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How a researcher and pond dwellers illuminate the nervous system

On the cover
According to new estimates, 1 in 68 children in multiple U.S. communities have been identified as having autism spectrum disorder. This cover image is inspired by a WMU art professor’s project, Autism and Visual Art.

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Budding ecologists
Some 150 third graders learned lessons in environmental stewardship as part of WMU’s Asylum Lake Adventure Day in May. Held in cooperation with the Kalamazoo Nature Center, the annual event opens up WMU’s 274-acre Asylum Lake Preserve to school children. Children studied pond ecology using water samples from Asylum Lake. In wooded areas, they learned about invasive species and practiced stewardship by uprooting garlic mustard. Here, Paul MacNellis, retired director of WMU landscape services, helps Kalamazoo-area students Drake Seelye and Zachary Villarimo measure a tree to help determine its age.
Dear Friends,

Discovery serves a broad purpose, and research does not exist in a vacuum. In the following pages, you will find that the discovery activity underway at Western Michigan University is far-reaching, diverse and significant. The fundamental role of a research university is to advance knowledge through the expertise of its faculty researchers and to educate and empower students with skills that also make a difference in our world.

The discovery activities you will read about include those related to countering pilot fatigue and analyzing long-cane design for people who are blind and visually impaired. Such efforts tap into a historic mission for WMU. We are grounded in transferring knowledge and intellectual property beyond the classroom into communities and industries.

We're pleased to report to you how WMU experts are putting their research and knowledge to work in ways that help individuals and families grappling with autism. That effort extends to a College of Fine Arts professor who, with undergraduate students, offers young people diagnosed with the disorder opportunities to express themselves through art.

Also, you'll read about a researcher whose study of leeches may help us grasp the complexities of the human central nervous system, vision, light sensing and other sensory responses. Appreciating the role sweets play in a culture is one more example of how discovery can lead to a greater depth of understanding of who we are and the choices we make.

Another prime example is a recent graduate who put into practice skills learned at the University to establish Soil Friends, a small farming operation that uses sustainable practices to bring fresh, local produce to residents.

We think you'll find this account and the other stories in the research edition of the WMU Magazine inspiring and enlightening. And we hope you share our sense of pride and ownership in the discovery underway at WMU—a learner-centered, discovery-driven and globally engaged research university.

John M. Dunn, Ed.D.
President

Daniel M. Litynski, Ph.D.
Vice President for Research

Dunn elected to American Council on Education board

WMU President John M. Dunn was elected in March to serve as a member of the board of directors for the American Council on Education, the major coordinating and advocacy body for all of the nation’s colleges and universities.

He was elected at the 96th annual ACE meeting that attracted some 1,500 American education leaders to San Diego. Dunn is one of seven new board members who will serve three-year terms expiring in March 2017.

“I am deeply honored by the faith and responsibility my colleagues have entrusted in me,” Dunn says. “Their vote provides a significant opportunity for me to be deeply involved in the higher education policy issues confronting our nation. I’m looking forward to serving with my fellow board members—all of whom bring experience in leading colleges or universities that, like WMU, play an important role in the national higher education environment.”

Additional new three-year members of the ACE board include the leaders of Case Western Reserve, Drexel, West Virginia and Washington State universities as well as the leaders of the Massachusetts Institute of Technology and California Community Colleges. The board is led this year by the president of Allegheny College, James H. Mullen Jr.

STEM instruction reform focus of $1.4 million grant

A $1.4 million grant from the Howard Hughes Medical Institute to WMU will be used to enhance undergraduate introduction to science, with the goal of attracting and retaining more students to science, technology, engineering and mathematics—the STEM disciplines.

The grant is one of 37 awards made by HHMI this year. A total of 203 U.S. research universities were invited to apply for the institute’s 2014 funding round.

Biological sciences faculty members Dr. Renee Schwartz and Dr. John R. Geiser will direct the effort with Graduate College Dean Susan R. Stapleton.

The five-year research and development effort, “Developing Scientists as Teachers; Developing Students as Scientists: A Dual Approach to Transforming the Culture of Undergraduate Biology Education,” will be centered on introductory courses in biological sciences.

The extensive work will focus on reforming the curriculum and enhancing the professional development of the faculty members and teaching assistants who introduce undergraduates to the scientific experience.

They aim to combat the dramatic loss of prospective scientists. According to Hughes Medical Institute, nearly 40 percent—about 1.2 million—of the 3 million students who annually enter college do so with the intent to major in a STEM discipline. Only 40 percent of those prospective science students go on to earn a bachelor’s degree in that STEM discipline, with most switching majors during their first two years on campus.
New Michigan budget includes $4M for an array of WMU autism research and service initiatives

WMU is slated to receive $4 million to boost its autism research and professional training initiatives, State Rep. Margaret O’Brien announced June 20 at a news conference on campus.

The University, which has a national reputation for its work in behavior analysis as a treatment for autism, will use the funding to tackle the growing national incidence of the brain development disorder by:

• Increasing the number of new professionals in the field each year and developing a training model that can be disseminated and replicated at other colleges and universities
• Developing innovative on-campus support networks for college students on the autism spectrum
• Directing and overseeing a community daycare and treatment center for young children
• Directing, developing and maintaining community consultation resources, using such technology as podcasts and teleconsultation

who serve those families that are dealing with autism.

Autism spectrum disorder and autism are general terms for a group of complex disorders of brain development. These disorders are characterized—in varying degrees—by difficulties in social interaction, verbal and nonverbal communication and repetitive behaviors.

Earlier this year, the Centers for Disease Control and Prevention indicated the prevalence of autism is rising and now affects 1 in 68 American children.

See page 4 for more on how the dearth of autism experts affects families.

WMU joins national initiative to increase study abroad enrollment

WMU has committed to increasing study abroad participation by 50 percent over the next five years as part of a national initiative that aims to double the number of U.S. college students studying abroad by 2019.

WMU is one of more than 160 higher education institutions representing 41 states that have pledged to support the goals of the Generation Study Abroad Commitment initiative by the Institute of International Education.

IIE, a private nonprofit leader in the international exchange of people and ideas, partners with sponsors around the country to create programs of study and training for students, educators and professionals from all sectors.

The institute’s programs include the flagship Fulbright Program and Gilman Scholarships administered for the U.S. Department of State. Through the initiative, IIE hopes to increase the national annual total from the 295,000 students who studied abroad in 2011-12 to 600,000 by the end of the decade.

At WMU, a total of 482 degree-seeking undergraduate students were studying abroad during the 2011-12 academic year, according to the Open Doors Report released by IIE this past November.

WMU achieved a 2011-12 study abroad participation rate for undergraduates of 12 percent, which was more than two percentage points higher than the average national rate for undergraduates.

WMU’s efforts will be focused on raising study abroad enrollment from about 600 students per year currently to 900 students by 2019.

Some of the steps University officials plan to take to achieve this goal include launching a new pre-freshman study abroad program, working with colleges to increase college-based study abroad scholarships and working with WMU’s longstanding transnational education partners to establish study abroad programs for WMU students.
In 2009, Jim and Erica Penner were elated with the birth of their beautiful baby boy Matthew. But as their firstborn grew into toddlerhood, the couple began to sense that something was seriously amiss with his development.

“He began speaking at 15 months, which was normal, but by 24 months he had regressed to where he had only one consonant and no vowels left,” Erica Penner says.

Worried, they brought Matthew to their pediatrician only to have their concerns waved away after a short evaluation. But the parents knew something wasn’t right and kept searching for answers.

Online research on language regression in childhood led them to suspect that Matthew was showing a sign of autism. Complicating matters, the couple had to relocate from Virginia to Michigan when Jim landed a new job.

They knew little about where to go, what to do or how to get help, but believed time was of the essence.

Ultimately, the Penners’ suspicions about autism were confirmed, but it took half a year before Matthew could be definitively diagnosed.

“It was a long, frustrating process,” Erica Penner says. “Everything we were reading said that ‘the earlier the intervention, the better the outcome.’ But finding what you need is the hardest. There is not just one place to go.”

Researchers at Western Michigan University are focused on providing support and guidance for Kalamazoo-area families seeking help and answers for their struggles with autism.

Every year, thousands of American children are diagnosed with this developmental disability also known as autism spectrum disorder. People with autism have difficulty with verbal and nonverbal communication and demonstrate repetitive behaviors.

Loss of speech—such as Matthew’s language regression—is one sign. Lack of eye contact, a trait the Penners’ son also exhibited, is another hallmark of the disorder.

According to statistics released in March by the Centers for Disease Control and Prevention, 1 in 68 children in multiple U.S. communities has been identified with autism spectrum disorder.

This new statistic is about 30 percent higher than the agency’s 2012 estimate that 1 in 88 children was on the spectrum.
What is autism spectrum disorder?

