Greetings from Houghton

Transition is the word of the day in the ECE department. Tim Schulz, the former chair, is now the dean of the College of Engineering. He will be hard to replace, and I am happy to fill in as we conduct a national search for new leadership.

Another transition: we are hiring many new faculty. In this issue we introduce three young faculty who have been here a year or less. Two others will be joining us in January. They join a cadre of standout researchers, scholars, and teachers who are prominent in their field and care about our students.

We have some of the best academic programs around. For example, our power systems engineering program is the flagship program in Michigan. I am proud to collaborate with Associate Professor Bruce Mork and Professor Dennis Wittanen on this endeavor. Bruce Mork has been especially pivotal in the development of an international dimension to this program.

Partnering with industry is one of the keys to a Michigan Tech education. It is this aspect of our Enterprise Program, which engages students in projects that are supported and guided by industry and in which the students make real contributions to the industry sponsors. General Motors wants our students to push the boundary of human-computer interaction in vehicles. Think simple: voice commands. Think bold: automated transportation.

We take great pleasure in the successes of our alumni. In October, five were inducted into the Electrical and Computer Engineering Academy. We also update you on the continuing achievements of another Academy member. We are proud of all the members of our Academy. They inspire us.

New prospects are both challenging and invigorating, so we educate students to stay abreast of change. Thank you for your support of these endeavors.

—Leonard Bohmann
Interim Chair

The road to the future

Picture this:
You’re driving down a country road in the dark, and far past where you can see with your headlights, there has been an accident. No worry: you have a collision avoidance system, and it kicks in. Infrared sensors in your car detect the unseen danger and relay the information back to you in an instant so you can slow down or stop.

Or this:
You’re driving down a crowded interstate and a car cuts you off. No worry: you have adaptive cruise control that senses the presence of the vehicle, and it automatically reduces your speed so you maintain a safe distance. Then, once the vehicle moves out of the way, it readjusts your speed.

Or this:
You have three people driving the same family car. You get in the driver’s seat, and say, “This is dad.” Automatically your comfort system adjusts all six axes of your seat to a configuration preset just for you. Those are the prospects facing automobile engineers these days as they design cars for the twenty-first century, and Michigan Tech students are poised to play a leadership role in similar endeavors.

Six students in the department are seeking the imprimatur of the Enterprise Council, the overseer of Michigan Tech’s Enterprise Program, in which student-run groups, numbering more than twenty, work with industry on real-world projects. The application process is expected to be routine, and the Enterprise should be up and running in early 2008.

Associate Professor John Lukowksi is the faculty advisor for these students who will be organized as the Automotive Computing Enterprise (ACE).

“It’s really, really great stuff,” Lukowski says.
He calls Enterprise “a springboard to continued next page
employment." Companies aren’t hiring off the street anymore, he says. They want leadership and experience. “So this is a great way to leap into that first position.”

General Motors is the industry sponsor and will provide both financial backing and a vehicle, either a full-size Chevrolet Suburban or a Cadillac Escalade—“something that has all the bells and whistles,” Lukowski says. The students will try to simplify how they are engaged.

In today’s world, many functions on automobiles are computerized systems: engine, comfort, navigation, collision and avoidance, and entertainment.

Typically, each function has a separate button. “When you end up having so many buttons for controls,” Lukowski says, “it makes it very difficult and distracting. So what we’re trying to do is to make it easier for people to interface with all the different systems. That means less buttons.”

The first task will be voice commands that replace fingers and switches. The students will start with binary, or two-command, functions, such as up/down, open/close, on/off.

The long-term goal: a more-powerful and user-friendly onboard computer system that interfaces with a vehicle’s numerous embedded microcontrollers to both enhance and simplify the driving experience.

Overall, the charge is ambitious. Lukowski says, “GM wants us to go beyond what their people are doing at the GM Proving Grounds. They said, ‘We don’t want you to solve problems where we already have the answers. We don’t want you to check our answers. We want you to be right there—partnered with us or ahead of us.’”

Lukowski says that makes for great prospects. “I can’t see any end to the tasks that we could be called on to investigate and develop.”

