collaboration

Students spend one week on campus, and then go to Chicago to visit an intermodal yard, a railroad classification yard, and an urban transit rail operation. Finally, they spend three weeks in Tampere, Finland, at the Tampere University of Technology, conducting engineering design work and touring rail facilities. Several students have since graduated and gone on to work for railroads.





Dr. William Sproule

Teaching and hockey are common pursuits in the Houghton area, especially for Dr. Bill Sproule. Michigan Tech provides a foundation in both for Sproule, whose background includes transportation planning, traffic engineering, airport design, and public transit expertise. He recently introduced courses in traffic safety and consulting firm management. Sproule also coaches hockey, and teaches *Hockey History and Culture* in the freshman *Perspectives on Inquiry* course. He explains, “It’s wonderful to be able to contribute so many things to Michigan Tech and the community here.”

Originally from Sault Ste. Marie, Ontario, Sproule graduated from MTU and then returned to Canada to work in the Toronto area. After receiving his PhD from Michigan State University, he taught at the University of Alberta in Edmonton before returning to MTU in 1996. Sproule has found his place here in Traffic Engineering; he notes, “We have a student chapter for the Institute of Transportation Engineers, and we have more student members than any other university in the world.”

His varied research projects often have regional impact: “For the Keweenaw National Historic Park, we examined transportation systems in order to link together parts of the park—we considered streetcars, steam locomotives, and other modes of transportation. We assisted with a study of log truck safety in the UP, and are now involved in a project for improving rail systems in Wisconsin and the UP.”

Sproule’s current interests include several books in the works: one on airport design, one on automated transit systems, and another on local hockey history. In addition, his current PhD students operate diverse programs that run the gamut from railroad engineering education to bicycle facilities to traffic safety for elderly drivers. Finally, he expresses the desire to recruit Canadian students and build partnerships there: “Canada is the largest trading partner of the US. Today, lots of firms are establishing Canadian operations which afford many more opportunities to link with Canada.”

Student-Centered Ventures



What does it feel like to paddle a concrete canoe?



"It feels like you are paddling a regular canoe with a big anchor behind it. You have to put forth a lot of effort to get it going, but once it is going, it cruises along pretty nicely," describes Erron Peuse, a CEE graduate student who has competed in the last three years of competitions.



Concrete Canoe Competition

For almost all of the 220 Civil Engineering departments at universities across the country, the National Concrete Canoe Competition has become a popular and prestigious event. With over 200 regional teams competing in 25 different regions, these races have created a huge splash with sponsorship from the *American Society of Civil Engineers (ASCE)*. A team of Michigan Tech students placed third in the 2005 National Competition—their highest ranking ever!

Concrete Canoe History

Michigan Tech CEE students have been participating in concrete canoe competitions since the 1970s, but it was not until 1995 that they really became serious about winning. CEE students Dave Meyer, Dave Morland, and a few others worked with Dr. Bob Bailod to study the design reports and results of prior competitions. Based on what they learned, the students built a more competitive canoe and that year, the team placed very high in Regionals, kicking off the era of competitive concrete canoe teams at Michigan Tech.

Components of the Competition

Competitions are judged on four components: the design report, a presentation, the final product (which includes aesthetics and durability factors), and concrete canoe races in the water. The races include men's and women's races with two paddlers and coed races with four paddlers, two men and two women. In the upcoming 2006 competition, a new event has been added—the three-person paddling race. According to Co-Captain Sarah Nunn, "No one has ever done this before so I think anybody has a chance of winning, considering that this component will make it a completely different experience for everyone."

The Concrete Canoe Competition requires dedication and year-round participation—offering incredible learning opportunities along the way. Nunn states, "It has been a great experience in the engineering process because we are given a set of specifications, and we have to go out and design it, figure out how we are going to fund it, how we are going to build it, and go right from design all the way through construction and marketing."

Student Success Center Speaks for Itself

Descriptions from the student coordinators at the *Lee and Arleta Bernson Student Success Center* speak to its overwhelming success. Located in Dillman Hall, the SSC offers student coaching Sunday through Thursday evenings, and provides opportunities to sign up for study teams.

LeFevre, Craft, and McKenna oversee the day-to-day operations of the Center, setting up schedules and making certain that the volunteer coaches have what they need. Director Dr. Kurt Paterson assisted with getting the SSC started, and now supports the student coordinators in determining its direction.