Autism spectrum disorder and autism are general terms for a group of complex disorders of brain development. These disorders are characterized—in varying degrees—by difficulties in social interaction, verbal and nonverbal communication and repetitive behaviors.

What are some of the signs of autism?

Children or adults with autism spectrum disorder may…

- not point at objects to show interest
- not look at objects when another person points at them
- have trouble relating to others
- have no interest in other people at all
- avoid eye contact and want to be alone
- have trouble understanding others’ feelings or talking about their own
- prefer not to be held or cuddled
- appear to be unaware when people talk to them, but respond to other sounds
- be very interested in people, but not know how to talk, play or relate to them
- repeat words or phrases in place of typical language
- have trouble expressing their needs using typical words or motions
- repeat actions again and again
- have trouble adapting when a routine changes
- have unusual reactions to the way things smell, taste, look, feel or sound
- lose skills they once had

Sources: Autism Speaks, Centers for Disease Control and Prevention
But as the Penners discovered, diagnosis or suspicion of the disorder, doesn’t mean there’s a clear road map to available services and treatments for this special population, sometimes leaving families frustrated and scrambling for answers.

The need for more and better guidance has not gone unnoticed at WMU.

**Addressing a ‘huge need’**

Drs. Stephanie Peterson and Wayne Fuqua, both WMU psychology professors, have received a $500,000 Michigan Department of Community Health grant that will fund a sweeping array of initiatives to help train more health practitioners, boost research, and help parents and others working with autism spectrum disorder.

And at press time, the University received an additional $4 million allocation from the state to support these initiatives, which will ultimately lead to a wider certification of professionals trained in treatment.

"The need is really huge," Peterson says.

The grant initiative comes after the state of Michigan reviewed existing autism services and enacted legislation in 2012 requiring that insurance companies cover autism treatment.

Peterson and Fuqua looked closely at the gaps that were identified by the state and wove their grant proposal around those needs.

"WMU does not want to be a service provider itself. We partner with community-based agencies who already are reaching the target population," Peterson explains.

Chief among those services Peterson and Fuqua will oversee are initiatives that will employ high-tech methods to provide training.

Those initiatives include teleconsultation, podcasting, online and on-site training, and partnerships with organizations that already provide services to those with autism and their families.

WMU also is exploring a partnership with the Autism Alliance of Michigan and assisting with plans to create a parent navigation system that would put families in touch with autism services in their communities.

Another impetus for the grant to WMU and to other Michigan universities is to spur more research.

“Our focus is on evidenced-based practices. We do not want to waste money and resources on therapies not supported by research,” Peterson says.

Research has shown, for example, that for autism, early intervention is optimal and where “we see the biggest bang for the buck,” according to the psychology professor. “So that is where most of our resources are directed.”

When the Penners moved to the Kalamazoo area in 2011, they sought help from Early On, a special education program offered by the Kalamazoo Regional Educational Service Agency, an agency that provides education to students with special needs.

Early On offers services for families with children who are age 3 and younger and have a developmental delay or are at risk for a developmental delay.

The Penners wanted Matthew to be assessed right away, but they had moved to the area as the school year was ending and had to wait months for an official evaluation.

Not wanting their toddler to lose more ground in development, the couple hired a private speech therapist who worked with Matthew every other week at the couple’s home during the family’s first summer in Michigan.

“We had to do something while we waited for an official diagnosis,” Erica Penner says.

By that fall, when Matthew was 2 years old, he was assessed and indeed diagnosed with autism. Specialists began using applied behavior analysis to teach him to do what most of us take for granted, such as how to use eye contact appropriately and greet others.

“Early intervention made all the difference,” says the boy’s mother.

Today, Matthew is almost 5 years old and his language skills have greatly advanced. This fall, he begins elementary school in Young Fives, a pre-kindergarten classroom.

Still the family worries that their son will get “lost in the mix,” says Jim Penner.

“We also worry about the social part of life—can he keep up?”

The CDC reports 1 in 68 U.S. children falls somewhere on the autism spectrum.

Peterson
Advocacy never ends
Another Kalamazoo-area family has similar concerns about their fourth-grade son’s needs being met as time goes on.

The couple requested anonymity from the WMU Magazine because they haven’t shared with their son that he’s been diagnosed with autism.

Autism spectrum disorder has a range of symptoms. Its characteristics and severities present uniquely in the individuals affected. And these parents don’t want their son to feel limited by a label.

The youth was diagnosed with autism just before he turned 3, after months of lagging farther and farther behind in communication and in motor-skill developmental milestones.

“It’s taken us the past 10 years working with (him) and seeing him struggle with his teachers in the classroom, to identify that he is a visual learner,” the youth’s mother says. “He needs visual cues and having the classroom schedule in a visual form at his desk is what works for him.”

Their son always had language skills, says his father, a trained educator himself. “We are fortunate for that, but he uses language from movie characters. Once we realized that, it helped us to understand what he needed.”

And he’s also quite social, wanting to spend time with friends at school, which his parents say is what motivates him to go every day. But while there, they worry that he may not get all his educational needs met.

From age 3 until he was old enough to attend kindergarten, the boy attended WoodsEdge Learning Center, a Kalamazoo-area school designed to teach children with autism and other special needs.

“We learned early on from Parent to Parent, a support group we found through WoodsEdge, that we need to be our son’s educational advocate. We missed out on a lot of things we didn’t know was out there for him,” says his mother.

Beginning in kindergarten, he was enrolled in a school district with an elementary school known for its work with students with autism.

“We made assumptions that what he was receiving at WoodsEdge would continue on in kindergarten as he was mainstreamed into the classroom.

“We learned a paper trail must follow (their son) from grade to grade. The need for advocacy never stops,” the father said, adding that it would be “useful to have someone who is there to go along the journey with you to help families like ours.”

Another mother whose son was diagnosed says parents cannot meet their children’s needs alone.

“Every parent of an autistic child needs help from someone who knows what’s available to assemble a team for their child,” says Kim Nelson, a Kalamazoo mother of three who admits to being overwhelmed when her firstborn son, Nick, was determined to be on the autism spectrum 11 years ago.

“I spent hours on the Internet trying to find out what to do, where to go, and who could help me. I had to build a team of healthcare providers to help me with my son, Nick, and I fumbled to assemble that team over time,” says Nelson, the director of creative services at WMU.

She hopes that the University’s grant opens the door for creation of such a resource center.

“Without a centralized resource center, you don’t know as a parent what to expect. You don’t know what you don’t know.”

Extending educational outreach and efforts to bring together some of the best minds in autism research and treatment, the final initiative WMU is spearheading involves an autism conference that will be a resource for professionals and parents.

In 2013, WMU organized and hosted the first Michigan Autism Conference that featured national experts on autism. It attracted more than 280 individuals from across Michigan and surrounding states.

“I was surprised by the number of parents at the conference who attended panel discussions oriented more for the professionals in the fields. They were taking notes, listening and learning what they could,” Peterson says.

“We are definitely planning to identify which talks or topics are geared for parents at the conference this September and provide more resources for the families who are so thirsty for help and knowledge.”

For more information on autism, visit cdc.gov/actearly. For more information about the autism conference, go to michiganautismconference.org.
When the art created in these workshops was exhibited, it was the art of the students with autism that garnered the most public attention,” he recalls. “It was unique, stimulating and curious.”

That experience birthed Davis’ Autism and Visual Art project, the results of which were displayed this past academic year in on-campus art exhibitions and a book by the same name.

“The exhibitions and book were the products of a semester-long art course Davis taught with undergraduate students. Davis and his students were co-researchers exploring what happens when visual art intersects with autism. “Is it art, research or communication?” Davis says. “The answer is probably: All of the above.”

What they found shed light on the inner perceptions and learning styles of a group of students who experience the world through an impaired sensory lens. Over the course of the class, the undergraduate researchers worked with Davis to offer art workshops for young adult students with autism at the Kalamazoo Regional Educational Service Agency, which provides a variety of educational services to children through young adults in Kalamazoo County.

Working one-to-one or one-to-two, WMU art students guided KRESA students through various drawing tests. The KRESA students were first shown a basic line drawing of a cat and asked to draw what they saw. Second, they were asked to draw what they saw while hearing a cat meow. Third, the students were asked to draw what they saw—again this basic cat—while hearing dogs barking.

The WMU team found the results fascinating. With exposure to the cat drawing, most of the KRESA students roughly drew the cat. When sound effects of cats meowing were played, the students were viewing the same rudimentary picture of the cat as inspiration, but many then drew more details, adding whiskers, eyes, paws and tails.

