• Advancing hearing science
• Student wins NSF fellowship
• From discovery to market
Western Michigan University is a nationally recognized research institution that possesses a passion for knowledge. It shapes and energizes us with laser-like focus to find solutions to problems. This energy to grow and learn threads its way into our classrooms, studios and research labs. The research and creative work of our scholars and artists that we collectively call discovery are the passions that drive them to excel, to engage and to share with the broader community. We continually seek creative and compelling ways to support the activities of our scholars and students to achieve their goals.

Our faculty members have accomplished much individually and collectively that we can build upon. We grow our discovery programs through planning and action in the domains of leadership, scholarship, collaboration and resources. Creation of discovery plans by departments and identification of discovery focus areas in the University are tools being formulated to move into the future.

This research edition of the Western Michigan University Magazine highlights some outstanding work as a sampling of the discovery underway by our academic community. As you read the story of the young children identified at birth with hearing loss, think about the body of research here at WMU that informs this program. As you reflect on impulse noise—firearms, firecrackers, whistles—and their threats to hearing, consider how much more we know today about how to protect our hearing than a generation ago. Read about a professor’s 30-year commitment to his research that is global in reach, collaborative in nature and restorative in outcome. See another’s work on poverty-reduction strategies. These are the tangible outcomes of a discovery-driven University.

We have strong initiatives to transfer our discovery knowledge to the community through technology and patents. WMU is changing the blueprint of the community by collaborating with industry to lead in green manufacturing initiatives and licensing research to industry partners. We also remain steadfast in our historical and ongoing commitment to enlighten through the humanities, fine arts and sciences.

We are proud to see our students succeed as they compete with the best in the nation. David Sellers won a National Science Foundation graduate research fellowship—a distinctive and singular honor. An iPad app, developed by an undergraduate student whose training at WMU informed her design, is a tool to help children and adults speak. Today Aynna Lloyd uses it in her graduate program.

We hope that as you read these stories, you will share our sense of pride in the discovery that permeates our fine institution.

John M. Dunn, Ed.D.          Daniel M. Litynski, Ph.D.
President                  Vice President for Research

Visit us at wmich.edu/research to learn more about Western Michigan University and our research.
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Technology Development Fund: Moving inventions to market

WMU researchers have developed an innovation on rapid metal casting technology using specialized sand.
A firm that markets some of the best-known consumer brands in the nation will bring its global design and innovation capabilities to WMU’s Business Technology and Research Park next year.

Atlanta-based Newell Rubbermaid will open a state-of-the-art 40,000-square-foot facility at the park by early 2014, and expects to have a Kalamazoo employee base of up to 100.

The firm is the corporate umbrella for such well-known brands as Sharpie®, Rubbermaid®, Graco®, Calphalon®, Paper Mate® and Irwin®. The company’s move is being assisted with a $2 million award from the Michigan Strategic Fund.

Newell Rubbermaid will build on property that is located on the west edge of the BTR Park near the WMU soccer fields and the University’s historic Gibbs House. And the company expects to develop strong recruiting ties with the University.

“We’re extraordinarily excited about both Newell Rubbermaid’s decision to locate here and its interest in working with our business, engineering and fine arts colleges,” says Miller. “This development, along with the upcoming construction of a new corporate headquarters for the design firm mophie, means our Business Technology and Research Park is now full.”

Miller notes that the park was launched in 1999 and is now home to more than 40 companies as well as WMU’s College of Engineering and Applied Sciences and the Southwest Michigan Innovation Center, which is a life sciences incubator. The BTR Park is one of Michigan’s 11 original SmartZones.

“We’ve had exceptionally strong partners every step of the way. The state of Michigan, the Michigan Economic Development Corp., the city of Kalamazoo and Southwest Michigan First have all helped make this possible,” Miller says.
WMU aviation, engineering colleges part of network that partners with the FAA

The Federal Aviation Administration has tapped WMU to be part of a new network of 12 universities charged with enhancing the safety and future of the nation’s general aviation sector.

The goal of the Center for Excellence Partnership to Enhance General Aviation Safety, Accessibility and Sustainability—known as PEGASAS—is to lay the groundwork for the creation of a cost-sharing partnership between academia, industry and government that will focus on general aviation safety-related topics.

Outgoing U.S. Transportation Secretary Ray LaHood said that the partnership with academia and industry will help the United States take general aviation safety to the next level.

PEGASAS will be led by Purdue University, Ohio State University and the Georgia Institute of Technology. The core team also will include the Florida Institute of Technology and Iowa State and Texas A&M universities.

WMU is an affiliate member along with Arizona State, Florida A&M, Hampton, Kent State, North Carolina A&T State, Oklahoma State, Southern Illinois-Carbondale and Tufts universities as well as the University of Minnesota-Duluth.


WMU’s role in the consortium will involve both its College of Aviation and its College of Engineering and Applied Sciences.

More than a dozen faculty and staff researchers in the aviation college and a smaller number in the engineering college will use the college’s fleet of aircraft, aviation facilities and simulators in Battle Creek as well as research and development tools such as wind tunnels and structure labs located on the WMU engineering campus.

“Our aviation and engineering faculty bring to the new center expertise in all of the areas of focus as well as a national reputation in a number of very specific areas,” says Dr. Raymond Thompson, associate dean of the College of Aviation.

According to Thompson, WMU’s contributions to the effort will likely revolve around its reputation and capabilities in such areas as crew and human factors research, flight safety and system safety management.

Over the next decade, the Center for Excellence is expected to forge a union between the public and private sectors to create a world-class consortium that will identify solutions to existing and anticipated issues.

Two professors named among nation’s 50 American Council on Education Fellows

Dr. Linwood Cousins, director of the School of Social Work, and Dr. Keith Hearit, professor of communication, have been named American Council on Education Fellows for the 2013-14 academic year.

Cousins and Hearit were among just 50 senior faculty members and administrators from around the nation named to be part of the prestigious program.

Fellows are nominated by their presidents and chancellors and selected following a rigorous application process. Only WMU and three other U.S. schools had two of its faculty members selected. The others are Purdue and Ohio State universities and the University of Texas at Arlington.

Established in 1965, the ACE Fellows Program strengthens institutions and leadership in American higher education by identifying and preparing promising senior faculty and administrators for responsible positions in college and university administration.
WMU researcher says 75 percent of the population is at excess risk of hearing trouble. But the good news is that regardless of the cause, hearing loss is nearly always preventable.

A collaboration of government, university and agency research is revealing that a wide range of environmental noises can potentially damage a person’s hearing.

“Hearing impairment is unacceptably common, and it sneaks up on people gradually,” says Dr. Gregory Flamme, associate professor of speech pathology and audiology.

Flamme says hearing can be compromised in routine ways, but people often don’t recognize this, particularly when hearing loss is mild.

“While industrial causes are well-recognized, less awareness is present concerning recreational causes. The key is to identify those risks and educate people on how to prevent dangerous exposures,” he says.

One of Flamme’s recent studies that has garnered him a lot of attention, including by the New York Times and BBC radio, shows how referees officiating sporting events are a particularly at-risk population.

Known for his research on the effects of impulse noise, Flamme says that short loud bursts of sound—such as a referee’s whistle—that can come with little time to prepare can cause permanent hearing damage in just seconds.

But it’s not just sports officials who should be concerned about their hearing.

“We need to do a better job of educating people about the hazards to their hearing and the options available for people who have hearing loss,” he says.

Flamme is part of a multidisciplinary research team including audiologists, hearing scientists, psychologists, physicists and engineers at universities as well as federal and international agencies.

This team includes personnel in the Hearing Loss Prevention team at the National Institute for Occupational Safety and Health, which is part of the U.S. Centers for Disease Control and Prevention.

NIOSH advises the Occupational Safety and Health Administration and other regulatory agencies on the science of worker health and safety.