Max Leason, of Warren, Michigan, one of the two students who are working on ACE, has two main interests: cars and computers. So the prospect of linking the two in a new Enterprise was a natural.

For the moment, ACE is under the umbrella of another Enterprise, Blue Marble Security. Leason and a partner have tagged along on that initiative, with the expectation that they would “break out on our own” in 2008. He expects ultimately to have a team of twenty or more students.

What Leason especially likes about

Enterprise is the latitude of inquiry and the responsibility resting on the students.

“There’s no teacher pushing you,” he says. “It’s all student-run. So what you put into it is what you get out of it. It’s a great opportunity for you to learn, and it’s really great on your resume.”

He is grateful that Lukowski doesn’t hover but is available. “We need to be on our own and have somebody to go to for advice.”

That guidance complements the main aspect of the endeavor—“GM is keeping us on our toes,” Leason says.

Leason and his partner are looking far beyond the initial work in voice-activated vehicle controls. He eagerly anticipates tackling such tasks as vehicle-to-vehicle communication—and beyond that, to automated transportation. “We hope to have a lot of good ideas and make a lot of changes. As far as we’re concerned, it will never really end.”

He will bring a sound work ethic to the project. He’s accustomed to long hours at his family’s restaurant.

“I’m used to putting in the time,” he says, “and I love learning.”

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**Alumni honored**

Five alumni were inducted into the ECE Academy in October. “We are honored by their association with Michigan Tech,” says Leonard Boihann, interim department chair. “They inspire us and lead us.”

**Cynthia (Cindi) S. Anderson ’85**

BS, Electrical Engineering

Sparks, Nevada

Owner and Partner

Wigglydog Productions

Founded 1999

E-commerce business to sell ceramic supplies for artists on the Internet

Developed a 500-page website

Outstanding Alumni Award, Michigan Tech, 1999

Founder and Chairman

IEEE Society on Social Implications of Technology, 1989–92

Service

Juvenile Diabetes Foundation, Adult Literacy, and Planetree Health Resource Library

**Teo A. Babun Jr. ’71**

BS, Electrical Engineering

BS, Engineering Administration

Surfside, Florida

President and CEO

Babun Group Consulting, Inc.

Business services for multinational companies operating in the Caribbean, especially Cuba

**Paul K. Goethe ’49**

BS, Electrical Engineering

Olmsted Falls, Ohio

Founder and President, 1969–present

Optimized Program Service, Inc.

Computerized design software for transformer industry

Consultant work in Europe and Asia

Cofounder, Vice President, General manager, 1950–69

Electronic Devices, Inc.

Manufacturer of transformers and power supplies

US Air Force, 1942–46

Service

Churches and hospitals

**Townsend (Tom) H. Porter Jr. ’68**

Electrical Engineering

Napa, California

Retired CTO and Executive Vice President

Seagate Technology Corporation.

Scotts Valley, California

Worked for IBM, 1968–94, attained rank of vice president of engineering, and gaining eight patents

Owns a vineyard and winery and races cars

He and his wife established a foundation that helps needy children from America to Tanzania.

**Dr. Tim Arthur Williams ’76**

Electrical Engineering

Danville, California

Chairman, Digital Schools, Inc., Chicago

Supplier of software for management of K-12 schools

CEO, BEEcube, Inc., Berkeley, California

Builds massively parallel high-speed computation engines

Chairman, DocceTech, Inc., Danville, California

Trains engineers in wireless Internet technologies

Worked for Motorola, Inc., from 1976 to 91, when he moved to Silicon Valley and became an entrepreneur

Twenty-six patents from 1983 to 2004
Yes, it was hard,” she says. “Not only was it hard?” she is asked of her years at Mississippi State University, a job she assumed in fall 2006. She leads a program at Mississippi State University, a job she of Electrical and Computer Engineering at North Carolina State University. She was the first woman in NCSU’s College of Engineering to serve as associate dean. And she was the first woman in NCSU’s College of Engineering to serve as associate dean.

