OAKLAND UNIVERSITY RESEARCH

Fall 2016 | Volume 8

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RESEARCH

RESEARCH AT OAKLAND UNIVERSITY

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OAKLAND UNIVERSITY

On the Cover

Professor of Mechanical Engineering Lianxiang Yang, Ph.D., pictured with Ph.D. student Junrun Li (left), researches optical engineering (digital speckle interferometry) and has informed unique uses of the technology; he has 11 patents or patent applications and received OU's 2016 Research Excellence Award.

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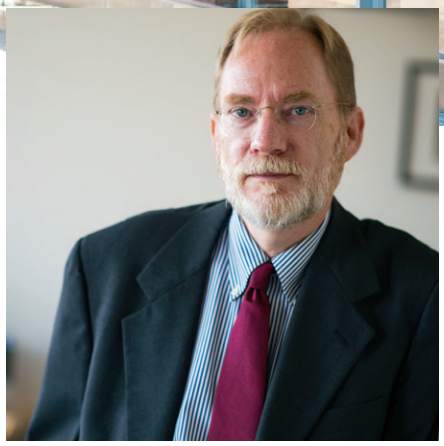

David A. Stone, Ph.D.

David A. Stone, Ph.D., joined Oakland University in August as associate vice president for research. Dr. Stone coordinates all of the University's research-related operations, including sponsored and internally funded programs, as well as technology transfer, commercialization of intellectual property and oversight of compliance activities.

A highly accomplished instructor, researcher and administrator with an extensive background in interdisciplinary scholarship, Dr. Stone joins OU from Northern Illinois University (NIU). At NIU, he was associate vice president for strategic innovation and planning and an associate professor of public health in the School of Nursing and Health Studies. He was also an associate vice president for research and director of the NIU Office of Sponsored Projects.

Dr. Stone earned a joint bachelor and master of arts degree in interdisciplinary forensic psychiatry as well as a doctorate in interdisciplinary philosophy and social studies of science and technology, all from Boston University.

His areas of specialization include philosophy of natural and social science, technology and medicine; ethics; forensic psychiatry; substantivist economics; organizational change; public health; qualitative research methods; risk behavior; youth violence; placebo studies; research development; inter- and transdisciplinarity; and research development.

Cumulatively, he has conducted research with more than $40 million in grant support, provided research consulting services to several major U.S. universities, organized eight international conferences and authored more than 100 publications, conference papers, lectures and abstracts.

Technology Transfer Mentor-in-Residence

Michael W. Long, Ph.D.

Michael W. Long, Ph.D., joined the University in February as a Mentor-in-Residence for Intellectual Property Development and commercialization. Dr. Long assists OU faculty conducting research and pursuing applied projects to develop and guide their intellectual property toward commercialization — whether licensing or spinning off a startup. He also explores the intellectual property potential within different campus units and establishes methods by which the commercial potential of faculty or student intellectual property can be evaluated.

Dr. Long earned a Ph.D. from the Wayne State University School of Medicine Department of Physiology and did post-doctoral training with the Memorial Sloan Kettering Cancer Center before serving as a professor of pediatrics at the University of Michigan. Dr. Long has also been a principal investigator on multiple grants, raising approximately $30 million in funding. The University of Michigan used a number of his patents to spin off a company that Dr. Long then directed.

October 2016

Colleagues,

We are pleased to present this edition of the *OU Research Magazine*, highlighting the significant accomplishments of our faculty in a range of research and creative activities. Oakland University continues to expand its reach and impact as a research university, as evidenced by an increasing number of external grants from organizations that include the NIH, NSF, NASA, and the defense industry.

As a Carnegie-classified doctoral research institution, Oakland University's recently updated strategic plan calls for us to "be recognized as a strong research and scholarly environment focused on creative endeavors and on the discovery, dissemination and utilization of knowledge." To reach our aspirations, we have taken important steps in recent months to bolster our research efforts.

First, we welcomed David Stone, Ph.D, to the position of Associate Vice President at OU this past August. As the chief research officer, Dr. Stone is working on plans to strengthen research development at OU and to lead the Office of Research Administration in supporting our research mission. Another of our goals is to increase interdisciplinary research. To spur new collaborative efforts that will attract additional sponsored research opportunities, we recently announced startup funding for three new research centers that include the Center for Data Science and Big Data Analytics, Center for Cyber Security, and the Institute for Spintronics and Microwave Technology.