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Dr. Gregory Flamme poses with his acoustic test fixture. The model is designed to evaluate the effectiveness of hearing protectors against high-level blast exposures—such as acoustic shocks, firecrackers and gunshots—without jeopardizing human listeners.
As part of his current research contract with NIOSH, more than 500 people have undergone hearing assessment in Flamme’s lab at WMU to examine the reliability of hearing test results over time. He’s seeking evidence-based data to define the best practices to prevent hearing loss in occupational settings.

**Predicting impairment, recognizing risk factors**

Occupation in combination with recreational activities and genetics together are significant predictors of hearing loss. Men have an above average risk of hearing loss as compared to women, according to Flamme.

“It’s an accumulation of affects: occupation, hobbies, recreational choices and social expectations all contribute,” he says. “Interestingly, hearing impairment isn’t just a problem in and of itself—it is also a predictor of occupational injuries and numerous psychological and social effects.”

The good news is that regardless of the cause, hearing loss is nearly always preventable. But individuals need to understand the threats.

Flamme says that 75 percent of the population is at excess risk of hearing trouble.

“And the majority of adults have noise exposure profiles that put them at excess risk of noise-induced hearing loss of some amount. “This is where education comes in to play. If we can educate people to recognize the risk factors, they can use proper protection or find ways to reduce their exposure,” he says.

Once it’s clear there is a problem, the earlier those experiencing hearing loss seek treatment, the easier they can adjust to a hearing impairment.

“The longer someone goes without treatment, the harder it is to adjust when those sounds are made audible again with hearing aids or other technologies,” Flamme says.

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**When noise hurts**

-Mayo Clinic; adapted from National Institute on Deafness and Other Communication Disorders, 2008; the National Institute for Occupational Safety and health, 2009; and American Tinnitus Association, 2009.
Other research realms

Flamme also studies hearing loss in young people in addition to his work on the occupational and recreational causes of hearing loss.

With a team of researchers from the National Institute on Deafness and other Communication Disorders, he is working on a study with the U.S. Department of Education to follow more than 3,500 youths nationwide to assess the effect of hearing loss on educational and social performance in school.

Their study is the first of its kind to be done on a national scale. Flamme, along with colleagues and students in the WMU Department of Speech Pathology and Audiology, are eager to address such an important issue.

He says that part of the problem is that doctors as well as policymakers and regulators have an oversimplified understanding about hearing loss in our society.

“Many view hearing impairment as something one is born with or develops in old age. It’s not that simple,” Flamme says, noting that small declines in hearing that are often labeled “slight” or “mild” can have much greater consequences than these labels imply.

“Among chronic conditions, hearing loss is among the most prevalent, and its effects on daily life are profound,” Flamme. “If captured early, we can minimize the effects of that loss on a person’s life.”

For more information, contact Dr. Gregory Flamme at gregory.flamme@wmich.edu.

Earshot

Whistles, starting pistols and other hazards put sports officials’ hearing at risk

For sports officials, a high-pitched whistle is often the key tool of their trade.

But the bleat of the whistle also can be an occupational hazard of the profession, suggests a recent study co-authored by WMU researcher Gregory Flamme and audiologist Dr. Nathan Williams.

In their study, “Sports Officials’ Hearing Status: Whistle Use as a Factor Contributing to Hearing Trouble,” tests of a wide range of whistles showed that even short bursts could be unsafe.

And referees reported hearing loss more often than people in the general population as well as a higher incidence of ringing in the ears.

“We got ahold of pretty much every whistle we could and tried to figure out the amount of maximum whistle signal time a person could have and how that varied by whistle,” explains Flamme, an associate professor of speech pathology and audiology at WMU.

“It turned out that for some whistles that had really, really high sound levels, that limit is about five seconds. And that’s a very short time for a sports official, even on a single game or match,” he says.


As part of their research, Williams, an audiologist at the Boys Town National Research Hospital in Omaha, Neb., and a graduate of the WMU Doctor of Audiology program, wore a personal noise dosimeter and refereed during an all-day high school tournament to measure his noise exposure.

The findings showed that referees are exposed to shrill whistle sounds at levels that could damage hearing and worsen it with repeated exposure.

These sound measurements revealed that in a span of four hours, the unprotected ear would receive more energy than the typical person’s ear receives in 250 days.

“Although whistles probably are not the only risk factor among sports officials, they can be expected to make a significant contribution to an official’s overall risk profile,” Flamme says.

Other noisy exposures, such as a shouting audience, starting pistols, amplified music, and other sounds common at sporting events, also can play a role.

“Excess exposure is the result of too much sound over too much time,” Flamme says.

“Damaging exposure comes when volume of sound exceeds the safe decibel level on a daily level or exceeds the time of exposure (in seconds) before damage occurs.”

For the whistles used by sports officials, that maximum time could be as little as a few seconds.
“The ability to do early diagnostic testing really allowed us to make a significant difference in the lives of families by identifying children born with hearing loss.”

—Dr. Ann Tyler, chair of the Department of Speech Pathology and Audiology
A series of grants from the Carls Foundation have been instrumental to helping WMU’s speech pathology and audiology program treat children with hearing problems and with its mission to train the next generation of audiologists and speech-language pathologists.

Recognized as a premier program across the state and the nation, the University’s 77-year-old Department of Speech Pathology and Audiology also serves the community through the Van Riper Language, Speech and Hearing Clinic.

Because of its reputation for research and service excellence, the department received more than $600,000 in funding from Detroit’s Carls Foundation as part of the foundation’s mission to help children with hearing impairments.

“Our first grant from the Carls Foundation in conjunction with the Kalamazoo Foundation went to purchase special equipment that allowed us to identify hearing impairment in newborns at birth,” says Dr. Ann Tyler, chair of the department.

“The ability to do early diagnostic testing really allowed us to make a significant difference in the lives of families by identifying children born with hearing loss.”

Unlike the behavioral testing that previously was used, infants are now able to be evaluated as newborns using auditory brainstem response testing. This test measures auditory potential from ongoing electrical activity in the brain recorded by electrodes placed on the scalp, Tyler says.

The impact of the testing is dramatic in that it enables medical professionals to diagnose hearing loss almost immediately, leading to better long-term outcomes for children, she says.

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Case in point

‘We were blessed with early diagnosis’

Dr. Teresa Crumpton, master faculty specialist, works with two preschoolers in the Van Riper clinic.

One child, Claire Koning, was identified with hearing loss at birth while the second youngster, Laila Buchanan, was not identified as having a loss until she was 3 years old.

Differences in the girls’ progress today demonstrate how critical early diagnosis is to treating hearing impairment and achieving good outcomes for patients.

Claire’s mother, Anna Koning, says her daughter benefitted immensely from early diagnosis.

Claire and her twin brother, Henry, were born prematurely at 29 weeks. Henry passed the auditory brainstem response test, but Claire did not.

She was 4 months old when she was fitted with her first hearing aids, which she wears every waking moment. Mildly to moderately hearing-impaired, Claire benefits significantly from using hearing aids, her mother says.

Now 3 ½ years old, Claire is hitting the same developmental milestones as her brother.

“We were blessed with early diagnosis,” Anna Koning says. “While Claire’s diagnosis was hard to swallow—I struggled to understand what this was going to look like—the early intervention and therapy have been wonderful.”

Ashley Buchanan shares a different experience with her daughter Laila.

Laila passed the auditory brainstem response test at birth, but did not seem to respond well as time progressed. Subsequent testing revealed mixed results.

It was not until Laila was referred to the University of Michigan Health System for a sedated auditory brainstem response test that she was definitively diagnosed with severe to profound hearing impairment.

By this time, Laila was almost 3 years old.

Because of the severity of Laila’s hearing loss, she had a cochlear ear implant installed in 2010 in one ear at the U of M hospital. But that initial implant failed, another surgery ensued, more time was lost and Laila’s speech and hearing therapy was delayed.

“She went almost three years with no sound, no speech,” Buchanan says.

Today, Laila, an energetic 5 year old, is putting two to three words together. “She knows her alphabet, and can count by fives,” Buchanan says. “It makes me happy that other people can understand her when she talks.”