Now, she’s head of the Department of Electrical and Computer Engineering at Mississippi State University, a job she of Engineering at North Carolina State University. She was the first female professor in the Department of Electrical and Computer Engineering classes while at Michigan Tech in the early 1970s.

Rajala was the only woman in her electrical engineering classes while at Michigan Tech in the early 1970s.

She was the first female professor in the Department of Electrical and Computer Engineering of the American Society for Engineering Education, which also recognized her as educator of the year in 2007 and elected her as president. In October she received the IEEE Education Society Achievement Award. She moved to Mississippi State in fall of 2006 after twenty-seven years at North Carolina State, the last four years as associate dean of research and graduate programs in the College of Engineering.

She has conducted extensive research and has an arm’s length of publications and presentations. She also earned the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring from the National Science Foundation.

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Rajala says that Tech prepared her “extremely well” for the working world. She went on to earn a master’s and a doctorate, both in electrical engineering, from Rice University. That was quite a trip, too, she says: Think of it—“Houghton to Houston.”

So, a pioneer?

“I guess I have been, but I don’t think of myself that way. I just try to do what’s right and work to overcome injustice.”

In that endeavor, she has gained stature. She is a fellow of the IEEE and a fellow of the American Society for Engineering Education, which also recognized her as educator of the year in 2007 and elected her as president. In October she received the IEEE Education Society Achievement Award. She moved to Mississippi State in fall of 2006 after twenty-seven years at North Carolina State, the last four years as associate dean of research and graduate programs in the College of Engineering.

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With all the accolades, she remains well-grounded. The rewards of her efforts? “The people I get to work with,” she says. “Students to help, faculty to collaborate with.”
Power program stays energized

From left: Bruce Mork, Leonard Bohmann, and Dennis Wiitanen lead Tech’s power engineering program.

Michigan Tech has a model program in power engineering, and faculty are striving to keep it charged.

“We’re doing meaningful work,” Associate Professor Bruce Mork asserts. “We’ve always been moving, but we keep pushing, too, so that we continue to do some good things.”

All in all, he says, power engineering at Michigan Tech is well-grounded.

“We’re very proud of our program,” Mork says. “We’re essentially the main program to educate power engineers in the state. I daresay that we have the most comprehensive program, too. That speaks volumes. Our students come out of here with a very solid foundation and background. And people in the industry know that. They know our students make good employees.”

Connecting with industry is key, Mork says. Companies sponsor senior design projects; provide funding for research projects; welcome new technology developed at the University; and support scholarships, fellowships, and faculty endowments. Those opportunities continually attract industry collaborators, Mork reports.

He and two other faculty members—Professor Dennis Wiitanen and Associate Professor Leonard Bohmann—spearhead the ECE department’s power area. The three of them have expertise in control systems, communications systems, power electronics, mathematics, and mechanical engineering. A new faculty member will arrive in January to enhance the program in alternative energy, such as wind and solar power.

Besides working with industry, the power unit collaborates with academic departments and research centers on campus, for the name of the game these days, Mork says, is interdisciplinary inquiry. Gone are the days of disciplines in their own pigeonholes, what Mork calls “small silos.” “We must look further afield and link up with other experts,” he says. “We must take a broader and more-comprehensive view and build research teams.”

Those include students, and they have the advantage of nine laboratories in the ECE department alone that help them stay current with new technologies.

Beyond the campus, the power program reaches out to professional engineers in the field by offering an online certificate in electrical power engineering. The pilot effort, offered in conjunction with American Electric Power, involves five classes for 15 credits. The courses deal with design, construction, operation, and maintenance.

“It’s less than a degree,” Mork says, “but engineers in other disciplines can take extra classes and build up their capabilities in electrical power engineering.”

The certificate will address a “huge manpower shortage” in the field, Mork says. “There are not enough people, and not enough competency in the people they do have.”

Similarly, a graduate certificate is planned; it, too, will be substantial, constituting half of a master’s degree.

Michigan Tech’s presence in power engineering includes the Power and Energy Resource Center, which was founded in 1996. Mork, who has been in the department since 1992, is the director.

PERC undertakes broad initiatives, including working with industry partners to link education and research related to energy.