Paterson describes how coaching has reinforced student learning: “One of the reasons students give for becoming a coach is that there is no better way to learn material well than to have to teach it.” Craft, a Civil Engineering senior, adds, “Until you try to teach it, you don’t realize how differently people can approach things. I understand the material so much better after teaching it to someone else.”



Elise Nyland coaches on Monday nights, yet she began coming to the SSC as part of a learning team for a class. These established learning teams meet weekly, and students are already making requests for teams for their upcoming semesters.

Now open 24 hours a day, the Center offers a quiet space to study, and has a resource wall of textbooks used in CEE courses. Nyland states, “Even if it is not during coaching hours, you can often find someone here who can help you.”

“A group of students working to help make their learning experience and the learning experience of fellow students better.” Corrie Craft

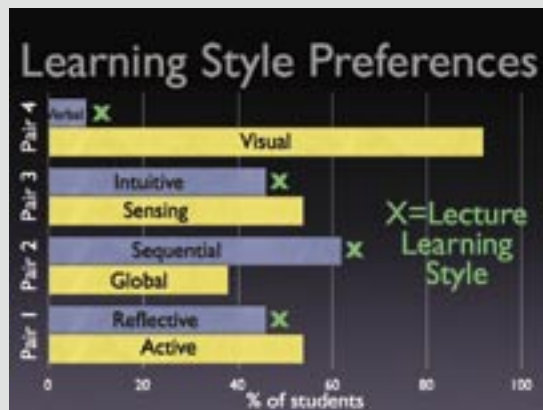
“A community learning environment with students helping other students so that everyone can succeed.” Greg LeFevre

“A cooperative learning experience that is more about teamwork than individual students.” Katie McKenna



A Shared Vision for the Student Success Center

The SSC is a reflection of the larger environment within the CEE Department, embracing the philosophy that individuals can, and do, make a difference in the world by working together to address a need. The Center was originally started by Dr. Paterson and students Aaron Tice and Tor Anderzen. The SSC now has 20 volunteer coaches who work with over 35 students a week, boasting a 129% increase from its start in the spring of 2004. Today, the SSC offers coaching in seven classes along with numerous learning teams.



This learning style assessment of environmental engineering students over the past five years paints a clear picture of our current student body. Today's students learn best in an active, sequential, sensory, and visual environment. Dr. Paterson is using his educational research findings to build more effective classes; so far, none of those classes are lecture-based.

Dr. Kurt Paterson

The exceptional reputation of Michigan Tech is what brought Dr. Kurt Paterson here in 1993 after he received his PhD from the University of Iowa. Since then, he has traveled the world overseeing student projects in the *Master's International Program* and participating in the global projects of *Engineers Without Borders*. Paterson describes, "There has been an explosion in international programs and opportunities. The boundaries between nations are becoming transparent, and engineers are going to be working with people all over the world."

Paterson has also created innovative courses which address contemporary issues: *Environmental Measurement Analysis*, *Air Quality and the Built Environment*, and *Experiences in Environmental Engineering*. He designed this last course as a way for freshman to meet upper classmates and other faculty. Paterson notes, "This class demonstrates that our students come into this program very motivated, thoughtful, and articulate. We have an outstanding group in this department."

Alumni support and a generous gift by Lee and Arleta Bernson have made the SSC one of the most comfortable, functional rooms in Dillman Hall. Because of its success, the SSC has also expanded into a room in Dow, converting this space into a project room for senior design work.

Paterson shares the future of the SSC: "I chose the name quite carefully because I didn't want it to be simply a learning center. Perhaps, we will establish a leadership program—a way for students in the department who want to go the extra step to distinguish themselves as leaders for the future."

The students also affirm the critical role of Julie Ross, Academic Advisor for the department, who handles countless administrative tasks for the SSC. Ultimately, Paterson declares, "The students are what make the *Student Success Center* work! If it wasn't for their time and energy, it would have never been as successful as it is now."





ACADEMY of Civil and Environmental Engineers

The tenth Civil and Environmental Engineering ACADEMY Induction was held on August 3, 2005. The ACADEMY was established in 1993 to recognize excellence and leadership in engineering and civic affairs of outstanding graduates and friends of the Civil and Environmental Engineering Department. Eight alumni were honored bringing the ACADEMY membership to 84.