That’s progress. Almost eight months ago, Laila received her left ear implant. Currently enrolled in kindergarten, she is achieving new milestones regularly.
**Student supported**

Through its many contacts with community members in need of services through the Unified Clinics, the speech pathology and audiology program provides students with training and preparation to be therapists and audiologists.

Another Carls Foundation grant has enabled the speech pathology and audiology department to expand its programs to offer more intervention services, to design cross-training opportunities in the classroom and the clinic, and to provide scholarships for graduate students in speech pathology and audiology.

“The training and service grant allowed us to identify children early and bring them into our clinic for treatment for cochlear ear implants,” Crumpton says.

“By serving families here in Kalamazoo before a scheduled cochlear ear implant surgery at Spectrum (Health System) in Grand Rapids or University of Michigan in Ann Arbor and after the surgeries, we offer families real options that make a difference for them,” she says.

Specifically, the clinic can offer children and adults pre-implantation assessment and mapping. After surgery, the audiologists at the clinic can activate the cochlear ear devices implanted in the surgery, thus saving families a trip to the hospital.

“We are one of the few places to give all these services in one place. We have activated six people here in the clinic. Our oldest was an 86-year-old woman,” Crumpton says.

The clinic also offers patients aural rehabilitation and listening services.

Even while serving clients, Crumpton notes that the benefits go beyond providing a service to the greater community; they aid in training the next generation of specialists.

She says the Carls Foundation’s funding allows the program to cross-train graduate students in speech-language pathology and audiology.

In addition to their interaction in the rehabilitation clinic, students in speech pathology and audiology work as externs at U of M and Spectrum hospitals in the cochlear implant programs. What they learn at WMU prepares them for these professional opportunities.

Kaitlin Jehnzen is a first year speech-language pathology student working in Crumpton’s cochlear ear implant lab along with Allisa Haan, a graduate student in the audiology doctoral program.

Jehnzen works with two clients in her clinical practicum in the speech and language clinic as well as with three clients in auditory habilitation. As a speech-language pathologist, she says the additional training in audiology is a value-added component.

Likewise, Haan is exposed to courses in speech-language pathology to augment her audiology specialty.

“I was an undergraduate in speech-language pathology, and this program funded in part with the Carls Foundation grant provides a good bridge between my speech-language pathology and my doctoral program in audiology,” she says.

And both students say the scholarship provides much-appreciated financial support to offset the costs of education. With the foundation monies, the speech pathology and audiology program can offer four graduate students each a $10,000 scholarship.

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**About the Carls Foundation**

Detroit-based Carls Foundation has a long legacy of providing vital gifts to Michigan nonprofit organizations, including many in West Michigan. William Carls, a German immigrant who made his fortune in the booming Detroit industrial scene of the 20th century, spent a lifetime giving back to the charities he loved. Through the foundation, the work started by William and Marie Carls lives on many years after their passing.
“We want the center to be an incubator of ideas and projects. It’s like an industrial park for the mind. We want this space to generate and nurture ideas across colleges and across disciplines and, at the intersection of those, to stimulate new thinking.”

—Katherine Joslin, said of Center for the Humanities, for which she is the founding director.
A mathematics software design and development effort based at WMU and funded by the National Science Foundation is being featured by the NSF as a transformative tool that levels the playing field for all students by providing ready access to mathematical and statistical software.

The Core Math Tools Project involved almost 10 years of cycles of research, development and classroom testing. The effort was featured recently as an NSF Highlight, with information about the software distributed to media, other federal agencies and Congress as well as featured in NSF publications and other outlets.

Dr. Christian Hirsch, WMU professor of mathematics and longtime math curriculum innovator, is the principal investigator on the project. His former doctoral student, Dr. Brin Keller, who is now an associate professor at Michigan State University and responsible for the coding of the software, is the co-principal investigator.

“The tools are already influencing the nature of mathematics teaching and learning and mathematics teacher preparation nationally,” Hirsch says.

The project has produced a suite of interactive mathematical and statistical software tools that are now freely available at the National Council of Teachers of Mathematics website, nctm.org/coremathtools. The free software and accompanying website content are designed to help high school teachers and their students meet the new Common Core State Standards for Mathematics.

Michael Buchalski coauthored “Bat Response to Differing Fire Severity in Mixed-Conifer Forest California, USA.” This study was led by Dr. Winifred Frick, a bat ecologist at the University of California, Santa Cruz.

In addition to WMU and UC-Santa Cruz, researchers from the Central Coast Bat Research Group, the University of Florida and Murdoch University of Perth, Australia, were part of the team.

Their research found that one year after a 2002 wildfire, bats showed no signs of harm. Published in March, find the journal article at plosone.org.
WMU recently entered into a commercial development partnership with HUMANeX Ventures, which continues to work with the University to develop an online product based on the Career Guidance Inventory developed in the late 1970s by WMU researcher Jerry Nowak and updated by Drs. Glinda Rawls and Mark St. Martin.

Unlike many career tests that measure only one or two areas, the CGI is a comprehensive career assessment that measures an individual’s personality, interests, values and achievements.

The CGI sets itself further apart by going in depth to look at psychological and personal factors that can identify strengths and preferences that can help a person to find a career that is a good fit.

Historically, the biggest limitations in the CGI were its size, format as a paper test and the inability to store the results in a usable database for research and development purposes.

The latest version—referred to on campus as “CGI Online” and commercially as “IMPACTeX Navigator”—further sets itself apart by going in depth to look at psychological and personal factors that can provide powerful insights into talents, preferences and styles.

Consulting, research and development firm HUMANeX Ventures—the vision of which is to create talent-driven organizations and communities—strives to match the individual’s talent to an organization that best maximizes that worker’s potential.

The idea is that employees are not an organization’s best resources; the right people in an organization are its best resources.

Sandi Karman, a WMU student pursuing a master’s degree in organizational communication, has taken the assessment. She found it to be both affirming and revelatory.

“It’s really a good way—personally and professionally—to find out what your interests are and where your talents lie, so you can channel that into whatever you do, and it’s also good for opening your mind to other possibilities,” says Karman, human resources coordinator for Greenleaf Hospitality Group.

Greenleaf’s human resources division has partnered with HUMANeX Ventures to use the career assessment with its employees.

The collaboration between WMU and HUMANeX naturally plays to each organization’s strengths: HUMANeX’s reputation for innovation and drive to identify talents and passions in workers combined with WMU’s development and use of the CGI in its counseling center to supply students with career and life planning help.

The assessment tool makes use of a series of questions that cumulatively can be interpreted to identify career options for students that fit with their individual goals and values.

Nowak’s version of the 1,100-question, paper-and-pencil assessment was initially designed to explore individuals’ academic skills, interests, values and personality.

Retooled to a much shorter version by Rawls and St. Martin, the updated version of CGI sets industry standards as perhaps the only comprehensive career assessment tool available to offer a holistic view of an individual, thus making it a one of a kind.
Dr. Michael Sharer, director of intellectual property management and commercialization at WMU, brought Rawls and St. Martin together with HUMANeX’s CEO Brad Black and his team to discuss plans for his company to commercialize the CGI by transitioning the assessment from its paper form to a scalable electronic tool that interfaced with today’s technology.

“It was a good fit because we had been marketing the CGI to the commercial sector looking for someone who could envision the opportunity or was willing to invest with us in creating a scalable, online version of the CGI,” Sharer says.

“Brad Black and HUMANeX recognized the potential in WMU’s research to commercialize it for broader impact,” he says.

Black agrees, saying of his company’s decision to license CGI from WMU: “We saw in the assessment its commercialization potential on many levels, and we wanted to take CGI and make it famous and impactful to thousands of individuals.”

HUMANeX collaborated with Rawls and St. Martin to create the IMPACTeX Navigator, the online version of CGI, licensed from WMU by Black’s team.

“HUMANeX had the time, enthusiasm and resources needed to take the assessment and make it readily accessible to others,” Rawls says.

“While we have helped thousands through the use of the Career Guidance Inventory assessment tool, we were limited to our students, faculty and staff at the University in our use of it,” she says.