The center “is an immense foundation for aspiring engineers,” one industry leader affirms.

PERC brings together a power team that demonstrates wide-ranging expertise, including business and economics, control systems, communications systems, environmental engineering, mechanical engineering, materials engineering, and power electronics.

As well, a strong international dimension characterizes the center. Michigan Tech has a longstanding relationship with the Norwegian University of Science and Technology and Norsk Hydro. The Norwegian firm, which has facilities in Lower Michigan, is shifting its focus from light metals to renewable energy, and will continue to partner with NTNU and Michigan Tech on that new front.

Mork himself has close ties with both education and industry in Norway. Beginning with his PhD work in the late 1980s, he has traveled to Norway three times for scholarship and research.

In the most-recent investigation, which includes several international students supported by the National Science Foundation, Mork and his students teamed up with the Norwegian Electric Power Research Institute on a research effort financed by a European research consortium. The work will provide computer-modeling tools for high-voltage transformers, which Mork describes as “an aging and vulnerable part of the power infrastructure.”

He adds, “There is a huge need for simulation tools which correctly predict transformer behaviors. Our goal is to extend their operational life, as well as delay or avoid unexpected failure, because, when one goes down, the entire grid can go down.”

In general, then, power engineers face considerable technical challenges; they also address such issues as public policy, security, and economic and social concerns.

Mork loves the work and the students, and he sums up the essence of the power program in just a few words: “New people. New ideas. Exciting possibilities.”
Melissa Meyer is a purposeful and engaging woman who loves her work and has found an agreeable life in the north country. She came to Upper Michigan because of the career opportunity and the lifestyle. The latter, she says, is highlighted by the region’s outdoor recreation and friendly people.

Meyer, a native of middle Tennessee, earned a bachelor’s degree in electrical engineering from the University of Tennessee and both a master’s and doctorate from the University of Washington.

It is no whim that she ended up an electrical engineer. “When I was a kid,” she says, “I always wanted to understand how everything worked, especially computers—these magical devices.” What she likes most about Michigan Tech is that it engages in research without sacrificing the quality of undergraduate education.

“The big undergraduate classes are my favorite things to teach because I like being able to interact with students when they’re first seeing a new concept—the first time they see a circuit, or the first time they see signal processing. It’s a lot of fun for me.”

As well, the opportunity for research is a godsend. “It’s a really great and amazing opportunity to have a job where you get paid to go off and follow your nose on whatever you want to investigate.”

Her research has two thrusts: the aurora borealis and solar winds that create electric fields applied to the ionosphere, the top layer of the upper atmosphere.

Part of the inquiry is pure science: “It’s there so we’ll study it.” Part has practical applications: better communication across the ionosphere, which tends to mess up signals.

One of her goals is to recruit students who are interested in the phenomenon and turn them loose with their imaginations, just as she has done.

“What drives you?” she is asked.

“Appreciation. I like to make people happy—happy in the sense that the students feel like they are getting the education they’re paying for. So if I could be known as a good teacher, that would make me happy.”

She’s well on her way. Last year, her first undergrads voted her the most helpful professor.

She appreciates the accolade but remains grounded. Her own young career, she says, has been characterized simply by interest and persistence. “I just kept showing up in class,” she says.

She strives for balance. “Everything in moderation is a good thing to keep in mind,” she says. “If I’m having trouble focusing on my work, instead of saying ‘work harder,’ I’ll go out and take a jog. That clears my mind. I’ll get more done, paradoxically, by taking time off.”

Her other interests are her dog, cooking, Nordic skiing, kayaking, and woodworking. The latter is a new pastime, and she is putting together a workshop and building a cedar kayak in her basement.

Meyer has traded the rains of the Pacific Northwest for the snows of the Keweenaw, with 2006–07 being a cupcake winter.

“I’m looking forward to my second winter here because everybody told me my first one wasn’t real bad.”

Meanwhile, life is real good.

“Do you feel lucky to be here?” she is asked.

“Absolutely.”