The students understanding of what they saw was clearly influenced by the introduction of the auditory information. “Because workshops of this nature convey information about learning styles, findings like this can have a positive effect on developing strategies to build social confidence, self-awareness, self-
Autism and Art

“Is it art, research or communication? The answer is probably all of the above.”
—Bill Davis, associate professor of art

estee, and the creation of a more independent life,” Davis says.

When students were exposed to a drawing of a cat with the sound effects of dogs barking, many drew a dog—all the while being directed to draw what was placed in front of them, which was never more than a basic line reproduction of a cat.

Davis says this suggested that those students who drew dogs tend to be more visually responsive to auditory experiences than to a visual experience.

He seeks to further research this finding and is currently looking at ways this information can be used as part of a larger diagnostic report on the knowledge, skills and assets each KRESA student possesses.

“One goal is to offer students with autism an opportunity to develop individual experiences in their art and to help develop a leisure skill,” Davis says.

Jessica Parrish, one of the 11 undergraduate students involved in the project, says she appreciated being part of research involving art and gained new insights into how “art engages a person.”

“We all had some introduction to autism, but we all approached the course from our disciplines and artistic niches,” says Parrish, who is majoring in art as well as speech pathology and audiology.

“None of us were quite prepared for the way art could bridge the gap between those with autism versus those without a cognitive impairment.”

Davis wanted the undergraduates to gain deeper insights beyond observing how the KRESA students created their artwork.

In a project separate from the group art instruction, the WMU students tried to create artwork while contending with a self-imposed “impairment.”

Davis created a series of mechanically limiting wearable prosthetics for his “neurotypical” students to use during their independent studio art practice.

“While this did not convey the nature of autism, I used this form of experiential learning to challenge and mature the way students understand their studio art practice and human potential,” Davis says.

Parrish, for instance, wore moderately rigid and coiled PVC tubing on her arms while trying to work with clay on a pottery wheel.

“As approaching my art project, which was pottery, from the perspective of being ‘impaired’ gave me an appreciation for how difficult it can be to create something when ‘impaired,’” she says.

Davis says the students came to appreciate those moments of connection created in the process of making art, that the finished project was not the end goal. Rather, the creation process was the real objective.

For more information about this project or to order a copy of the “Autism and Visual Art” book, contact Bill Davis at william.davis@wmich.edu. Find a documentary film on the Autism and Visual Art project at vimeo.com/81531497.
Sweet, sweet consumption

Warnings about the dangers of a high-sugar diet abound. Why do some societies overindulge anyway while others do not?

When cultural anthropologist Jon Holtzman explores a society, he often looks to see how its history, economics, social trends and other attributes influence eating habits or lead to certain food preferences. And vice versa.

“I’m interested in food as a thing that’s fundamental in the human experience—apart from air and water, there’s not much else that you couldn’t go without for a long time without dying—and yet, it has all this complexity,” says the WMU associate professor of anthropology.

“Food experiences are a way to capture, in a more intimate way, broad-level changes in society.”

During the past 20 years, Holtzman’s research has largely been set in Kenya, centered on a community of pastoral people whose diet has shifted with climate, economic change and other forces.

With his latest study, food is a sweet subject.

The National Science Foundation has awarded Holtzman with a $105,000 grant to study what biological and cultural levers push people’s preferences toward sweetness.

His focus is on Japan, contrasting the Japanese use and view of sweetness with how the western world regards and consumes sweets.

In doing so, the anthropologist is wading into a public health debate surrounding the use of sugar in the modern human diet, especially what happens when it is readily available to a population.

Public health warnings about the dangers of a sugary diet abound. Citing the hazards of carrying excess weight and susceptibility to disease, the World Health Organization recently advised the world’s citizens to cut sugar intake by half.

Holtzman is looking to Japan as a case study, as a society in which sweet foods are as accessible as in the United States, for example, but isn’t plagued by the high obesity and diabetes rates found in modern America.

He contends that sugar isn’t the “boogie man” it’s made out of intricate Japanese food systems that tie eating to social, aesthetic and moral values” are what make it a “notable outlier to global obesity trends despite high levels of wealth and sugar access.”

Until a few years ago, Holtzman had no familiarity with how sweetness figured into the Japanese diet. He became intrigued during a presentation on Japan when event organizers offered a Japanese confection called “Pocky,” a straw-shaped biscuit covered in chocolate and available in various flavors.

“Even if this isn’t literally true,” Holtzman says, “people will describe their experience in the 1950s of being a little kid following a G.I. in a Jeep yelling, ‘Give me chocolate or give me chewing gum!’”

He’s found the Japanese observance of Valentine’s Day particularly enlightening.

Though Valentine’s Day was observed in Japan to some extent prior to the World War II era, Holtzman says, it became a major holiday in the decades that followed.

“It really started as a marketing ploy for chocolate companies. … There were a lot of changes in gender relations following the war—and continuing in the present—and one of the ways in which they marketed chocolate on Valentine’s Day was to tell women that this is the one day they could be expressive,” Holtzman explains.

“Generally as a woman in Japan, you’re supposed to be reserved, but this is the day you can express your true feelings.”

As observed in Japan, on Valentine’s Day it is women who give chocolate to men, including so-called “true chocolate,” given to a man for whom a woman has true feelings, such as a spouse.

There is also “giri choco,” that is “obligation” or “courtesy” chocolate, which a woman may give to the men in her workplace, for instance.

Weeks later, in an extension of the holiday, Japanese men are supposed to reciprocate by giving gifts to women.

“In a way, Japanese seem to be much more obsessed with sweet things than we here in
the United States. We don’t have Valentine’s Day in the elaborate way they have it,” Holtzman says.

And he adds, “If you go to a roadside stop in Japan, such as on a major highway, there will be lines and lines of sweets that will be regional specialties that people will bring as gifts from their trips. Yet they don’t eat nearly the quantity of sweets that we do here in the U.S.”

During a trip to Japan several years ago, Holtzman learned about a popular all-you-can-eat cake restaurant concept that would likely be cheered in the states, but perhaps patronized differently.

“It’s all you can eat, but it’s timed. One thing that’s interesting is that they eat with a lot of moderation… You could picture what the typical American would do in that setting, especially with only 75 minutes to do it.”

So, why do some societies overindulge and others do not?

“In cultural anthropology, we’re always interested in how these things are mediated through cultural factors. So if you said, ‘Sugar is like heroin,’ does that mean the Japanese can use heroin in moderation? Probably not,” he says.

“People like sugar, but it doesn’t do all the things attributed to it apart from the cultural, social and economic context in which it’s placed.”

—Dr. Jon Holtzman, anthropologist

People like sugar, but it doesn’t do all the things attributed to it apart from the cultural, social and economic context in which it’s placed.”
WMU scientist seeks to unlock the mysteries of the central nervous system through a creature whose anatomy can help answer complex questions about vision, locomotion, light sensing and other sensory responses

At the end of a lab table clogged with notebooks and instruments, five European medicinal leeches gyrate, squirm or swim in a jar of water.

Dr. John Jellies rolls up the sleeve of a black turtleneck sweater, reaches in and grabs a leech with the ease of one snatching a gummi worm from a candy jar.

But this slimy invertebrate won’t just quiver benignly in Jellies’ grasp. Using suction cups on its head and tail, it crawls, inchworm-like, across his hand.

What’s more, this creature is the type of leech that sucks blood for nourishment (Jellies will tell you that not all leeches do).

But its appetite for blood is of no concern to this professor of biological sciences in whose Haenicke Hall lab these creepy crawlies have a home.

After all, John Jellies is: The Leech Guy.

He’s well earned this moniker after working with leeches for more than 30 years. His lab is full of bubbling aquariums, amplifiers, microscopes and computers, as well as dishes of snails and, of course, hundreds of leeches.

When regarding the leeches in Jellies’ lab, you might see a simple, primordial pond dweller. But he sees a creature of beauty and intricacy.

As a scientific researcher, he’s interested in how circuits of neurons generate behaviors. He says that studying this requires neurons that one can actually see, listen to and manipulate.

This is where the leech undulates into the picture.

“There’s a high probability of using findings (with the leech) to generalize to other more complex animals—perhaps even humans."

—Dr. John Jellies, WMU researcher

This dissected body of a European medicinal leech is shown here awash in light. There are tiny incisions down the middle of the creature so that researcher John Jellies may study the ganglia—a collection of neuronal cell bodies—of its central nervous system.
In his view, the leech fits into a sort of scientific "Goldilocks zone" as an animal that is not too simple and not too complicated, but just right for his research questions.

One can gain insights by performing direct experiments on its neurons, he says.

Jellies seeks to unlock the mysteries of the central nervous system through this creature whose anatomy can help answer complex questions about vision, locomotion, light sensing, and other sensory responses and actions.