Black says that his company wanted people to access the test so that its potential to help communities and individuals could be fully realized.

“We also were committed to building a partnership with WMU as the major academic institution in the area to leverage the CGI for impact across the Kalamazoo community,” Black says.

HUMANeX Ventures markets the IMPACTeX Navigator for its clients nationwide.

Black offers communities the means to tap into and keep local talent by marketing primarily to K-12 schools, universities, businesses and community groups.

The tool affirms for the individual participants who they are and where they need to concentrate their efforts. Compared to other career assessments available commercially, the IMPACTeX Navigator has rigor, purpose and design.

“We all need ‘mirrors’ to reflect who we are as a person. A tool that reflects and affirms our personality and values helps us in our choice of a career,” Black says.

“Once we identify our talents and skills, the ability to match those to a ‘map’ or career path, allows the individual to realize his or her passion in life,” he adds.

The WMU and HUMANeX teams continue to work together in developing, testing and refining the IMPACTeX Navigator as a tool to be used commercially to grow people, organizations and communities into talent-rich resources, as well as to have a significant impact on WMU students and their career decision making.
Moving discoveries to market:

Fund supports WMU inventions

In the industry, it’s known as the “valley of death.”

Getting stuck in this chasm can signal the demise of an early-stage invention that shows commercial promise in the lab, but still requires further refinement or development to prove its marketplace viability to business interests.

Most of the time, the potential product—be it a device, a drug or computer software—has garnered federal grant dollars during the research phase, but needs the lifeblood of additional funding to progress and avoid proverbial death valley.

For WMU inventors, the WMU Research Foundation’s Technology Development Fund offers financial investment to help move promising discoveries from invention to the market.

Each year, the fund has $60,000 or more available for projects and each project can receive up to $20,000. An Intellectual Property and Commercialization Advisory Committee reviews proposals for funding. The eight-person committee includes faculty members from departments across the University.

“We’ve got a real breadth of projects and managing that breadth is part of the challenge,” says Dr. Michael Sharer, director of intellectual property management and commercialization in WMU’s Office of the Vice President for Research.

“We’re doing everything from software to hardware engineering—including sensors, advanced manufacturing and new green technologies—to drug candidates and other medical inventions,” he says.

These are essentially early-stage products, meaning they’re not yet ready for sales.

“Often these projects need development before you can get someone to license them. The technology development fund helps advance nascent technology further along the research-and-development continuum to the point at which someone would be interested in taking it on,” Sharer says.

“We’re trying to cross that valley of death,” he adds.

Projects seeking investment are judged by the advisory committee based on several criteria, including whether they clearly demonstrate marketplace potential.

“One of the biggest factors we look for are projects that have evidence of market pull. Is it a problem that someone wants solved,” Sharer explains.

“The stage of development also is a big issue. There are some things that are too early. We’ve had some who have an idea, but it’s an untested idea. At that stage, usually they are in need of more funding first to do further research and testing and then come back to us later on,” he says.

And WMU experts in the intellectual property management and commercialization office—which this fund is a program of—are there to assist inventors on everything from determining whether their intellectual property has commercial promise to guiding them through the patenting process to marketing and deal negotiation.
Ultimately, an invention may be licensed to an existing business or could lead to the creation of a startup company that would market it.

“The overall goal is that WMU wants to increase commercialization,” Sharer says.

The funds allocated are monitored and managed as investments. With licensing agreements for projects funded through this program, for instance, the WMU Research Foundation gets a portion of the royalties and allocates those back to the technology development fund to keep it capitalized.

Since its inception more than six years ago, the fund has provided awards to well over a dozen projects, which are in various stages of maturity and hail from across WMU’s campus.

‘Breadth of projects’

Two WMU researchers, Drs. Margaret Joyce and Sam Ramrattan, and graduate student Hemant Bohra, are working on an innovation related to rapid metal casting technology that fabricates intricate metal products.

Their methodology is unique in that it does not require a solid pattern to develop a mold. Instead, the process uses computer-aided manufacturing and drawing, and specialized materials and processes—such as synthetic sand, light curing and machining—to create 3-D molds, layer upon layer. A patent is pending on this technique.

“It will allow for rapid prototyping of a variety of industrial parts, such as cast automotive components,” says Ramrattan, professor of industrial and manufacturing engineering.

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Alum’s invention: Lighting the way to destroy cancer cells

Accomplished clinical researcher Dr. James Olson says that by letting him explore, WMU’s honors college planted seeds for his life’s work in cancer research.

A WMU alumnus is behind a promising compound called Tumor Paint that could greatly advance the surgical removal of cancerous brain tumors. Human trials are expected to begin later this year.

The compound, which contains modified scorpion venom linked with a “molecular flashlight,” binds to and illuminates cancer cells, allowing surgeons to remove as many of these insurgent cells as possible and leave normal tissue unharmed.

There are some cancers for which doctors can clearly distinguish the borders, “but there’s a number of cancers that you absolutely cannot distinguish from normal tissue,” Dr. James Olson says.

The 1984 WMU graduate leads a research laboratory based at the Fred Hutchinson Cancer Research Center in Seattle, and he also is a pediatric oncologist at the Seattle Children’s Hospital.

“Right now, believe it or not, surgeons use their eyes and their fingers and their thumbs to tell the difference between brain and brain cancer,” Olson says.

But this approach also can leave some undetected cancer cells behind, destroy healthy tissue or result in both of these unwanted outcomes.

If a surgeon removes even a small number of brain cells or inadvertently damages the brain, the patient could wake up from surgery with impaired speech, diminished motor skills or any number of limitations.

Olson says that similar danger exists for head and neck cancer patients and anal cancer patients, “where blindly taking extra normal tissue in an effort to get out all the cancer can dramatically impair life.”

And for other cancers, there are different risks.

Somehow illuminating cancerous tissue so that patients and surgeons avoid disastrous results is a concept that occurred to Olson when he was in graduate school, decades before medical technology caught up with the idea.

In the early 2000s, he says, a patient strengthened his resolve to try making the idea a reality. She was a 17-year-old suffering from a type of brain cancer few youths survive.

Olson’s colleague, Dr. Richard Ellenbogen, a Harvard-trained physician and head of neurosurgery at the University of Washington, spent 17 hours trying to remove the tumor.

“And after all that, she still had a grape-sized piece of cancer left in her brain because with the best available tools and his incredible expertise, he couldn’t tell the difference between brain cancer and normal brain,” Olson says.

The neurosurgeon didn’t want to harm the teen by removing the remnant, fearing he would take out normal brain along with the cancerous tissue. But billions of cancers cells, if resistant to radiation or chemotherapy, still threatened her life.

“After that, we decided together that we would work jointly on developing a molecule that would make the cancer light up so that surgeons could see (cancer cells) while they’re operating,” Olson says.
Rerouted to research
More than 30 years ago when Olson left his Escanaba, Mich., home to pursue a degree in biological sciences at WMU, he had no clue he would fall in love with research.

The road map young Olson had for his life: Get undergraduate training, go to medical school, return to Michigan's Upper Peninsula and practice as a family doctor.

Olson says he chose WMU for the first leg of that journey because of the personal attention he received on campus while visiting.

“I could just feel that my individual educational needs would be best met at WMU. I knew very little about the University prior to the visit, but was just blown away by the potential,” says Olson, who entered WMU in 1981 as a member of the honors college, today known as the Lee Honors College.

It was a good fit. Olson says he’s always had a high level of curiosity and the honors college encouraged and fed this natural inclination.

“One of the things that I loved about the honors college: ...If there was an educational experience that we felt as students would be valuable to our future career, we could discuss it with the directors and if they agreed, we could get credit for it,” Olson says.

“As part of that opportunity, I did a summer research internship at the Mayo Clinic in Rochester, Minn., and absolutely fell in love with research, in addition to medicine. Each day we were working toward answering questions that weren’t known by anyone else in the world... Research was a natural fit for my own curiosity,” he says.