Oakland University's ideal location in Southeast Michigan has allowed us to partner in research collaborations with leading international companies and institutions ranging from health providers to the auto industry. The results have included new patents, discoveries and innovations that contribute positive solutions to complex questions.

As you will see in the pages of this magazine, we are proud of the impactful research being conducted at Oakland University, and we are pleased to share the outstanding accomplishments of our faculty, staff and students.

James P. Lentini, D.M.A., Senior Vice President for Academic Affairs and Provost

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James Lentini *is the senior vice president for Academic Affairs and provost at Oakland University. Formerly the dean of the School of Creative Arts at Miami University in Ohio, he has also served as the founding dean of the School of Art, Media and Music at the College of New Jersey and as acting chair of Wayne State University's Department of Music. A native Detroiter, Dr. Lentini earned his Doctor of Musical Arts degree from the University of Southern California, his Master of Music degree from Michigan State University and his Bachelor of Music degree from Wayne State University. His other studies include management in leadership and education at Harvard University.*

Bioinformatics

Powerful new tools time-stamp life's evolution

How did life on Earth evolve? Can life be created from non-life?

Fabia Battistuzzi, Ph.D., assistant professor of Biological Sciences at Oakland University, may be en route to the answers. Dr. Battistuzzi recently received a $600,000 three-year grant from NASA to help her research team on the journey.

"We are developing the tools to create a deeper understanding of life's evolutionary history," she said. "It may take us three years to answer the question, but the general idea behind the grant is to develop methods to give a more accurate time stamp to all of the different species that have evolved on Earth."

Back to one cell

Dr. Battistuzzi, a database-oriented evolutionary biologist, joined OU's faculty in August 2012. Her research aims to understand when and how species evolved, and she investigates the connections between their genetic variations in different environmental conditions. Since graduate school in 2002, Dr. Battistuzzi has studied the evolution of prokaryotes, a microscopic single-celled organism.

"Among all species, microbes span the largest duration of Earth's history and are extremely metabolically and ecologically diverse," she said. "These characteristics make them a powerful resource to investigate evolutionary mechanisms over long (billions of years) and short (millions of years) timescales, while tracing the origin of important ecological innovations such as pathogenicity of infectious diseases."

Traditionally, scientists have used fossils to time the origin of a species. Prokaryotes don't leave a fossil record. "Using genomes, scientists can go further and further back in time to get to the very early origin — one cell," Dr. Battistuzzi explained.

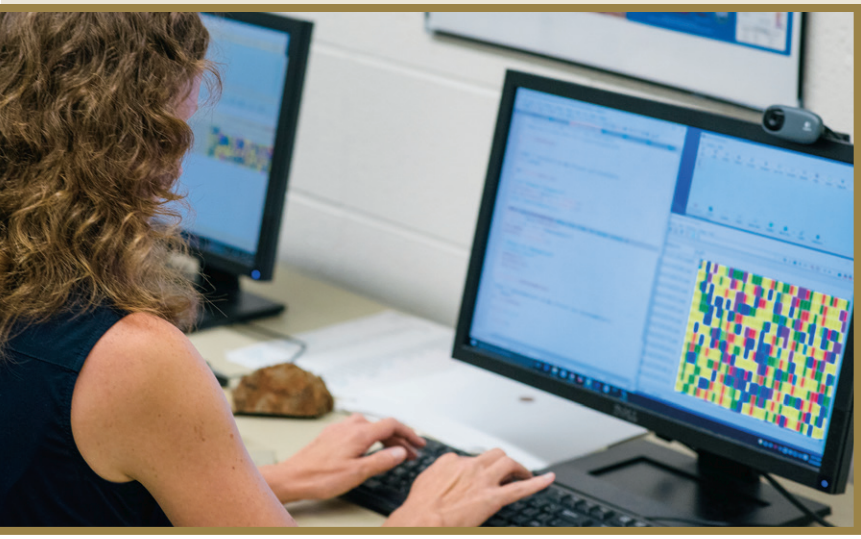
Genomes are repositories of information that over time show changes an organism underwent to survive and to adapt, she said. "When we understand what kind of changes that pathogen has figured out to adapt to the human host, then we can have a better understanding of how it can actually infect us and how it can hurt us."