The ‘sheer joy’ of discovery

As a researcher, Jellies adheres to “a tenacious reliance on experimentalism to obtain answers that expand the narrative of understanding in concrete, generalizable ways,” he says, adding: “First, happiness is an understanding of how things work. And second, if you want to know how something works, do the experiment.”

Jellies grins and says, “It’s mostly mountains of detailed grunt work punctuated by occasional moments of sheer joy.”

“There’s a high probability of using findings (with the leech) to generalize to other more complex animals—perhaps even humans,” he says.

After earning a Ph.D. in neurobiology from the University of Texas at Austin, Jellies accepted a post-doctoral fellowship in the Department of Biology at the University of California at San Diego, obtaining an award from the National Institutes of Health. He used the award to study the development of neurons and neural circuits that generate behavior in the humble leech.

He came to WMU in 1995, establishing his research program using leeches.

The undulating, graceful swimming motion of a leech is actually a complex behavior, from a neuromuscular standpoint, Jellies says. Think about the alternating complex rhythms of walking, jogging or sprinting in human locomotion.

The European medicinal leech has two “brains”—one in the head and the other in the tail—and a central nerve cord connects the...
two. Jellies notes that if this nerve cord is severed, given time to recover, the animal will eventually regain much of its original ability.

The same does not hold true for humans because our spinal cord is encased in boney vertebrae, Jellies explains.

While this boney structure offers significant protection, he says it also isolates the sensitive neurons so that when they are severely traumatized, the effects are significant and the neurons are prevented from growing in this enclosed environment.

“Very different degenerative diseases like traumatic paralysis or Alzheimer’s are among the many different things that can interrupt how neurons talk to each other. I argue that to make progress in understanding them, we must understand at a basic, detailed level how these neural circuits do these almost miraculous things in the first place,” Jellies says.

Though experimenting on the leech isn’t meant to address specific human diseases like these, learning how a leech's more simple physiology and anatomy works has a lot of relevance, he says.

“After all, how do we understand how a system is failing if we don’t understand how it works at a fundamental level in the first place?”

Leeches and light sensing

Among the many research questions that interest Jellies is how animals integrate multiple stimuli and generate adaptive behaviors in response to them.

Humans do this each moment, using hundreds of stimuli at the same time, even without conscious awareness.

Jellies’ most recent research has centered on how leeches behave when exposed to different wavelengths of light.

Just as the leeches Jellies studies outdo humans in their number of brains, the same is true for eyes. The leeches have five pairs of eyes on their head, each containing 50 photoreceptors.

To visualize these photoreceptors, imagine a vase made out of black glass, containing 50 marbles. Each of these vases is attached to an optic nerve that sends a signal to the animal’s brain. In addition, there are other photoreceptors that run all along a leech’s body.

As complex as our eyes are, the chemicals that detect light and turn them into an electrical signal have a common origin, Jellies says.

The photoreceptors, rods and cones that make up the intricacy of the human eye also can be found in houseflies, squid and, yes, leeches. And the same genes that “turn on” to build the human eye during development are also found in leeches, worms and dogs, Jellies says.

Though leeches seek prey during daylight hours, overexposure to invisible ultraviolet light can weaken or even kill them.

Jellies hypothesized that in addition to already known responses to visible light, leeches must be able to detect and integrate UV radiation as a visible cue to decide whether to hide, pursue prey or “get out of Dodge,” he says.

But this had never been shown.

Through a series of experiments involving the use of small LED light wands that emitted light across both the visible and UV spectra, Jellies showed that leeches would back away from the harmful UV radiation.
To his surprise, UV radiation aimed at the head resulted in a shortening of the body to withdraw, while the same light at the tail resulted in extension, the opposite motor pattern.

Both behaviors make sense in that they removed the leech from the light, but their different movements to accomplish this suggested a high degree of sensory and motor integration, he says.

He was also able to show that at least some photoreceptors on the leech were specifically sensitive to UV radiation, and that one of the higher-level leech neurons dedicated to controlling rapid movement is activated by both visible and UV radiation, setting the stage for looking at how the nervous system integrates various sources of diverse inputs to make decisions. Some neurons even responded to both light and the pressure of physical touching.

His findings were published in the *Journal of Experimental Biology*.

“We’ve begun to get a better understanding of how input is getting into the central nervous system. There’s a lot more to do on that but we have made a start,” Jellies says.

“Leeches and their lunch

With hundreds of leeches in his lab, Dr. John Jellies is responsible for keeping them fed. The biological scientist is dedicated to his work and a great admirer of these blood-eating creatures, but the “how” of feeding is not what you may think.

“In the wild, the animals have to feed on mammalian blood. But we don’t want them to feed on mammals in the lab, so we developed a procedure that uses sausage casing,” he explains.

Jellies or his lab assistants fill the casings with bovine blood obtained from a commercial supplier and warm the blood to body temperature.

“The leeches seem to be excited by vibration and disturbance in the water, as though they are attracted to someone clomping about,” Jellies says. “We know from the work of others that they use vibrations as one way to locate potential prey.”

The leeches soon detect the nearby blood meal and adhere to the sausage. After about 20 minutes, all the blood is sucked from the casing. It may take several sausages to sate the leeches, but most will be finished feeding in about an hour.

“Leeches and Light

What happens to neurons and synapses during profound responses associated with things like addiction, learning, flinching? To broaden the question: What does the brain do with the input when the signals are coming in?

“We are in the early stages of this, but I think those doing research in vertebrates will be informed by the kinds of things we find out about these deceptively simple (leech) nervous systems that are really pretty complex,” Jellies says.

“I hope that what we do has an impact on the human condition in some meaningful ways. Almost all studies of living systems relate to each other, to the fundamental molecular structure of life,” he says.

“All animals’ nervous systems are built out of basically the same things. We have, with the leech, one of the best systems at the single-cell level for asking the big questions about neurons and brain function. These are exceptionally complex issues, we at least have a prayer of success with this critter.”

“It has a small amount of heparin or citrate (compounds that impede clotting) per liter, just enough to keep it from clotting,” he explains.

The blood-filled casings are then placed into a tank containing one to three dozen leeches in shallow water. The animals are gently stirred by hand to get them excited and swimming.

What keeps them from chomping onto the hand that feeds them? Being quick.

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Dr. Dae Kim, associate professor in blindness and low vision studies, was awarded more than $421,000 from the National Institutes of Health to study ways to improve the long cane design and biomechanics for blind cane users.

Orientation and mobility is a specialized area of study under the umbrella of blindness and low vision studies where research is underway to improve how blind persons move about safely in the environment.

Specifically, orientation involves teaching the blind and visually impaired to know where they are and where they are facing. Mobility addresses getting from point A to point B safely and efficiently. The long cane enters into orientation and mobility as a device that relates to the mobility piece—getting from where you are to where you need to go safely.

Kim was an orientation and mobility instructor at the Cleveland Sight Center from 2001 to 2006, where he was directly teaching the blind to walk and navigate with the long cane.

“The two most widely used long cane techniques in use today are the two-point touch technique and the constant contact technique. The two-point touch technique, which has been around since the 1940s, involves holding the long cane centered in front of you and sweeping the path ahead of you with the cane tip in contact with the walking surface at all times looking for drop-offs—a dip in elevation in walking surface—and obstacles that can cause a fall.

“I myself taught these two techniques to my blind students with success,” acknowledges Kim, “but I was surprised that no research studies existed which compared the two techniques to assess for effectiveness. So I engaged in a controlled experimental study to compare them.”

Not surprisingly, the results from the study confirmed that the constant contact technique was superior to the two-point technique in detecting drop-offs.

“This was an important step in the field of orientation and mobility to promote evidenced-based practices. We need well-designed, scientific studies to correctly guide our practice in the field.

Kim’s current three-year NIH project aims to elevate cane studies to a next level by more systematically investigating the factors that may affect how reliably the cane user can detect hazards such as drop-offs and obstacles.

The NIH study investigates the rigidity, length, weight and weight distribution of the cane for ergonomic factors. Next the study involves biomechanic factors that can affect drop-off and obstacle detection. Factors like how the cane swings side to side, how high the cane is picked up in the swing, whether the gait and swing are coordinated, and where the cane is held may all affect how reliably the hazards can be detected using the long cane.

“Our goal at the end of the study is to propose a better long cane design that is more reliable in detecting drop-offs and obstacles. We also expect to be able to suggest improved cane-use biomechanics instruction to blind individuals that will enable more dependable hazard detection. We want to improve safety,” says Kim.

Kim is the principal investigator on the grant with assistance from two key personnel on the grant: Dr. Robert Wall Emerson, blindness and low vision studies, and Dr. Koorosh Naghshineh, mechanical and aerospace engineering.