That experience was pivotal because, based on it, Olson decided to take a slight detour from his planned path. The decision to detour came when his medical school acceptance letter, to his surprise, left him feeling more let down than elated.

“It just felt to me that I needed a bigger challenge,” he says.

“I loved that summer of research I did through the honors college program, and I thought it would be interesting to apply to programs where I could do both medical training and graduate school training and have a combined career taking care of patients and researching ways to treat diseases that are incurable or not very well addressed,” he says.

Olson found that opportunity in the University of Michigan’s Medical Scientist Training Program and went on to become a pediatric oncologist and clinical researcher.

Over the past 20-plus years, about 80 percent of his work has been in cancer research and 20 percent patient care.

Cases like that of the 17-year-old afflicted with a brain tumor motivate his work in the laboratory.

Lighting up cancer
In the wake of the imperfect results of that teen’s surgery about nine years ago, Olson’s research team began looking for ways to literally light up cancer.

Many potential candidates were tested and rejected by the time Olson learned, from unrelated research done by a University of Alabama researcher, about a protein in the venom of the Deathstalker scorpion that binds to brain cancer cells.

Olson and researchers in his lab “re-engineered” those proteins, coupling them with a molecule that fluoresces—basically acts like a flashlight.

The moment of truth came when they injected the compound into human brain tumor grown underneath the skin of a mouse.

“We injected the tumor paint into the veins of the mouse and one hour later, the cancer was glowing brilliantly (under an infrared camera). It was the first time I’d ever seen two grown men in lab coats dancing in a hallway,” Olson recalls.

Since then, researchers have found that Tumor Paint, in the laboratory, also binds to other types of cancer, including prostate and colon cancer.

One of the two biotechnology companies that Olson founded, Blaze Bioscience, is carrying the Tumor Paint research forward. Later this year, human trials on the compound are set to begin.

Even at these early stages, the promising technology has garnered a lot of attention, including outside the clinical research arena. Tumor Paint was the subject of a three-minute film that won recognition in the Sundance Film Festival earlier this year.

Meanwhile, the Olson Lab steadily works on developing other therapies to cure and treat childhood cancer.

“I have been taking care of kids with cancer for 22 years, and I allow myself to fall in love with every one of them. I don’t try to put up an emotional barrier,” Olson says.

The physician forges these connections knowing that many of his young cancer patients are gravely ill and won’t overcome their disease.

“That can be emotionally devastating. So what I do in my life is turn all of that energy into motivating me to try harder and harder to come up with therapies so that more children survive in the future,” he says.

Learn more about Olson’s research at projectviolet.org. ■

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WMU helps manufacturers gain by greening their operations

As a convener, source of talent and provider of expertise, WMU is a significant player in helping area manufacturers run their operations in sustainable and energy efficient ways that also preserve their bottom lines.

Now almost three years old, the University’s Green Manufacturing Industrial Consortium connects like-minded manufacturers in their efforts to “green” their internal processes. “The GMIC provides a neutral space for manufacturers to come together and share their knowledge and experience with other manufacturers, and to expand their knowledge through the sharing of new discoveries from our research teams’ work on member projects,” says Dr. David Meade, GMIC associate director.

The consortium was formed as an offshoot of the Green Manufacturing Initiative which had the support of a nearly $1 million U.S. Department of Energy grant.

Initial grant monies went for infrastructure to create educational workshops, to underwrite faculty and students work on the initiatives, and for outreach efforts to manufacturing companies.

The purpose is to assist West and Southwest Michigan manufacturers with developing and implementing energy-conscious and environmentally benign manufacturing practices. With their work with WMU, consortium members also connect with other state and federal agencies, seeking out funding sources as well as technical expertise.

“Green manufacturing crosses all industry boundaries, meaning the lessons to be learned are not industry segment specific,” Meade says. “The result is we can accelerate the rate of improvement for our members on lowering their impact on the environment while improving their bottom line.”

Full consortium members are well-known companies with widely used products—Fabri-Kal, Landscape Forms, Post Foods, Polywood Inc. and Steelcase.

Meade says that through WMU, the consortium members not only have a base from which to network to share project ideas and goals, the manufacturers have access to faculty and students in the College of Engineering and Applied Sciences for project-specific work.

Currently, 15 undergraduate and graduate students from programs in engineering and other WMU units join together to help conduct site visits, lead discussions on changes to processes to enhance green manufacturing, and present their findings to companies inside and outside the consortium.

“We can accelerate the rate of improvement for our members on lowering their impact on the environment while improving their bottom line.”

—Dr. David Meade, associate director of WMU’s Green Manufacturing Industrial Consortium

Students involved on GMIC research teams also are tapped by the organizations to work as interns and as full employees.

Executives at Landscape Forms are among those who speak highly of their GMIC experience, both for how it advantages their company and for the experiences the company can offer students.
“The college students benefit by creating relationships with those already in industry and have the opportunity to confirm what they know and don’t know from their classroom studies,” says Kal Kalkowski, Landscape Forms’ director of operations.

“The students are part of the conversations upper management is having (at GMIC meetings) about how to get people more interested in sustainable practices,” adds Becky Fulgoni, Landscape Forms’ executive vice president. “We are sustaining engineering talent here in the area, and we have access to high-level students.”

Landscape Forms is a founding member of GMIC. The well-known Kalamazoo company has produced site furniture and accessories for the outdoors for 40 years.

“Landscape Forms sees itself as a leader in green initiatives,” Fulgoni says. “As such, we need to be part of the conversations and the discussions, and we need to be contributing to the broad body of knowledge that is developing around green manufacturing,” she says.

Today, GMIC, with its member consortium fees, is on target for being self-sustaining.

“The challenges for the next 12-18 months for GMIC is to maintain its current consortium members, recruit an additional one to three members, maintain faculty participation and establish base funding for the administration of the consortium,” says Patten.

For more information about GMIC, contact Dr. John Patten or Dr. David Meade at john.patten@wmich.edu or david.meade@wmich.edu; or, contact Carey Schoolmaster, GMIC program coordinator at carey.schoolmaster@wmich.edu.
Poverty-reduction measures informed by research, affected communities

Census figures show that almost 16 percent of U.S. citizens and a similar percentage of Michigan residents have incomes below the federal poverty line. Poor children alone are at risk for homelessness, hunger, subpar academic achievement, and even emotional and health problems.

Galvanized by the incidence of poverty and its effects, a team of WMU experts has aligned with a statewide anti-poverty initiative to offer the movement poverty-reduction strategies informed by research as well as by residents of low-income communities.

The Voices for Action Poverty Reduction Initiative has the goal of cutting Michigan’s poverty rate in half by 2020.

As part of that effort, WMU social work, legal affairs, evaluation and public policy experts, along with their partner-consultants, The Bingman Group, are evaluating the effectiveness of programs with anti-poverty related missions.

Together they’ll use their expertise to help these various organizations develop best-practice models and to assist them in making programmatic changes where necessary. The W.K. Kellogg Foundation has granted $245,000 toward this work.

Led by Dr. Linwood Cousins, professor of social work, and Dr. Earlie Washington, dean of the College of Health and Human Services, the WMU research team has made connections with community organizations that serve the poor.

The focus of the Early Learning Neighborhood Collaborative, for instance, is on school readiness. The Grand Rapids nonprofit provides children in poor areas of the city with an early start to education.

A WMU evaluation team from the College of Health and Human Services and educational consultant, Dr. Lloyd Bingman, are working with the ELNC to assess its kindergarten-readiness efforts.

Specifically, the team is assessing how the ELNC helps parents and caregivers prepare children for kindergarten.

Their evaluation also is assessing the nonprofit organization’s progress toward its goal of providing, expanding and sustaining the capacity of high-quality early care and education programs in Grand Rapids neighborhoods deemed vulnerable.

Meanwhile, the team also is conducting an evaluation for another Grand Rapids nonprofit, the Hispanic Center of Western Michigan.