New Academy Members:



Lee A. Bernson, P.E.
BSCE '65
Michigan Tech,
*Retired Owner/Director
Mathisen Tree Farms
Traverse City, Michigan*



William J. Bier, P.E.
BSCE '51
Michigan Tech
*Retired CEO
Dunn Construction
Engineering*



Debra A. Campbell
P.E., BSCE '76
Michigan Tech
MSCE '94
*University of Colorado
Director of Planning
Grand County, Colorado*



Paul B. Frair
BSCE '50, Michigan
Tech; *Retired
Vice President of
Operations
Herman Gundlach
Inc. of Houghton,
Michigan*



David I. Matson
BSCE & BEA '69,
Michigan Tech,
MBA '70, Western
Michigan University;
*Vice Chairman &
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Officer, Union
Bank of California
& UnionBanCal
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Michigan Tech
*President of Bridge
Design Associates,
Inc. of West Palm
Beach, Florida*



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'69, Michigan Tech;
*Retired Vice President
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based in Southeast
Michigan*



Richard D. Wilcox
P.E., P.S., BSCE '82,
BSLS '83; *President/
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 Harold S. Jensen, D.E. '52
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 David I. Matson '69
 Gerald J. McCarthy, P.E. '48
 Franklin D. Meyers, P.E. '57, Deceased
 Edward S. Neumann, PhD, P.E. '64
 Kenneth E. Noll, PhD, P.E. '59
 Melvin E. Orchard, P.E. '49
 John E. Paas, Jr., P.E. '41, Deceased
 Peter G. Perla, P.E., R.L.S. '38
 Rob L. Petroelje, P.E. '74
 Linda D. Phillips, P.E., P.M.P. '77
 David P. Post '56
 Joseph M. Post '50
 Damoder Pati Reddy, PhD, P.E. '62
 Delmar R. Rediger, P.E. '58
 Thomas J. Rentenbach, D.E., P.E. '32, Deceased
 Brian C. Rheault, P.E. '82
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 Robert F. Seaton '52
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 Theodore C. Williams, P.E., D.E.E.,
 Honorary Member
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 Norman D. Witteveen, P.E. '61
 Robert C. Wylie, P.E., R.L.S. '47
 Philip C. Youngs, P.E. '57, Deceased

MS & PHD Graduates & Advisors, Fiscal Year 2005

PHD IN CIVIL ENGINEERING

Numetu, Roger (2005) Advisor: Vitton, Stanley J.
A GIS-Based Slope Stability Analysis of the Appalachian Valley and Ridge Province Under Seismic Loading

Pang, Wei Chiang (2005) Advisor: Sandberg, L. B.
Corrugated Wood Composite Panels for Structural Decking

PHD IN ENVIRONMENTAL ENGINEERING

Baker, James R. (2005) Advisor: Mihelcic, James R.
Quantitative Structure Activity Relationships for Soil/Water Partition Coefficient and Biodegradation Potential

Chai, Yingtao (2005) Advisor: Urban, Noel R.
Study of Particle Movement in the Nearshore Region of Lake Superior With Radioisotope Tracers

Endres, Karen L. (2004) Advisor: Mayer, Alex S.
Optimal Design of Pump and Treat Remediation Systems: Treatment Modeling, Source Modeling, and Time as a Decision Variable

Hokanson, David R. (2004) Advisor: Hand, David W.
Development of Ion Exchange Models for Water Treatment and Application to the International Space Station Water Processor

Li, Hua (2005) Advisor: Barkdoll, Brian D.
Countermeasures Against Scour at Bridge Abutment

Luo, Jinjing (2004) Advisor: Hwang, Jiann-Yang
Enhanced Absorption of Gaseous Mercury on Carbonaceous Materials

MS IN CIVIL ENGINEERING

Arpke, Angela (2004) Advisor: Hutzler, Neil J.
Operational Life Cycle Tool Development for Commercial Buildings

Carlson, Jeremy M. (2005) Advisor: Sutter, Lawrence L.
Advancement on the Application of a Flat-Bed Scanner for Hardened Portland Cement Concrete Air Void Analysis

Colling, Timothy K. (2005) Advisor: Sproule, William J.
Common Sense Solutions to Intersection Safety Problems: A Nationwide Training Program for the Local Technical Assistance Program Centers