“The other innovation of our study involves our instrumentation,” says Kim. “Using a high-resolution infrared camera system, Optotrak, we can track the movements of our subjects and the cane. We can track the coordinates of different body parts and the cane with great precision (up to 4600Hz and .1 mm).”

“Our goal is improved safety and quality of life of blind cane users,” Kim says.
Potash: Michigan’s next billion-dollar industry?

Backlit, it’s easier for the uninitiated to discern the layers of potassium and sodium chloride in this core sample derived from 8,000 feet below the earth’s surface. The core’s lighter layers are potassium chloride—which could be processed to create potash fertilizer—and the darker bands contain sodium chloride—a compound used for road or table salt.
A WMU research facility has assisted in the rediscovery of a rich and rare deposit of potash. As a result of the rediscovery comes the introduction of a new industry in Michigan worth as much as $65 billion, geologists say.

With the rediscovery of a long-forgotten mineral deposit located under two West Michigan counties, Michigan is positioned to spark a new multibillion industry as the nation’s leading source for a critical agricultural tool that is in demand internationally.

Potash—potassium chloride—is an essential plant nutrient and critical ingredient in fertilizer. Currently mined in only three locations in the nation, supplies are dwindling and prices skyrocketing.

Now, one of the highest-quality potash ore deposits in the world has been identified below the surface of West Michigan.

A valuable resource
The discovery was made by using the treasure trove of geologic data that is housed at Western Michigan University’s Michigan Geological Repository for Research and Education.

The result of the rediscovery, say geologists, will be the introduction of a new industry in Michigan worth as much as $65 billion, easily surpassing the state’s historical oil and gas production revenues and triggering explosive job growth in Osceola and Mecosta counties.

“This is conceivably one of Michigan’s most valuable resources,” says Theodore A. Pagano,
One of the things that makes this so valuable is that it is an incredibly rich deposit that is in easy reach of the enormous demand from Midwest corn and soybean farmers.”

— Dr. William B. Harrison, director of the Michigan Geological Repository for Research and Education at WMU
a potash geologist, engineer and general manager of Michigan Potash Co. LLC.

That firm now controls the rediscovered potassium ore reserve called the Borgen Bed that lies under more than 14,500 acres in the two counties.

His company has worked quietly over the past several years to ensure the reserve could be technically, economically and logistically put into production and compete head to head with the New Mexico and western Canadian mines that are now the major North American sources of potash.

“This is the United States’ only shovel-ready potash project,” Pagano says.

“Michigan is New Mexico untapped. What we’re looking at is the introduction of an industry that is critical to the economic health of the state. We’ll be producing a Michigan product for Michigan farmers that would dramatically reduce the expensive transport costs on the more than 300,000 tons of potash consumed in our state annually.”

Verification of the quality and amount of the potash in the Borgen Bed was done by using core samples provided by WMU geologists under the direction of Dr. William B. Harrison III, professor emeritus of geosciences and director of his department’s Geological Repository for Research and Education.

In 2008, Harrison and his wife, Linda, an administrator with the repository, came into possession of geologic core samples collected in the early 1980s when a Canadian company was prospecting for potash in Michigan.

That company established a mine and small processing plant in Michigan but pulled back from fully commercializing the deposit. Over the years, changing business plans and corporate mergers pushed the Michigan operation into the background, and mineral leases for the area lapsed. The sample cores came to WMU by chance and were added into the University’s statewide collection of such core samples.

“Without Bill and Linda Harrison, Michigan and the United States would be without the rediscovery of a multi-billion dollar potash deposit,” says Pagano who learned through industry sources that the Harrisons might be able to help him in his quest to define the scope and quality of the Borgen Bed.

**The scoop on potash**

Potash is found in just a few areas once covered by inland seas. The seas evaporated and the potassium and sodium chloride deposits crystallized into potash ore and were covered by successive layers of rock and soil.

The Michigan deposit, WMU’s Harrison says, is the purest and highest-grade potash being produced globally—600 percent higher than that being produced in New Mexico’s vast Permian Basin. It is also twice the grade of deposits found in Canada and Russia, the two nations that control more than 80 percent of the world’s potash reserve.

“One of the things that makes this so valuable is that it is an incredibly rich deposit that is in easy reach of the enormous demand from Midwest corn and soybean farmers who operate within a 500-mile radius of this deposit,” Harrison says.

“This is an opportunity for new wealth to come from the use of natural resources never tapped before.”

Pagano has been working with investors and state and national officials to move forward with the capital-intensive establishment of manufacturing and processing facilities. He estimates an initial demand for more than 300 workers employed in an enterprise that will produce more than a million tons of potash annually.

Bringing Michigan potash to market, Pagano says, will provide a domestic source of the element at reduced cost to Midwest farmers as well as to the national agriculture industry. It will reduce imports, improve the nation’s trade balance, create jobs and increase the state’s tax base.

“It’s our responsibility to develop this wisely and in a way that moves Michigan forward,” Pagano says.

**WMU’s rock treasure trove**

WMU has been home since 1982 to an extensive set of one-of-a-kind core samples and well records that have made the University the preeminent source for data on Michigan’s subsurface geologic layers.

WMU’s Michigan Geological Repository for Research and Education makes information about those layers available by maintaining extensive online databases and housing the most comprehensive archive of Michigan geological samples and data.

That archive includes more than 500,000 feet of rock cores from oil, gas, water and environmental research wells and from glacial research and Lake Michigan bluff erosion studies. It also contains impressive collections of geologic maps, and thousands of drillers’ reports, electrical and mechanical logs, mudlogs, porosity and permeability analyses, and related well data.

In 2011, the state of Michigan tapped WMU to serve as home to the Michigan Geological Survey.

The move made WMU Michigan’s designated geoscience agency and put responsibility for mapping and assessing the state’s geological resources—such as minerals, soils and groundwater—in the hands of the University’s Department of Geosciences, which was already a storehouse of information concerning the state’s groundwater, mineral and oil and gas resources.
Subsurface history: How Michigan potash was made

With a core sample containing potassium chloride balanced on his shoulder one sunny morning at WMU’s Michigan Geological Repository for Research and Education, geoscientist Dr. William Harrison bore a record of Michigan’s ancient history.

Some 400 million years ago, geoscientists say, the landmass now known as Michigan resided close to the earth’s equator and was covered by inland seawater.

The potash in Osceola and Mecosta counties that WMU geologists helped rediscover and all the salt deposits in Michigan are from the Silurian period, says Harrison, director of the repository.

Those millions of years ago when Michigan was covered by sea, there were barriers that kept the ocean water from coming into the area very efficiently, Harrison says.

“There were channels, but it was kind of a landlocked region, similar to the Mediterranean Sea. It was still an ocean, but it was only connected to the rest of the world’s ocean by small channels,” he says.

“It was really hot and dry and during certain seasonal periods, or maybe all the time, it was so hot that the ocean water kept evaporating.”

As those vast waters receded and evaporated over a long period to the point of drying up, concentrations of salt remained.

“You could do this process yourself,” Harrison says. “Put some seawater in a pan and boil it continuously until almost dry and you’d start to see the salt crystals.”

To get rock salt or table salt to crystallize, he says, you have to increase the concentration of the salt in the water anywhere from six to eight times greater than normal seawater. To form potash, it takes even higher concentrations, possibly up to 15 or 20 times normal seawater.

“Modern seawater doesn’t have a lot of potash in it. But some of these ancient seawaters were richer and because of that, you have higher concentrations,” Harrison explains.

Over many millennia, those layers of salt were covered by rock and soil so that today, they are thousands of feet below the earth’s surface. The cores from potash deposits in Osceola and Mecosta counties, for instance, were 7,000 to more than 8,000 feet deep.

Mined, potash is heavily used in agriculture as a plant nutrient and ingredient in fertilizers.

“That’s kind of what our geology studies are all about,” Harrison says.

“We’ve got all these core samples that represent wells that have been drilled down into the crust of the earth and then as they pass through different kinds of rock layers, we can see what the materials are and possibly identify certain deposits that are of economic interest to various mining companies and manufacturing or energy companies.”

And, in this case, agriculture as well.
Gerontology student researchers capture World War II memories, create book

Some of the World War II memories are soldiers’ brief, heartfelt and at times arresting accounts.

“It was a rewarding and terrifying experience since I was 18 when I was drafted into the war,” one Navy veteran related. “It was a very scary experience seeing as I knew I might die any second.”

There are poignant remembrances from the home front.

During the war, Sandy Heathcoat was a nursing student in a Kalamazoo hospital that overlooks a cemetery. Her mind is still etched with scenes of young men selecting burial plots before heading to war.

And other memories are touching in a different way, such as a soldier’s love note.

Dr. Janet Hahn’s gerontology students collected these and other World War II stories from nearly 200 people.