The ongoing assessment for the Hispanic center involves evaluating the organization’s goal to improve its operational capacity as an anchor agency, both locally and regionally, for improving immigrant-rights advocacy and racial equity for Latinos impacted by heightened anti-immigrant speech, legislation and law-enforcement action, according to Teresa Bingman, policy analyst and principal with The Bingman Group. This includes strengthening partnerships with the Mexican Consulate, she says.
Evaluators also are assessing the center’s programs that are designed to strengthen parental involvement and civic engagement on educational issues.

These projects are supported with grants in the amount of $125,000 and $120,000, respectively, from the Kellogg Foundation.

**Research and community engagement**

Central to community-based research, Cousins says, is striking a balance between the perspectives of experts who visit those communities and the perspectives of residents who live in them.

One of the key components of the Voices for Action project headed up by WMU researchers was a series of community engagement forums in Kalamazoo.

Through the forums, low-income communities shared their thoughts and needs with organizers. Three issues came to the fore: jobs, education and healthcare.

“When you listen to people in poverty, you give them their dignity and show respect,” Cousins says. “Some of their stories involved structural inequalities and some involved unwise personal decisions. In listening, we neither condone their decision-making nor justify the unjustness of the system. We try to listen and leave them with their dignity.”

Bingman noted that “from these forums, trust was built and earned on both sides... This gave WMU credibility in the community. Collaboration is key.”

One participant in a 2012 forum put it this way: “I am pleased to participate in the UC Collaborative because people listen to me and others to find out what we need to improve our lives. We have our own thoughts as low-income people about how we can do better, but often people don’t listen to us and hear our needs.”

Cousins’ overall plan is to help establish the University Community Empowerment Center at WMU, housed in the College of Health and Human Services.

“The UCEC will become an innovative leader in community-focused research and asset development through university-community collaboration,” Cousins says. “The center will provide leadership in training, consultation and technical assistance, as well as applied research, program development and evaluation.”

Voices for Action is contributing $340,000 to support the creation of a university-based “empowerment” center that would be a hub for research, technical assistance and leadership training for programs.

Cousins says that his interest in poverty is rooted in a desire to understand all the issues related to being poor—social, political, economic equity and access as well as education, healthcare and employment.

Growing up during segregation in the South, Cousins says, “I saw poverty and the issues associated with it, and for the most part, it affected people of color, people within the world I knew. As I got older, I saw how it affected others as well. But what I saw in my own community consumed my interest and has led me where I am today.

“To help people is to help myself. We have interlocking destinies... In helping others, we are helping ourselves.”

For more information, contact Dr. Linwood Cousins at linwood.cousins@wmich.edu.
Sea no more

After 25 years, WMU geographer who helped expose the Aral Sea environmental disaster remains dedicated to his research.
The Great Lakes are the pride of Michigan. The lakes that surround the state not only shape it geographically, but they are critical to tourism and other industries. The waters teem with marine life and are a vital resource for other animals.

Now imagine the seemingly impossible. Imagine that over the next 25 years, because of human activity, one of these lakes virtually disappears.

While such an environmental and economic disaster may seem unlikely, it’s what happened in the former Soviet Union when the Aral Sea began to dissipate.

Moreover, officials in the region successfully concealed this catastrophe from the wider world. That is, until a WMU professor’s published research revealed it in the journal *Science*.

Dr. Philip Micklin, a now-retired geography professor but still active researcher, was among the first to tell the world in the 1980s about how efforts to grow cotton, rice and other crops diverted so much water from the two major rivers that feed the Aral Sea that it left the once-majestic body of water with just 10 percent of its original volume, covering only 20 percent of the area it once occupied.

This year marks the 25th anniversary of Micklin’s Science cover story that revealed what the Soviets had been trying to keep from wide public knowledge.

Understanding the demise of the sea and the need for water-resource management remains relevant today for the lessons it offers—including reasons for hope.

### Diminished waters, high toll

Since the early 1980s, Micklin has made more than 25 trips to the central Asian region that was once part of the Soviet Union and straddles the countries of Kazakhstan and Uzbekistan.

He has watched the Aral Sea, once the fourth largest lake on Earth, shrink dramatically before his eyes.

Today, the sea has been reduced to the Small Aral in the north and two salty lakes in the south that are connected by a long, narrow channel.

The decline in the sea’s fortunes has been well-documented:

- Widespread water diversion projects along the Amu and Syr rivers that feed the lake have reduced the flow of fresh water to a trickle.
- Of the three remaining residual lakes, two are so salty that no fish species can survive. The eastern southern lake is on average four times as salty as the oceans.
- Marshlands declined from 100,000 hectares in 1960 to 15,000 hectares in the 1990s, fish species from 32 to six, mammal species from 70 to 32 and bird species from 319 to 160.
- The port cities of Moynak in Uzbekistan and Aralsk in Kazakhstan are now scores of kilometers from the shoreline of the lakes that remain.
- Pesticides and other agricultural chemicals that have accumulated in the lake are now exposed on the dried bottom and winds blow the toxic compounds and sand across the region.
- The sea’s decline has caused residents to suffer from inadequate nutrition and respiratory illnesses, esophageal cancer, liver diseases and other disorders.

“The story of the Aral Sea has been one of gloom and doom,” says Micklin, who taught at WMU from 1970 until 1999.

Even after retirement, he remained committed to his research documenting and studying the effects of the Aral Sea’s demise.

He received funding through NATO’s Science for Peace program in a series of grants from 1994-2003 as well as a National Geographic Society grant in 2005. And as part of a United Nations team, Micklin pieced together funding and research teams to support his endeavors to work collaboratively with scientists in Europe and central Asia.

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He’s found that out of the sea’s story of gloom is emerging a modicum of hope following the construction of a dam in 2005 that dramatically improved the northern-most lake.

“The North Aral Sea has come back amazingly quickly, much better than anyone expected,” he says.

Not only have water levels risen and salinity levels dropped, nearly every species of fish has returned and multiplied to the point where subsistence and small-scale commercial fishing has increased several fold in recent years.

Partial recovery of one or the other two southern lakes is possible but less likely. It would require far more money than was spent on the northern lake dam project and the benefits might not be worth the expense, Micklin says.

The Aral Sea is a terminal lake, meaning there is no outflow of water. Over the centuries and before human interference the Amu River course has shifted briefly away from the Aral Sea, although the lake had always quickly rebounded when the river course shifted back again.

Without the fresh supply of water from both the Syr and Amu rivers, which carry glacial melt water from the central Asian mountains, evaporation significantly outpaces any rainfall, snow melt or groundwater supply.

Micklin says that today not only does irrigation dramatically reduce the inflow of water to the lake, but the vast former seabed that is now exposed is so porous that the water that would have fed the lake when it was larger quickly disappears in the sand.

A sea victim to economics, politics

Micklin, a native of Washington who has a doctorate from the University of Washington, began his studies on the Soviet Union in the 1960s.

Over the years, he worked with United Nations-funded projects and with institutes in Moscow and Kavakalpakstan, a republic in Uzbekistan.

In the early years of his research he had focused on a series of Soviet Union-proposed projects to move water from Siberia to the desert region in central Asia.

For decades Soviet officials had known of the shrinkage of the Aral as water was diverted from the Syr and Amu rivers to expand irrigation. But, as much as possible, they kept this information from public eyes.

“People knew it was slipping down the drain,” Micklin says. In the mid 1980s, however, Mikhail Gorbachev, general secretary of the Communist party, cancelled the extensive and expensive proposed river diversion projects, which he saw as economic boondoggles.

Publishing news of the disastrous shrinkage of the Aral Sea caused by excessive irrigation was used to show the folly of sending precious Siberian water to central Asia to be “wasted.”

It was about that time that Micklin published his Aral Sea findings in the journal Science, the first time news of the decline had appeared in a widely read Western science journal.

Micklin was invited to join a UN-sponsored commission to propose solutions to the shrinking sea, but “it all fell apart with the collapse of the Soviet Union” in 1991, he says.

After 1991 the lake was divided between Kazakhstan and Uzbekistan, new nations formed from the Soviet Republics of the same name.