Coulter, Melzar L. (2005) Advisor: Williams, R. C.
Measurement of Hot Mix Asphalt Volumetric Properties by Thin Section

Cuellar, Kriselda (2004) Advisor: van de Lindt, John W.
A Design Check Method for the Steel Superstructure of Overhead Sign Support Structures

Gross, Adam D. (2005) Advisor: Mattila, Kris G.
An Investigation of Estimating Techniques for Michigan's Engineers Resource Library

Hallack-Alegria, Michelle (2005) Advisor: Watkins, David W.
Drought Frequency Analysis and Prediction in Sonora, Mexico

Hardyniec, Sara L. (2005) Advisor: Vitton, Stanley J.
Geotechnical Considerations Involved in the Analysis of Sand Angularity

Kethu, Sridhar (2004) Advisor: van de Lindt, John W.
Development of Steel Beam End Deterioration Guidelines

Kollmorgen, Glen A. (2004) Advisor: Ahlborn, Theresa M.
Impact of Age and Size on the Mechanical Behavior of an Ultra High Performance Concrete

Leow, Patrick M. (2005) Advisor: Ahlborn, Theresa M.
AASHTO LRFD Shear Design Implementation as Applied to Typical California Prestressed Bridge Girders

Li, Ke (2005) Advisor: Mattila, Kris G.
Demonstrating Construction Productivity Using CPCG

Liimakka, John W. (2004) Advisor: Bulleit, William M.
Examination of Methods for Structural Analysis of Wood-Pegged Timber Frames Subjected to Lateral Loads

Pendley, Preston S. (2005) Advisor: Mihelcic, James R.
Feasibility and Action Plan for Composting Operation Incorporating Appropriate Technology at Riverton Disposal Site, Kingston, Jamaica

Robinette, Christopher J. (2005) Advisor: Williams, R. C.
Testing Wisconsin Asphalt Mixtures for the 2002 AASHTO Mechanistic Design Procedure

Rottermond, Matthew P. (2004) Advisor: Williams, R. C.
Development of a Prototype Moisture Sensitivity Test for Asphalt Binders

Shrestha, Ravi C. (2005) Advisor: Barkdoll, Brian D.
A Direct Solution to Manning's Equation for the Normal Depth in Open-Channel Flow

Stanton, Brett T. (2004) Advisor: Williams, R. C.
Review of Methods for Determining the Bulk Specific Gravity of Hot Mix Asphalt and the Development of a Plan to Evaluate Vacuum Sealing Equipment

Stempihar, Jeffrey J. (2004) Advisor: Williams, R. C.
Quantifying the Lateral Displacement of Heavy Vehicles on Michigan's Highways and Its Incorporation Into Flexible Pavement Design

Stevens, Michael A. (2005) Advisor: Watkins, David W.
Snowmelt Frequency Analysis & Implications for Engineering Design in the Upper Peninsula of Michigan

Sundberg, Lindsay S. (2004) Advisor: Sproule, William J.
Planning a Bus Service for the Keweenaw National Historical Park

Touton, Sayward H. (2004) Advisor: Van Dam, Thomas J.
Effects of Deicing Chemicals on Concrete at Temperatures Just Above Freezing

Williams, Brett A. (2005) Advisor: Williams, R. C.
Permeability Criterion Test for Method Selection in Determining the Bulk Specific Gravity of Hot Mix Asphalt

Zelenock, Michael A. (2004) Advisor: Williams, R. C.
Fatigue Analysis and Pay Factor Development for Hot Mix Asphalt Pavements in Michigan

MS IN ENVIRONMENTAL ENGINEERING SCIENCE

Ochsner, Heidi (2005) Advisor: Paterson, Kurtis G.
Air Pollution as an Indicator of National Thrivability

Rodriguez, Wanda I. (2005) Advisor: Mayer, Alex S.
Arsenic Removal by Creating an In Situ Fe(OH)₃ Filter: Effects on Fe(OH)₃ Adsorption to Sand Due to Variations in Fe Concentration, Pore Grain Size and Residence Time

MS IN ENVIRONMENTAL ENGINEERING

Cannon, Bridget A. (2004) Advisor: Auer, Martin T.
Ecological Factors in Determining the Distribution of Diporeia in Lake Superior