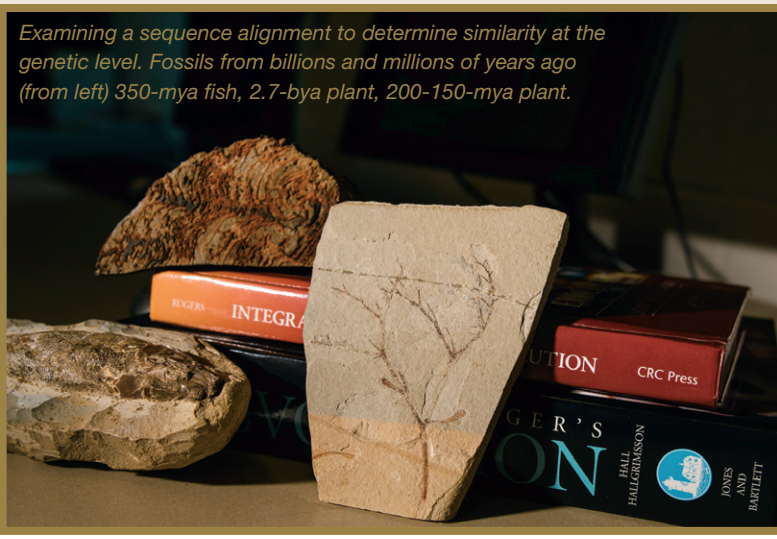
What's next?

"Real-world applications include determining how infectious diseases evolve. Different pathogens can infect other animals,

Fabia Battistuzzi, Ph.D., assistant professor, Biological Sciences

The research interests of Dr. Battistuzzi include the evolution of early life, phylogenomics, molecular clocks and the evolution of infectious diseases. Dr. Battistuzzi obtained her doctoral degree in Evolutionary Biology and Astrobiology from Pennsylvania State University in 2007, focusing on reconstructing the evolution of the earliest life forms on Earth. During postdoctoral training at Arizona State University, Dr. Battistuzzi built on this work to integrate geological and molecular data to obtain a timeline of life on Earth. She also applied similar methodologies to understand the evolution of pathogens and their interactions with other species. Since joining Oakland University, her research has focused on the development of new bioinformatics tools to improve the precision of the timeline of life and on using genome complexity as a signature of evolution and adaptation in species.





Examining a sequence alignment to determine similarity at the genetic level. Fossils from billions and millions of years ago (from left) 350-mya fish, 2.7-bya plant, 200-150-mya plant.

they can infect plants, they can infect other microbial organisms and eventually they can infect us," Dr. Battistuzzi said.

With this grant, "we're going to focus our research on early life specifically; however the method will be applicable to pretty much every group," she said. "This particular question arose because of the debate that is still going in the field: How do we determine how old a species is? Is it six million years? Is it one billion years?"

One goal is to determine how life originates from non-life. "Once we get that connection, we're going to have the whole history," she said. "And with the history of life at hand, its applications will span multiple fields, from ecology to medicine."

Key role for 'big data'

Large dataset analysis is key to Dr. Battistuzzi's work. The new interdisciplinary Center for Data Science and Big Data Analytics, a collaboration of the College of Arts and Sciences, the School of Engineering and Computer Science and the School of Business Administration, will be central to her research.

"Without the computers, I can't do anything of what I do right now," she said. "With a strong and constant institutional support, the Big Data Center will be a great support for my research and the research of many of my colleagues. It will allow us to remain competitive in research grants and faculty/student recruitment."

The implications of her research are far-reaching.