Efforts to deal with the sea’s catastrophic situation became more complicated as the five former Soviet republics in its drainage basin, now independent states, competed for the use of the water in the Amu and Syr rivers.

Micklin, who co-authored “Reclaiming the Aral Sea” for the April 2008 issue of Scientific American, says that the lessons learned from the Aral Sea can be applied to similar situations in other parts of the world—Lake Chad in Central Africa, for example, and the Salton Sea in Southern California.

He says that while people can quickly wreck a natural environment, restoration takes a very long time because quick fixes seldom work for complex environmental problems.

And yet, “the environment is resilient,” Micklin says.

As levels in the northern lake in Kazakhstan rose after the dam was built, fish that had virtually disappeared from the lake came back within months, he says.

“They were still upstream in the rivers that fed the lake and in deltaic lakes connected to the rivers. Once the salinity went down, they came back,” he says.

The rapid return of the health of the north lake and its biological diversity shows that the natural environment is resilient and that gives Micklin and others hope that restoration can improve such natural treasures.
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“We could become a clearinghouse where industry could get their parts made quickly,” Ramrattan adds.

Joyce, professor of chemical and paper engineering, and Ramrattan have used their technology development award to develop this new process.

For projects selected, the funding may also be used to scale up a “lab-sized” process to larger proportions or to improve a prototype or to underwrite a study or testing that moves the project forward.

In his laboratory at Haenicke Hall, Dr. Gellert Mezei is in the early stage of developing a method to selectively extract anions—negatively charged ions—from solutions. A patent is pending on the discovery.

Potential customers include wastewater treatments plants, municipalities and entities involved in environmental cleanup.

“One particular target we are going after is making the disposal of nuclear waste more efficient,” says Mezei, an assistant professor of chemistry.

As part of remediation efforts, nuclear waste can be transformed into glass in order to avoid leakage of this radioactive material.

But this also can be problematic in that sulfate anions can cause the glass to become unstable over time. There are extraction agents that can remove these sulfate anions, but they also extract other anions present in the waste, Mezei says.

“This makes the extraction of sulfate very inefficient and much more of the extraction agent needs to be used. There is a need for a selective sulfate extraction agent that can also tolerate the high alkalinity of the nuclear waste,” Mezei explains.

“We recently came across a system that is very promising and we have already achieved the selective extraction of sulfate over nitrate and perchlorate and we are working on the selectivity for sulfate over carbonate,” he says.

Mezei calls the process “liquid-liquid anion extraction” and in addition to the nuclear waste application, this same method may be used to decontaminate wastewater, even purifying the water to the point that it’s drinkable again.

“In the long run, we also think of it for cleaning up agricultural runoffs,” he says.

Mezei’s nearly $20,000 TDF award is helping to buy chemicals and equipment, pay for student research assistants and investigate how this extraction process could be scaled up from the laboratory to an industrial level.

In yet another project, Dr. John Patten, director of the WMU Manufacturing Research Center, received $20,000 from the TDF to develop the prototype for a cutting device he designed.

Using intense pressure and heat, the device uses a laser beam coupled with a diamond cutting tool to soften hard and brittle materials so they become easier to machine.

He and Dr. Deepak Ravindra, a doctoral fellow at WMU, have launched a company called Micro-Laser Assisted Machining Technologies, LLC around the invention.

A patent is pending on this technology which also has won funding from the National Science Foundation.

“The TDF provided much needed support to move our research down the road towards commercialization,” Patten says.

“The funding allowed us to support further refinement of the technology and continue progress without any delays or gaps in funding. This is very important to maintain momentum and continuity of the research group and program,” he adds.

To learn more about the Technology Development Fund, contact Dr. Michael Sharer at (269) 387-8298.

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Chemistry student second in WMU history to win NSF graduate research fellowship

“I was drawn to WMU’s graduate program in chemistry because of its environmental focus, with an emphasis on green chemistry, which is gentler, more environmentally healthy and friendly.”

—David Sellers

WMU doctoral student David Sellers was in high school when he had his first hands-on experience with the excitement and challenge of field research.

Led by a scientist from Dow Chemical, Sellers and others tested water quality in the Rifle River in Ogemaw County in northeastern Michigan.

“We could see actual changes that intrigued us, like the time a sudden storm washed a farmer’s lime into the river and we recorded the pH level changes,” he recalls.

Sellers’ intrigue with discovery through scientific inquiry has helped guide his academic pursuits ever since and recently earned him a big endorsement to carry on with them.

He is among an elite group of students in the nation to win a National Science Foundation Graduate Student Fellowship. The prestigious fellowship, secured this past fall, pays out $42,000 a year for three years, supporting Sellers in furthering his research in synthetic organic chemistry.

The 26-year-old has come a long way since that high-school era project set the stage for his career. Today, Sellers is wrapping up his involvement with research exploring working with molecules as indicators.

This research—performed in the lab of Dr. Elke Schoffers, chemistry professor—could be used to help emergency responders in a chemical weapons attack or perhaps as a catalyst for certain organic reactions.

As a doctoral student, Sellers has more time to explore where his passion lies in terms of a research focus.

But as just the second student in WMU history and the first in chemistry to receive this NSF fellowship, Sellers says the coveted award has the potential to help his career take off.

“It was great to be singled out for this honor,” he says.

Research experience was critical for Sellers’ fellowship application. He entered a competitive field of students vying for the award intended by NSF to recognize and support outstanding graduate students.

Of 2,000 applications submitted, less than 10 percent or 153 were awarded in chemistry. Just five of those awards went to graduate students in Michigan—to Sellers and four students from the University of Michigan.

Other universities with students receiving awards include Berkley, Caltech, Columbia, Harvard, MIT, Northwestern, Princeton, Stanford and Yale. There are past recipients of the fellowship who’ve gone on to win a Nobel prize.

In addition to his research background, Sellers believes his experience outside the classroom and the lab also were high points of his application.

Between his undergraduate years at Spring Arbor University and graduate school at WMU, he worked in Cambodia in a water-quality lab for Resource Development International-Cambodia, a nongovernmental organization.

The National Science Foundation Graduate Research Fellowship dates back to 1952. Since then, the NSF has funded more than 46,500 fellowships out of more than 500,000 applications. More than 30 recipients have gone on to become Nobel laureates. The first fellowship to a WMU graduate student was awarded in 1969 to psychology student Michael Domjan.
"I installed equipment and trained people to use it," Sellers says. "In Cambodia, education lags ours, so I taught organic chemistry there. That’s when I first thought I might want to be an educator at a university someday."

When he returned to the states, Sellers worked at Spring Arbor as an adjunct faculty member teaching organic chemistry. And for a period, he also was a carpenter’s assistant for a Romanian convent.

Sellers says he was drawn to WMU’s graduate program in chemistry “because of its environmental focus, with an emphasis on green chemistry, which is gentler, more environmentally healthy and friendly.”

His love for the discipline is palpable. “It’s a very exciting field, partly because it’s at the meeting point of almost all of the scientific disciplines,” he says. “So it’s an exciting field to be in, and I really like that interplay, especially between biology and chemistry.”

Since joining the chemistry department in 2011, Sellers says he has found the program and its scholars to be “outstanding” and singled out Schoffers, his advisor, and Dr. Sherine Obare, associate professor of chemistry, for helping him hone his research ideas.

Sellers explains that in Schoffers’ laboratory, working with molecules as indicators, “we learned new methods for using synthetic molecules.”

“I’d like to take this research we learned in a new direction—trifluoromethylation—which refers to the trifluoromethyl groups used in pharmaceuticals and agro-pesticides,” he says.

“The goal would be to design a reaction with high selectivity for one spatial orientation,” says Sellers. “This project offers many opportunities to develop new methodology.”
Is growing tropical milkweed in North America imperiling monarch butterflies?

Though tropical milkweed is popular to grow in the U.S.,

Dr. Stephen Malcolm says the potential danger of propagating the non-native plant warrants study.

The latest official count of monarch butterflies overwintering in Mexico revealed another year of troubling census news for the black-and-orange winged insects, famed for their migration from North America to Central Mexico each year.