Di Mare, Leonardo A. (2004) Advisor: Paterson, Kurtis G.
Characteristics of the Multilinear Engine (ME2) Software as a Receptor Modeling Tool, Case Study Christchurch, New Zealand

Fry, Lauren M. (2005) Advisor: Mihelcic, James R.
Spring Improvement as a Tool for Prevention of Water-Related Illnesses in Four Villages of the Center Province of Cameroon

Garcilaso Vejar, Luis R. (2005) Advisor: Barkdoll, Brian D.
Eco-Efficiency Analysis of Existing Industrial Wastewater Treatment

Gardner, Randall J. (2004) Advisor: Hand, David W.
Pore Diffusion Modeling of Laboratory Scale Ion Exchange Experiments

Ghimire, Santosh R. (2005) Advisor: Barkdoll, Brian D.
A Heuristic Method to Enhance Drinking Water Distribution System Security Through Optimal Water Quality Sensor Location

Hurtado, Daniel M. (2005) Advisor: Mihelcic, James R.
Compost Latrines in Rural Panama: Design, Construction and Evaluation of Pathogen Removal

McDonald, Cory P. (2005) Advisor: Urban, Noel R.
Historical Sedimentation Dynamics and a Model for Copper in Torch Lake, Houghton County, MI

Messenger, Douglas M. (2004) Advisor: Watkins, David W.
Technical, Organizational, and Social Challenges of Project Development in Rural Latin America: A Honduran Case Study

Northington, Chad D. (2004) Advisor: Mihelcic, James R.
A Evaluation of Electro-Thermal Dynamic Stripping Process (TM) for the Remediation of a Creosote-Contaminated Superfund Site

Rollay, Kirsten J. (2004) Advisor: Baillo, C. R.
Decision Support for Civil Infrastructure and Environmental Policy: A Review and Prospectus for Michigan Tech

Spicer, Rebecca J. (2005) Advisor: Paterson, Kurtis G.
The Relationship between Socioeconomic Status and Air Pollution-Related Mortality in the United States

Stanforth, Kelly L. (2005) Advisor: Mihelcic, James R.
A Sanitation Plan for a Fishing Village in Jamaica that Incorporates Evapotranspiration Bed Technology

Stewart, William E. (2005) Advisor: Mihelcic, James R.
Evaluation of Septic Tank and Subsurface Flow Wetland for Jamaican Public School Wastewater Treatment

Thiemann, Kenneth A. (2004) Advisor: Watkins, David W.
A Laboratory Study of Sediment Behavior in Groyne Fields

Tillison, Naomi L. (2005) Advisor: Hand, David W.
The Development & Application of an Assessment Framework to Enhance Student Learning in the Environmental Process Simulation Center

Troschinetz, Alexis M. (2005) Advisor: Mihelcic, James R.
Twelve Factors Influencing Sustainable Recycling of Municipal Solid Waste in Developing Countries

Tyndell, Courtney B. (2005) Advisor: Mihelcic, James R.
A Comparison of Wash Area and Soak Pit Construction: The Changing Nature of Urban, Rural, and Peri-Urban Linkages in Sikasso, Mali

Verhamme, Edward M. (2005) Advisor: Auer, Martin T.
Comparing Indicators of Bacterial Metabolic Activity at Slope and Profundal Sites in Lake Superior Sediments

Volkman, Sarah K. (2005) Advisor: Barkdoll, Brian D.
Quickbird Satellite Imagery for Riparian Management: Characterizing Riparian Filter Strips and Detecting Concentrated Flow in an Agricultural Watershed

MASTER OF CIVIL ENGINEERING

Mayoral, Clint R. (2005) Advisor: Sandberg, L. B.
I-94 Rouge River to Wyoming Avenue in the City of Dearborn

Shindorf, Melissa A. (2004) Advisor: Sproule, William J.
Practicum Experience With the National Park Service Anchorage, Alaska, Summer 2003

Golden Transit Society Members



Ned W. Bechthold, P.E.