Zak was born and raised in Beijing. He is the son of a father who was a researcher and a mother who was a professor. Both are retired. Zhao last saw them in 2001 when he returned home. China, he says, is characterized these days by a pace of change that is “beyond the imagination of many Americans.” New leadership and the global economy are transforming the nation, he says.

Zak joined the ECE faculty in fall 2006. He loves Upper Michigan for the friendly people and his newfound outdoor adventures: fishing, boating, and skiing. “America is my second home now,” he says, “I feel comfortable.” He especially likes the US for its friendly people and its opportunity.

His research interests involve communications, signal processing, information theory and coding, and optical communications. He’s been interested in the field ever since he was a radio amateur in his teens. He describes the discipline as “interesting and challenging. It has a bright future.” He is happy to be in a country that he describes as “the world leader for research and technology.”

Zak calls himself “hardworking.” He explains that characteristic by telling a Chinese folk tale: An old man lived by a mountain that blocked his view and his travel and many other activities. He tried and tried to move the mountain for a long time. People called him foolhardy for even thinking he could do so. But a warrior god, impressed with his courage and devotion, carried the mountain away for him.

Zak takes that lesson—work hard and stay devoted—to heart, particularly in his research, which, he says, involves “a lot of ups and downs.” “Sometimes you get stuck,” he says. “You have to stay with it. Solve problems.”

It helps that his research is balanced by his love for teaching. “I enjoy seeing students grow and learn,” he says. “I just want to teach what I know.”
One measure of a man is his diligence. By that standard, Chris Middlebrook, who began teaching at Michigan Tech this fall, is a standout.

He is ever mindful of his students and wants to make sure he is doing a good job—“giving them what they need to know to be successful.”

As well, he tries to be discriminating about course content—sizing down the material so it’s not overwhelming to an undergraduate. “You can’t fit everything into one class,” he says, “so I try to pick and choose and figure out what’s really important to them.”

He tackles these challenges with a blend of a routine to stay grounded and variety to stay enlivened.

Overall, he remains circumspect. “I know everybody that teaches has been down this same road.”

For him, the joys outweigh the worries. “I love it. The students are great, and the people in the department are just super-friendly.”

Middlebrook came to Michigan Tech because there was an opening in the photonics concentration. The job will occupy three of his passions: research, teaching, and mentoring. He likes the variety of the work. “No day is the same as the last.”

He grew up in Niles, Michigan. After high school, he served four years as an aviation electrician in the Navy. Then he went on to earn an associate’s degree from Southwestern Michigan College, a bachelor’s degree in electrical engineering from Michigan Tech, a master’s in optical engineering from Rose-Hulman Institute of Technology, and a doctorate in optics from the University of Central Florida.

While earning his master’s, he worked for four years in electro-optics at the Crane Naval Surface Warfare Center in Indiana. The job stimulated what is now a keen interest in optics. “I just enjoyed it,” he explains. “It was interesting and challenging.”

He is excited by the great research opportunities in the field, and he will both continue and expand the inquiry he covered in his dissertation: building gold nanowires to make tiny antennae for detecting infrared radiation without using optics like microscopes and telescopes. With that work, he’s collaborated with Tech faculty as well as scientists at Tech’s new research unit, the Michigan Tech Research Institute, in Ann Arbor.

Middlebrook was busy the entire summer packing, moving, unpacking, and preparing for a new job. So he’s out of shape for one of his favorite pursuits: triathlons, a two- to three-hour regimen of running, swimming, and biking.

He stared doing that two years ago when he was “overweight, out of shape, and tired of it.” He’s not only lean, he feels better physically, and the sport is “a great stress reliever.”

Because of his disruptive summer, he says, “Exercise went by the wayside.” Four months of minimal training was “horrible.” He’s anxious to get back into competitive form and will resume a strict daily schedule of early-morning workouts.

He also looks forward to another pet project: visiting local elementary schools to do science demonstrations and encourage youngsters to pursue careers in science and engineering.

Middlebrook is a soft-spoken man, not given to careless talk or overstatement.

“What guides you?” he is asked.

“I don’t think about that every day,” he says carefully. “Obviously there’s something there, but nothing I ever summed up in a sentence.”

Maybe a word or two would do: diligence and discipline.