This class research project in Hahn’s Issues in Aging course resulted in a 67-page spiral-bound book titled “There is No Substitute for Victory—Remembrances of World War II.” The book is available online.

The idea was that of Dr. Barbara Rider, professor emerita and former chair of the Department of Occupational Therapy, and Dr. Ellen Page-Robin, founding director of the WMU Gerontology Program.

The two now-retired professors had undertaken a similar project in the 1980s in which students compiled recipes from the Great Depression.

“They came to me in the fall of 2012 and said they had this idea of gathering the memories of people during World War II,” Hahn says. “I was developing a service-learning class and I thought maybe that would work as a class project. So we did it.”

The class first discussed World War II with help from a veteran class member with a passion for World War II history. Students developed a list of questions they wanted to ask.

A team of 22 students fanned out across the community, each conducting eight interviews. The students visited senior housing facilities in the area and interviewed retirees volunteering at the Kalamazoo Air Zoo. Other interview subjects were recruited by word of mouth.

Those interviewed stretched from the Detroit area to Canada, Hahn says.

“Many in the gerontology minor program carry a soft spot for older adults,” says student Jeana Brown. “But they have never had the close, one-on-one experience with them.”

With today’s social media-centered lifestyle, many students do not interact with their peers face to face, Brown adds.

“The World War II-era individuals are declining, and students may not get another opportunity to hear memories or stories first hand,” Brown says.

“The learning experience extended outside of a few questions answered for a school assignment. This really made students aware of the progression that has taken place in the United States and feel fortunate.”

The $20 book is available online by going to wmich.edu/disabilitycenter and clicking on Online Store and then Center for Gerontology Book.
Alumnus chases agrarian aspirations, finds...

Soil Friends

Meet Ben Martin.

His mentors say he’s one to watch among entrepreneurs.

It’s not because the new Western Michigan University alumnus has a robustly capitalized, long-established, profit-abundant business.

Not yet anyway.

But they’ve come to admire his pluck, and his passion for creating a livelihood from the ground up.

His “idea tap” runs a steady stream, they say.

He researches those ideas as though in fear of being outworked. Building networks and connections with people seem to come naturally to him.

And he’s scrappy.

Soil Friends, Martin’s “environmentally clean” produce-growing and marketing business, is still young, literally just unfolding.

But the two-season-old operation is the tangible result of his plan to be in business for himself by graduation. The 23-year-old completed a marketing degree in food and consumer package goods from WMU in April.

Martin’s tomatoes, cabbages, onions, zucchini and other types of produce—grown on land northeast of Kalamazoo—have been sold at independent grocers and a restaurant promoting local foods on its menu as well as at farmers’ markets and his uncle’s meat market.

For supplementary income, he also sells goods and provides marketing services on behalf of other growers.

A year-around farm operation is Ben Martin’s goal, but following his mentor’s advice to “start small and make it great,” he founded Soil Friends.
“Not everybody is an entrepreneur and if you look up the definition it says, ’One who assumes risk,’” says John Schmitt, a mentor to Martin and senior business consultant with the Michigan Small Business Development Center based in WMU’s Haworth College of Business.

“Ben has that inherent talent or skillset. He just naturally kind of gets it.

“He’s always coming up with ideas. And I see this commonly with a number of people I work with. Sometimes my job is to shut the idea tap off. But Ben doesn’t just have an idea, he does the deep research,” Schmitt says.

Start small, be great

“Being a business student, I just started thinking about ideas, researching innovative and sustainable ways for growing nutritious produce,” Martin says of his entrepreneurial ambitions. All that thinking led to his original vision to forge into vertical farming, a method of propagating crops in a multistory greenhouse, orienting the crops upward rather than over a swath of land.

But Martin soon “realized the capital intensity of it and got kind of timid.” Not to be dissuaded for too long, he then spent nearly a year working through a business plan and researching the feasibility of opening a skateboard shop. In addition to this workload as a marketing student, he took classes at the Small Business Development Center. Ultimately, he decided that the retail shop wasn’t what he wanted to do either.

Circling back to his original vision of being a grower and following Schmitt’s advice to “start small and make it great,” Martin created Soil Friends.

“People are really demanding locally grown crops, and I noticed it would be a really good fit to start squeezing in there,” he says.

So with little experience in agriculture and still a student, he was bold enough to found this market garden, hoping to develop it into his livelihood.

Start small, be great

But he also was cautious to do his research before putting a hoe in the ground. That meant staking out grocery stores for hours to see how consumers buy produce, handing over his business plan to a WMU marketing class to analyze its feasibility—they doubted it—and traveling to observe established growers.

“I spent an entire summer just traveling, going to different farms to see what they were doing as far as innovation, water conservation and fertility. The next summer, I jumped in and started growing produce by the acre,” he says.

That was in 2012.

Soil Friends

He’s since developed relationships with growers with like interests and methods. Martin also buys some of their vegetables—ones he doesn’t grow—and sells them at his own produce stand. It provides him with some additional income and keeps his face out there as the local produce guy.

The upstart is also continually learning about and embracing methodology from some long-tenured farmers and others who’ve become his advisors.

Martin says that the philosophy of Soil Friends is to abstain from the use of harsh chemicals in favor of practices that promote nutrient-rich soil and lead to nutrient-rich, robust plants.

“A lot of things used in conventional agriculture kills the biology in soil and everything we’re doing is to promote soil life,” Martin explains, such as growing a cover crop off season and later tilling that into the soil as a sort of “organic manure.”

“Dirt, that’s what’s on your shirt when you come inside. It doesn’t have any life. Soil has life.

“With inorganic fertilizers and pesticides, each time you apply them, you’re taking a stab at that life. You can use all those chemicals, but each time it kills off a little of the biology,” he says.

“I appreciate what people do when they start a business… It’s a long way to the top if you want to rock and roll.”

—Ben Martin
Last summer, he interned on a 12-acre research farm that conducts varietal studies of vegetables and fruits, which gave him important insights into how to select the best plants for Soil Friends, ones that are practical for the size of his operation and potential customer base.

“And that’s half the battle,” he says. “If I spent all this time planting a variety of tomato (plant) that didn’t produce or was really susceptible to disease, that’s my bottom line at risk.

He once cultivated a variety of onion that had good flavor, but he shrugged off warnings that it also had a short storage life. For a larger, higher volume commercial operation, that variety may have worked. But Martin ultimately lost a portion of that crop and the profit that would have come with sales.

That was one of several experiences that have helped underscore for Martin the definition of entrepreneurship that his mentor Schmitt talks about, that it’s fraught with risk. Growing produce particularly carries its own inherent risks.

“I appreciate what people do when they start a business. You’re not always hitting it off. It’s a long way to the top if you want to rock and roll,” Martin says.

Still, the 23-year-old hasn’t been without self doubt at times.

“It is hard to sit next to kids getting $65,000 jobs (right after graduation) and knowing you could do well somewhere else. But I’m not all about money. And nobody is going to tell me at the end of the day, ‘We had to make a cut and it’s you.’”

Enterprising roots

Family has been everything to Martin’s achievements so far and probably the root of his entrepreneurial ambitions as well. His parents and a grandparent have owned businesses.

“I’ve grown up in the setting; it’s what I know.”

And he partners with his uncle, Jim Nieuwenhuis. Not only did his uncle loan Martin the startup capital to help establish Soil Friends, but he owns the acre of land Martin uses to grow his crops and Nieuwenhuis’ Richland Meat Center sells Soil Friends-grown produce seasonally.

Since starting Soil Friends in 2012, the business has begun to develop a reputation.

Martin beams when he tells a story of selling asparagus at the meat market this spring when a customer inquired about his tomatoes, not based on her experience, but what she heard from a neighbor.

“So we’re weeks out from tomatoes right now, but people are at the meat market saying, ‘Are you going to grow any of those good tomatoes?’”

And once a one-man operation, he now has two to three others helping him on a part-time basis for what is often sunup to sundown, back-straining work.

“It’s cool to be able to pay three people and including—hopefully—myself at the end of it.”

Of pursuing this path after college, when there are easier and perhaps more prosperous rows to hoe, Martin says, “You have to pick something you like and that you’re passionate about. If you’re really enjoying what you’re doing, everything else will follow.”

Soil Friends’ produce is sold at independent grocers and restaurants promoting local foods on their menus as well as at farmers’ markets and at Martin’s uncle’s meat market.
Increasingly busy college students may look to meditation to mitigate stress

“Expert Insights

With the demands of juggling classes and work responsibilities—sometimes from multiple jobs—while plotting their professional futures, perhaps volunteering and almost certainly socializing, today’s busy college students are no strangers to stress.