*Herbert L. Fluharty,
P.E., '65*



Peter J. Grant, P.E., '68



*James L. Krause, '51
Deceased*



Ronald M. Krump, '57



Roland A. Mariucci, '58



*Thomas J. Rentenbach,
D.E., P.E., '32 Deceased*



Robert M. Thompson



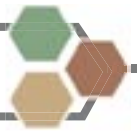
*Donald F. Tomasini, '54
Deceased*



*Louis C. Verrette, '34
Deceased*



William C. Verrette, '61



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The transit is a precision instrument that enables engineers to put projects in place. Without the transit, roadways would be misaligned and buildings would be skewed. The transit symbolizes foresight, order, and achievement. Accordingly, the Golden Transit Society recognizes highly successful alumni and friends of Michigan Tech who have made major gifts to the Department of Civil and Environmental Engineering. An exquisite, polished brass, antique "Golden" Transit or Level is awarded to express our gratitude.



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Phillip '60 & Sylvia Frederickson
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Robert J. Gaines '69
Stephen '70 & Joyce Goranson
Peter Grant '92 & Sandy Skotnicki Grant
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Brian '71 & Darlene Hicks
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David '80 & Susan Huizenga
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Arthur '41 & Ruth Klenner
Richard '69 & Diana Koch
Kevin '77 & Jo Ann '77 Lamb
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Irwin '68 & Valarie Martin
Ronald '53 & Mary Mathwich
Charles '63 & Joan Matrosic
John '59 & Bethal McCarthy
William '60 & Mary Ann Millar
John '69 & Liz Olson
Melvin '49 & Barbara Orchard
Terry '73 & Jean Paquet
Robin '74 & Sally Petroelje
Donald '58 & Rita Popko
Paul H. Queeney '90
Delmar '58 & Marcia Rediger
Daniel '75 & Laurie Rhude
John '51 & Betty Ann Ridan
Charles '66 & Diane Roberts
David '51 & Senia Rowe
L. Bogue '70 & Ann '77 Sandberg
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Theodore '59 & Faiza (dec) Schuurmans
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William '47 & Christine Turnbull
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Richard D. Wilcox '82
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William '73 & Anne Winiarski
Charles '59 & Thelma Zalud

Journal Articles, Fiscal Year 2005

Please Note: **Bold text** indicates CEE faculty members and *italicized text* indicates CEE students.

Gilbertson, C.G. and **Ahlborn, T.M.**, "A Probabilistic Comparison of Prestress Loss Methods in Prestressed Concrete Beams," *Journal of the Precast/Prestressed Concrete Institute*, 49(5), 52-69, 2004.

Ahlborn, T.M., van de Lindt, J.W., Uzcategui, A., and Lewis, M. E., "Cost and Performance Comparison of the Nation's Overhead Sign Support Structures," *Journal of the Transportation Research Board, Transportation Research Record 1892, Journal of the Transportation Research Board*, 14-23, 2004.

Churchill, J.H., Kerfoot, W.C., **Auer, M.T.**, "Exchange of Water Between the Keweenaw Waterway and Lake Superior: Characteristics and forcing mechanisms," *Journal of Great Lakes Research*, 30, Supplement 1, 55-63, 2004.

Auer, M.T. and *Gatzke, T.M.*, "The Spring Runoff Event, Thermal Bar Formation, and Cross Margin Transport in Lake Superior," *Journal of Great Lakes Research*, 30, Supplement 1, 64-81, 2004.

Auer, M.T. and Powell, K.D., "Heterotrophic Bacterioplankton Dynamics at a Site Off the Southern Shore of Lake Superior," *Journal of Great Lakes Research*, 30, Supplement 1, 214-229, 2004.

Auer, M.T. and *Bub, L.A.*, "Selected Features of the Distribution of Chlorophyll Along the Southern Shore of Lake Superior," *Journal of Great Lakes Research*, 30, Supplement 1, 269-285, 2004.

Gons, H. and **Auer, M.T.**, "Some Notes on Water Color in Keweenaw Bay (Lake Superior)," *Journal of Great Lakes Research*, 30, Supplement 1, 481-488, 2004.

Martin, R.W., **Baillo, C.R.**, and **Mihelcic, J.R.**, "Low-Temperature Inhibition of the Activated Sludge Process By an Industrial Discharge Containing the Azo Dye Acid Black 1," *Water Research*, 39, 17-28, 2005.

Bulleit, W.M., *Pang, W.C.*, and Rosowsky, D.V., "Modeling Wood Walls Under Combined Axial and Transverse Loads," *Journal of Structural Engineering, American Society of Civil Engineers*, 131(5), 781-793, 2005.