In March, some conservation groups reported their census showed a marked decline—the steepest ever recorded—in the monarch butterfly population in Mexico. Surveyors determine the size of the butterfly population by the acreage the insects cover, and that's down 59 percent, according to the World Wildlife Fund, which sponsored the survey with Mexico's National Commission of Protected Areas.

This drop is part of a trend that scientists account for variously.

Among suggested culprits for the butterfly's shrinking ranks: deforestation in Mexico and throughout the rest of North America, as well as destruction of native milkweed, the butterfly's only larval food source, due in part to extensive use of genetically modified crops and application of herbicides.

The tall leafy plant with bright yellow and orange flowers is colloquially known as "tropical milkweed." Malcolm has been growing it for decades for research purposes and knows the plant well.

For instance, this spring, he gave a presentation on milkweeds at the annual conference of the Wildflower Association of Michigan, ending his talk by sharing his concerns about raising Asclepias curassavica outside the plant's native territory in South and Central America and the islands of the Caribbean.

"Sending seeds to people around North America saying that this is a great food plant to raise monarchs strikes me as irresponsible because we think it disrupts the entire lifecycle of the butterfly and could be catastrophic if it's done on a very wide scale," Malcolm says.

Monarchs go "gaga" over this milkweed variety, which Malcolm says can be found blooming in the United States during a time when no other native milkweed is flowering.

"What we think is important is seasonality," he says.

He believes that growing Asclepias curassavica, particularly when no native...
Milkweed is blooming, is problematic for monarchs because they feed on the nectar and the healthy plants start to trigger mating at a time when the insects should be focused on migrating and accumulating the necessary fat stores that both fuel their flight to Mexico and sustain them while there during the winter.

“In September in Chicago you can see thousand and thousands of Asclepias curassavica” growing in municipal gardens, Malcolm says.

“You can walk through those gardens and you can catch monarchs in your hands. They just go gaga over this plant... They’re all flowering at a time in September when no other milkweed in the whole of North America at this latitude is flowering and the butterflies are confused. Physiologically, they don’t know what to do,” Malcolm explains.

In North America, from March to about the end of August, the butterflies are breeding and feeding on native milkweeds to store the fat needed to fly south.

Malcolm says what cues monarchs to stop breeding is the change in day length with the onset of fall.

“A very rapid rate of day-length change is the most reliable signal on the planet in temperate regions to trigger a behavior,” he says.

In the fall, the day length is decreasing at the fastest rate it will decrease in the year, which in turn, signals the migratory monarchs to stop breeding behavior.

But in the presence of abundant tropical milkweed, Malcolm says, “the butterfly thinks, ‘These day-length cues can’t be right. I’ve got these perfect host plants.’”

Furthermore, the native milkweed are senescing—their leaves are falling off—because it’s autumn and that’s what you’d expect.

At the wildflower conference, a gathering of professionals and flower enthusiasts who appreciate the potential perils of growing non-native species, Malcolm addressed a sympathetic crowd.

But when he presented these same concerns at a monarch butterfly conference in Minneapolis last July, Malcolm says, “I almost had to run from the room because there were so many people angry with me for saying this about a plant that they love.”

“Folks who are growing this think they are doing monarchs a favor,” he notes. “They are very well-intentioned. It’s hard to tell someone who is well-intentioned: ’Please don’t do this.’”

But, for the sake of the monarch, the biological sciences professor feels the potential adverse effects of growing Asclepias curassavica in North America on a large scale shouldn’t be ignored and warrants formal study.

A respected ecologist and researcher, Malcolm was consultant for the 2012 film “Flight of the Butterflies” about the amazing migration of monarchs. Some of his current research involves aphid, ladybird beetle and milkweed interactions and the influence of plant chemical defenses.

For more information, contact Dr. Stephen Malcolm at steve.malcolm@wmich.edu.
While working with children who have speech difficulties, master’s degree student Aynna Lloyd saw how useful storyboards and pictures were to helping the youngsters communicate.

Lloyd only wished there was an inexpensive assistive technology that her clients could use to relate their thoughts, as an alternative to the pricey text-to-speech tools available.

The 2010 WMU graduate’s notion led to the creation of an iPad app called SpeechHero that can give voice to children and adults who have trouble speaking.
The app has more than 6,000 “symbol tiles.” Users tap them on the iPad’s screen and the application vocalizes the image displayed, whether an animal, a fruit or a verb. The tiles can be strung together to create phrases or complete sentences.

Lloyd, who went on to pursue a master’s degree at the University of Tennessee, began using a variety of visual aids with clients when she was an undergraduate studying speech pathology and audiology at WMU and she says that experience led to her clinical work in graduate school.

Late in 2011, she approached her cousin and app developer, Drew McKinney, to help her create an iPad app she could use for speech-therapy sessions.

“I really wanted him to make me a simplified AAC—augmentative and alternative communication—device for my iPad that I could use with my kids. The iPad is so common and it’s not a big, bulky machine. And it’s easily accessible,” Lloyd says.

Lloyd says that while there are other text-to-speech apps and devices on the market, she found them to be too high-priced or difficult to use, or had a number of functions she didn’t believe her clients needed.

McKinney, owner of Bloomingsoft, agreed to create and market the app. It launched in September and is available on Apple’s App Store for $99.99.

Lloyd says that while SpeechHero was primarily designed to be used by educators and parents with schoolchildren, it can easily be used by anyone who has a communication disorder.

“We tested an elderly man with dementia who had word-finding difficulties. He was able to use the app and his wife was just so happy because the communication was much smoother. The tiles were a reminder to him...The iPad makes it so easy,” Lloyd says.

Following SpeechHero’s release, the WMU Magazine interviewed Lloyd this past spring semester about her career and her experience helping to develop the app to help those with communication disorders.

For more information, visit speechhero.com.

Q Where are you on your academic path today and what are your future goals?
A I am currently in my final semester as a graduate student in speech language pathology at the University of Tennessee, and I am doing my practicum at UT medical center. My goals in the next five years are to provide speech therapy services to my community and to continue to develop new ways to help people with communication challenges.

Q Who influenced you as an undergraduate in speech pathology and audiology at WMU?
A One professor that really inspired me at WMU was Dr. Janice Bedrosian. She is a professor in the department who really believes in her students and guides them to succeed. She taught my child language disorders class where I first learned about autism and how to communicate and work with children with autism.

Q How did you conceptualize the SpeechHero app with your cousin?
A I explained to Drew that my clients benefited from pictures and storyboards to communicate. There are a number of very expensive tools out there, but these were financially unreachable for the practitioner and my clients. So Drew and I began the design and development immediately. We tested the product in the Midwest with SLPs (speech language pathologists), clients and families over the course of a year.

Q How are you using the SpeechHero today in your graduate studies?
A I use the SpeechHero app whenever I have the opportunity. I especially used it when I had my practicum at the Tennessee School for the Deaf. It was a great way to communicate with the children, especially when I didn’t know a specific sign. I also used it to test their vocabulary knowledge. The great thing about SpeechHero is that it can be utilized in so many ways for an SLP, so it becomes not only a communication tool for a user, but also a therapy tool for the SLP.

Q How are professionals seeing SpeechHero impact their work?
A Currently the app is being used by SLPs, special education teachers, families with children who have speech issues and clients needing speech services. A new user group has emerged of those working with children to read. A grandmother from West Michigan told me that SpeechHero was a fun way to work with language and language patterns with her grandson. By playing with the app together, she said her grandson is developing beginning language.
This art piece, Overdose, was created by Mindi Bagnall, curator of the University Art Collection and graduate of WMU's School of Art. Bagnall says, "Many of my artworks include houses—images of comfort and safety. This particular house can be found on Stuart Avenue in Kalamazoo. I also enjoy manipulating the proportions of everyday objects in order to create interest and make people think. In this case, I think it's a good thing butterflies aren't actually that big or we might all think of them quite differently." Find more of Bagnall's work at her website: www.mkbarts.com.