“Our focus is to get the students to look at themselves and to examine what is creating so much stress in their lives. Once identified, the goal is to give them meditation/mindfulness tools to help them watch and change the movement of thoughts in their minds,”
—Oxhandler

“We have seen statistically significant changes in the perceived and real stress levels of students who enroll in our one-hour meditation course,” Oxhandler says.

“We could see it anecdotally in their journals, but we saw it statistically in our testing instrument. The meditative/mindfulness practice helps them live closer to their full potential emotionally, intellectually, spiritually and physically.”

Oxhandler’s research colleague, Dr. Mark St. Martin, notes that while in the counseling center, they tried to reach students in need by offering stress-reduction groups and an entire stress reduction clinic.

“However, neither approach attracted many students for long periods of time,” says St. Martin, associate professor of counselor education and counseling psychology.

Oxhandler adds that, “In order to reach the students, we needed an accessible one-credit course that had academic credibility and practical application for the students.”

“Yet we also saw significant results in stress and anxiety reduction when the techniques were integrated into occupational therapy, nursing and aviation classes in a one-half hour module,” he says.

The researchers found that, conversely, the control groups in their recent studies who did not participate in the mindfulness training showed statistically significant increases in stress, anxiety, depression and other negative trends by the end of the semester.

“This was concerning and makes it imperative we get this information out so we can help impact as many individuals as possible,” St. Martin says.

“Our focus is to get the students to look at themselves and to examine what is creating so much stress in their lives. Once identified, the goal is to give them meditation/mindfulness tools to help them watch and change the movement of thoughts in their minds,” Oxhandler says.

“Training and lots of practice gets them back to their natural state, out of the place where they are prisoners of past regrets and future worries and to live in the present moment.”

With six years of research results in hand, the researchers feel the results are incredibly consistent at statistically significant levels that the meditation and mindfulness techniques lower stress and anxiety and enhance the sense of well-being.”
New study reveals that blue light therapy can improve pilot alertness

Sleep-deprivation among pilots has long been a safety concern in the aviation industry. Investigations have found pilot fatigue was to blame in some serious and even fatal accidents, as in a 2009 Colgan Air crash in Buffalo, N.Y., that killed 50 and an Air Canada flight in 2011 that took an inadvertent nosedive, injuring several onboard.

A recent study led by a Western Michigan University aviation researcher found that prescriptive exposure to short-wavelength light increased alertness for pilots and flight attendants on long-haul journeys.

Crewmembers in this small study had significant decreased fatigue, sleepiness and significant increased reaction response after just 15 to 30 minutes of daily exposure to blue shortwave light, says Lori Brown, lead investigator in the study and an associate professor of aviation at WMU.

“The blue wavelength is effective in suppressing melatonin (a hormone produced by the brain and thought to aid sleep), that’s why we used it in the study,” she says.

With their findings, researchers hope to scale up the study to involve a larger cohort of flight crews to further validate the use of light therapy as a tool to help counter fatigue.

“As a former crewmember, I know firsthand what it’s like to be fatigued despite the need to continue doing your job,” says Brown, who was an airline transport pilot prior to joining the WMU College of Aviation faculty.

Pilots often work long shifts across several time zones and are confined to the small space of the flight deck for hours with little room to move and little human interaction—all of which can contribute to feeling fatigued, Brown says.

“As pilots, we’re really limited to what we can do as far as mitigation and countermeasures.”

According to the National Sleep Foundation’s 2012 Sleep in America poll, pilots and train operators were the most likely group of transportation professionals to say they experience sleep-related job performance and safety problems.

In the report, 26 percent of the train operators and 23 percent of the pilots polled admit that sleepiness had affected their job performance at least once a week compared to 17 percent of non-transportation workers.

In response to fatigue-related incidents, Federal Aviation Administration rules went into effect in January increasing from eight to 10 hours the minimum uninterrupted period of rest commercial airline pilot are required to have before starting flight duty. The regulations also limit the number of consecutive hours pilots can be on duty.

Both are steps in the right direction, Brown says, but adds that “even if you are getting more sleep, that doesn’t account for the affect of cockpit noise, vibration, irregular work schedules and jetlag, especially if you’re flying through several countries and time zones, all of which can compromise a pilot’s performance.”

The new federal rules don’t apply to pilots operating cargo planes, nor do they apply to flights coming into the United States from other countries. Brown notes that all of these planes share the same airspace.

Her study to determine whether light could be used as a tool to help mitigate fatigue was a collaboration of the WMU College of Aviation, Jeppesen (a subsidiary of Boeing Co.), a leading sleep scientist, a Swedish commercial airline and Nature Bright Co., a manufacturer of light-therapy products.

Dr. Gregory Pinnell, a WMU adjunct professor and flight surgeon, and WMU students Troy Booker and Travis Davis also assisted in the research.

In the first two weeks of the four-week study, 14 international long-haul pilots and flight attendants operated as they normally would without using light therapy, all the while conducting fatigue and sleepiness self assessments. They also used devices to measure their sleep behavior and reaction time.

For the final two weeks of the study, each crewmember used a small portable blue light unit within an hour of waking up before continuing with the subjective and objective assessments of fatigue and sleepiness.

When exposed to the eye, Brown explains that the blue light essentially takes two paths, one to the visual cortex for sight and “the other path goes to the hypothalamus, an area of the brain responsible for your circadian rhythm, your mood, emotional processing and your alertness.”

Results showed a significant difference in flight crew alertness when comparing their behavior before and after the light-therapy intervention.

Brown says their findings have implications for other industries in transportation. Cases of train operators falling asleep at the controls causing accidents have grabbed headlines in United States in recent months, for instance.

She says the results garnered from this light study can be used to develop innovative preventive strategies for shift workers in maritime, rail, nuclear and medical fields.
College of Arts and Sciences
Professor wins National Geographic Society grant for research in rural China

The National Geographic Society’s Committee for Research and Exploration awarded Dr. Gregory Veeck $11,500 to support his most recent research project, “An Ecological Economic Multi-Scale Study of China’s Grassland Resources.”

These funds support more than six months of fieldwork in selected areas of western China and complement awards Veeck received from the WMU Faculty Research and Creative Activities Award and from the WMU Department of Geography’s Ruth and Milton Scherer Fund.

The multi-year project designed by Veeck is being conducted jointly with WMU’s Dr. Charles Emerson and Li Zhou and Yu Fawen, professors from the Rural Development Institute of the Chinese Academy of Social Sciences.

The team combines environmental data—vegetation indices, climate data and elevation—with intensive fieldwork that includes interviews with local officials and herding families.

The intent is to determine how the nation’s pasture quality has changed since 2000 and how that has impacted the lives and incomes of herding families.

Once these changes are identified, Veeck and his team will look for correlations between these changes and livestock counts by type at the township scale. Veeck is seeking to examine how change in animal stocks co-varies with changes in pasture quality as determined through vegetation indices statistically adjusted for variable precipitation and elevation.

Last fall, Veeck took a two-month trip to western Sichuan and northwestern Yunnan Province to survey five counties located at different elevations, each with distinctive pastoral environments.

He returned to China in April to continue surveying pasture environments in Gansu Province.

College of Education and Human Development
Center’s new grant program supports two important studies

The Tate Center for Research and Innovation in the College of Education and Human Development has awarded its first-ever round of grants. The funding is in support of two important research projects by two faculty members in the Department of Teaching, Learning and Educational Studies.

Dr. Jeffrey Jones’ study is examining organizational strategies and participant experience in young adult diversion court and will run through November of 2014. The Tate Center awarded him a $2,000 grant to support this work.

Dr. Tetyana Koshmanova also was awarded a $2,000 grant for her research exploring the development of critical thinking, entrepreneurship and social mobility of faculty and students in Ukraine. Koshmanova’s project runs through January of 2015.
College of Engineering and Applied Sciences

Researcher wins grant to study propulsion in spaced-based maneuvering

An assistant professor in mechanical and aerospace engineering has been awarded a $360,000 Air Force Office of Scientific Research grant to investigate alternative propellant sources for electric propulsion systems used in space by, for instance, satellites.

Dr. Kristina Lemmer is studying the dynamics of complex molecular plasma chemistry. She says that while electrical propulsion is very efficient, it also is a very low-thrust type of propulsion for satellites and exploration vehicles that need to maneuver while in space.

The approach of Lemmer’s project is to combine experimental and numerical modeling methods to understand the processes and surface interactions of complex molecular dynamics of ionic propellant plasma chemistry.

The AFOSR program awarded a total of $15.5 million to 42 research institutions through its Young Investigators Research Program.

The goal of this program is to foster creative basic research in science and engineering, enhance early-career development of outstanding young investigators, and increase opportunities for the young investigators to recognize the Air Force mission.