Bulleit, W.M. and *Chapman, R.A.*, "Characterization of the Correlation Structure of Lumber Strength Properties," *Wood Science and Technology*, 38, 285-296, 2004.

Chen, Y., Crittenden, J. C., Hackney, S., Sutter, L., and **Hand, D.W.**, "Preparation of a Novel TiO₂-Based P-N Junction Nanotube Photocatalyst," *Journal of Environmental Science and Technology*, 39(5), 1201-1208, 2005.

Honrath R.E., *Owen, R.C.*, *Val Martin, M.*, et al., "Regional and Hemispheric Impacts of Anthropogenic and Biomass Burning Emissions on Summertime CO and O₃ in the North Atlantic Lower Free Troposphere," *Journal of Geophysical Research-Atmospheres*, 109(D24), D24310, 2004.

Jacobi, H.W., Bales, R.C., **Honrath, R.E.**, et al., "Reactive Trace Gases Measured in the Interstitial Air of Surface Snow at Summit, Greenland," *Atmospheric Environment*, 38(12), 1687-1697, 2004.

Boggs J.W., Williams, R.C., **Mattila K.G.**, Kennedy, W.A., and **Dewey, G.R.**, "The Pavement Enterprise at Michigan Technological University," *ASCE Journal of Professional Issues in Engineering, Education and Practice*, 130(3), 197-204, 2004.

Li, H., Lueking, D.R., **Mihelcic, J.R.**, and *Peterson, K.*, "Biogeochemical Analysis of Hydrogen Sulfide Removal By a Lava Rock Packed Biofilter," *Water Environment Research*, 77(2), 179-186, 2005.

Baker, J.R., Gamberger, D., **Mihelcic, J.R.**, and Sabliji, A., "Evaluation of an Artificial Intelligence Based Model to Estimate Chemical Biodegradability," *Molecules*, 9, 989-1004, 2004.

Martin Jr., R.W., **Mihelcic, J.R.**, and Crittenden, J.C., "Design and Performance Characterization Strategy Using Modeling for Biofiltration Control of Odorous Hydrogen Sulfide," *Journal of Air and Waste Management Association*, 54, 834-844, 2004.

Mihelcic, J.R., "Educating Tomorrow's Global Engineer Through a Unique Partnership With the U.S. Peace Corps," *Woman Engineer*, 25(1), 30-33, 2004.

Mihelcic, J.R., "Educating the Future's Water Professional," *Water Environment Technology*, 16(9), 86-92, 2004.

Perlinger, J.A., Simcik, M.F., and Swackhamer, D.L., "Synthetic Organic Toxicants in Lake Superior," *Special Issue of Aquatic Ecosystem Health Management on Emerging Issues in Lake Superior Research*, 7, 491-505, 2004.

Urban N.R., *Jeong J.*, and *Chai Y.T.*, "The Benthic Nepheloid Layer (BNL) North of the Keweenaw Peninsula in Lake Superior: Composition, dynamics, and role in sediment transport," *Journal of Great Lakes Research*, 30, Supplement 1, 133-146, 2004.

Urban, N.R., *Lu, X.F.*, *Chai, Y.T.*, et al., "Sediment Trap Studies in Lake Superior: Insights into resuspension, cross-margin transport, and carbon cycling," *Journal of Great Lakes Research*, 30, Supplement 1, 147-161, 2004.

Urban, N.R., *Apul, D.S.*, and **Auer, M.T.**, "Community Respiration Rates in Lake Superior," *Journal of Great Lakes Research, Supplement 1*, 230-244, 2004.

Delem, L., **Van Dam, T.J.**, *Peterson, K.R.*, and Sutter, L.L., "Evaluation of Premature Deterioration of Concrete Bridge Barriers By Petrographic Examination," *Journal of the Transportation Research Board, Transportation Research Record 1893*, 11-17, 2004.

Watkins, D.W., Kirby, K.W., and Punnett, R.E., "Water for the Everglades: The south Florida systems analysis model," *Journal of Water Resources Planning and Management, ASCE*, 130(5), 359-366, 2004.

Watkins, D.W., Link, G.A., and Johnson, D. L., "Mapping Regional Precipitation Intensity-Duration-Frequency Estimates," *Journal of the American Water Resources Association*, 41(1), 157-170, 2005.

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