College of Aviation

Aviation researchers examine use of weather technology in the cockpit

Several College of Aviation professors are part of a national research team investigating how pilots use weather technology during flight.

The college is involved in this research project as part of its affiliation with the Partnership to Enhance General Aviation Safety, Accessibility and Sustainability, a Federal Aviation Administration Center of Excellence for General Aviation.

In addition to researching how general aviation pilots access various weather services, the Weather Technology in the Cockpit project is exploring the tools pilots use to monitor conditions, how weather information is displayed to pilots and pilot decision-making related to entry into deteriorating flight conditions due to weather. The goal is to determine best practices and technologies.

Haworth College of Business

Prof praised for paper on corporate social responsibility, tax aggressiveness

Assistant professor of accountancy Mingming Feng and her co-author Joo Hyung Ha won the American Accounting Association Midwest Region Best Paper award.

The paper, “Corporate Social Responsibility Engagement, Tax Aggressiveness, and Firm Value,” highlights the tendency of tax aggressive firms to engage in more socially responsible business practices.

Feng and Ha analyzed the corporate social responsibility activities of companies on the Standard & Poor’s 1500 and found that tax aggressive firms who take advantage of tax codes to minimize their taxes also tend to engage in more socially responsible activities to offset the negative perception of being tax aggressive.

Applying payment of a fair share of taxes as a litmus test for the claims of being socially responsible, Feng and Ha found that corporate social responsibility efforts exerted by tax aggressive firms may create a perception of corporate hypocrisy and, ultimately, hurt firm value.

The evidence that Feng and Ha have studied suggests that successful implementation of corporate social responsibility strategies likely depend on aligning business activities with societal expectations.

Feng says they hope the study will be of interest to a variety of stakeholders, including managers interested in designing corporate social responsibility strategies to maximize the benefits, investors who want to know the market value of these efforts and consumers who want to evaluate a firm’s authenticity regarding its corporate social responsibility engagement.
**College of Fine Arts**

**WMU dances selected for regional festival gala concert**

Three adjudicators selected both of the WMU Department of Dance’s submissions to the American College Dance Festival Association East-Central Conference Gala Concert held in March at Ohio University.

This is the second consecutive year that WMU has had both dance submissions selected for this highly competitive honor.

Associate professor Carolyn Pavlik’s “It Takes Two,” performed by ten WMU dance majors, and WMU senior dance major Connor Cornelius’ “My Hyphen,” a duet performed by Cornelius and WMU junior dance major Alex Hlavaty, were featured on the Gala Concert program.

Assistant professor Whitney Moncrief served as rehearsal director for “My Hyphen,” and assistant professor Megan Slayter served as technical coordinator and lighting designer for both dances; sophomore dance major Raeann Burkey created the original lighting design for “My Hyphen.”

Adjudicators described “My Hyphen” as “clever, witty, ingenious” and as “dance theatre at its best!” “My Hyphen” was one of only four works choreographed by undergraduate students to be selected for the Gala Concert.

As for “It Takes Two,” the adjudicators admired the technique of the ten dancers and the joy and conviction with which they performed. The adjudicators also praised the performance for the thoughtful choreographic choices concerning design of the space, transitions between phrases and movement to and from the stage.

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**Lee Honors College**

**Undergrad researchers study a “green” practice in wastewater treatment**

Dr. Kathryn Docherty, a microbial ecologist in the WMU Department of Biological Sciences, is investigating the ability of the bacteria in the Kalamazoo Water Reclamation Plant to degrade a suite of chemicals. These chemicals could be used as “greener” replacements for the more hazardous solvents traditionally used in industrial practices.

Docherty says the research team for this project was unique in that it consisted entirely of undergraduate researchers preparing their Lee Honors College honors theses. The team collaborated with Drs. Blair Szymczyna and Andre Venter from the Department of Chemistry.

Docherty explains that sustainable advances in chemistry seek to improve the chemicals used in everyday life so they pose less of a hazard to human and environmental health.

In particular, she says that designing novel chemicals that can easily be broken down by the microorganisms in wastewater treatment facilities is of critical importance for preventing the release of emerging pollutants into the aquatic environment.

Results of their experiments demonstrated that microbial communities present in wastewater treatment aeration tanks vary based on the time of year that samples are collected, as well as the geographical location of the plant.

This variation can influence whether a newly engineered chemical will degrade, but also can be beneficial for isolating particular bacteria that are able to break down particular compounds, Docherty says.

A manuscript describing the scientific findings of this work is in preparation and will include as co-authors Barbara Buehler, Steven Aiello and Katherine Walker, all of whom were undergraduate students when the research was conducted.

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**Dr. Daneen Wardrop**

**professor of English**

Wardrop, an internationally known poet-scholar, joined the faculty in 1990 and has paired research and creative writing throughout her career. She has written three scholarly books focusing on major 19th-century literary figures and has finished a book-length research project concerning Civil War narratives. Her contributions have been so great that one literary journal editor categorized her WMU award as a long-deserved acknowledgement of her significance to her field.
College of Health and Human Services

Journal publishes researcher's study on environment, rural poor in India

One of the world's preeminent international development journals, the Journal of International Development, has published a study by a WMU assistant professor of social work.

Dr. Dolly Daftary’s article, “Watershed development and neoliberalism in India’s drylands,” is the first multi-level study to investigate, through a political-economy lens, India’s largest development intervention for its poorest rural areas.

The study’s findings show that after neoliberal reforms, the national government’s flagship rural development policy for the poorest rural districts has been transformed from emphasizing the poor to celebrating better-off households.

Daftary’s study also suggests that the state has shifted from a focus on environmental well-being to natural resource-extraction as well as from labor-intensive technologies in labor-rich areas to capital-intensive strategies that deepen unemployment.

She says the research has powerful comparative implications for other developing countries where similar approaches have been adopted in a period of economic globalization.


Graduate College

College announces list of lauded scholars

Through a highly competitive nomination and review process, five graduate students were selected for the Graduate All-University Research and Creative Scholar Awards for the 2013-14 school year.

It is the highest award presented by the University to graduate students. The winners exemplify excellence in original research or creative work. The awardees represent departments from a variety of disciplines.

The Graduate All-University Research and Creative Scholars for 2013-14 are Ahmed A. Anzaldúa, music; Traci D. Brimhall, English; Kevin A. Douglas, chemistry; Min Tang, philosophy and Samanthi J. Wickramarachchi, physics.

An April awards ceremony honored these five outstanding students, as well as 37 graduate students nominated as Department Graduate Research and Creative Scholars.

Nominations for the Graduate All-University Research and Creative Scholar Awards are sought on an annual basis by the Graduate College from academic departments. Each student nominated by his or her department becomes the recipient of the award at the department level.

From among the department award recipients for each program, a selection committee of the Graduate Studies Council selects those student whose research or creative activity has exceptional merit. These students are designated as All-University recipients, and their official transcript reflects this designation.

Emerging Scholars

An internationally known evaluation specialist, an expert in nuclear and astrophysics and an anthropologist whose focus on linguistics has attracted global attention have been named WMU's 2013-14 Emerging Scholars.

Dr. Chris Coryn is an associate professor and director of WMU's Interdisciplinary Doctor of Philosophy in Evaluation and an internationally known evaluation specialist. A member of the faculty since 2003, he is the author of some 80 scholarly papers and the leader or methodologist for grants and contracts totaling $5 million.

Coryn has been lauded by colleagues for modeling what it is to be a scholar and having amassed an international record of accomplishment.

Dr. Michael A. Famiano is a former associate professor of physics at WMU and an expert in nuclear and astrophysics. Famiano joined the faculty in 2005 and entered the private sector after his eight years at WMU. He has written 47 refereed publications and has been the recipient of more than $2 million in research grants and contracts to support his work. He was cited for contributing to breakthrough research and for mentoring students, taking many of those he was mentoring to the National Superconducting Cyclotron Lab at Michigan State University, where he carried out much of his research.

Dr. Kristina Wirtz is an associate professor of anthropology and a linguistic and cultural anthropologist whose focus on linguistics has attracted global attention.

Wirtz joined the faculty in 2005 and emphasizes Cuba, the Caribbean, Latin America and African diaspora in her work. She is the author of two books, with a third one in progress, as well as book chapters, book reviews and peer- and editor-reviewed journal articles. Scholars around the globe lauded Wirtz for having an enviable academic record even though she is in the early stages of her academic career.

College by College
Levity and relativity
A sculpture depicting a Frisbee-throwing Albert Einstein found a new home on WMU’s Parkview Campus. Montana artist Jim Dolan’s “Between Theorems” was installed near the College of Engineering and Applied Sciences building this spring. Dr. John A. Kapenga, associate professor of computer science, and his wife, Karen Woodin, donated the work.