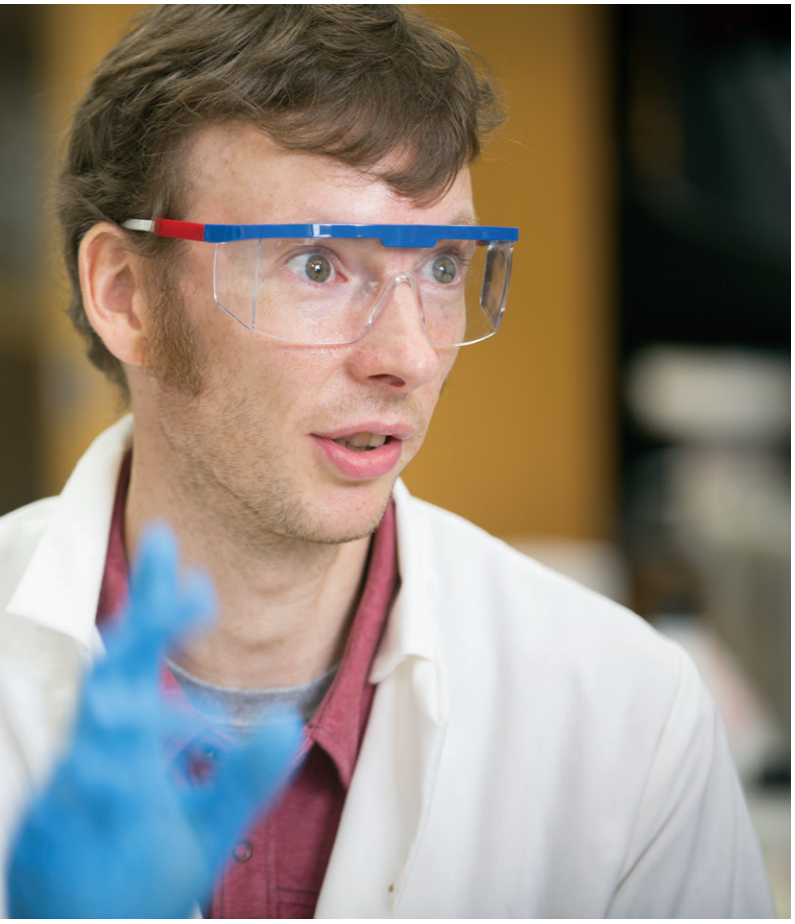
"The importance of my research lies in its role as a predictor," she said. "Past trends and patterns are regularly used to predict future reactions, whether it be the reaction of the stock market to a type of event or the reaction of a biological community to environmental change. Understanding how life and Earth interacted and reacted to each other in the past 4 billion years is the basis to predict how future changes in our planet might affect our current life forms."

By Susan Thwing, a freelance writer from Rochester Hills, Michigan.

Molecular Matchmaking

Seeking fastest, sleekest reactions from ideal combinations

You can combine two or three molecules in thousands of ways. Associate Professor of Organic Chemistry Nessan Kerrigan, Ph.D., matches up molecules, identifying which combinations are most interesting, useful or profitable — particularly for pharmaceuticals.



Then he researches how to make their reactions happen faster.

Describing his lab's work as "basic, fundamental, organic chemistry," Dr. Kerrigan said, "We try to develop new ways of carrying out chemical reactions more efficiently and economically, and with an end goal in mind."

Benefits to other researchers

Scientists outside the University might apply what Dr. Kerrigan and his student researchers uncover to develop a treatment for tuberculosis or cancer. Inside Dr. Kerrigan's lab, though, the focus is on making the reactions between molecules happen more quickly, and in a more predictable manner, so that other researchers can benefit from what they learn.

Their work has been supported by two grants from the National Science Foundation and more recently, by a $333,000 grant from the National Institutes of Health that applies through 2017.

Because of a focus on fundamentals, undergraduate students can participate in the research. This has allowed several of them to be credited in published articles.

"It expands what they've learned in the organic chemistry undergrad teaching lab — they just build on that knowledge," Dr. Kerrigan said.

His group currently includes a Ph.D. student, two post-doctoral researchers and two undergraduate students.

Improving on 60 years of knowledge

In 2012, Dr. Kerrigan's work to find a more efficient version of a reaction that researchers were aware of for more than 60 years led to publishing "Catalytic Asymmetric Heterodimerization of Ketenes" in the prestigious "Journal of the American Chemical Society".

With that research, Dr. Kerrigan and Ph.D. student Nick Peraino identified a catalyst that would limit the number of reactions between two very reactive compounds.

"There were many catalyst systems that might work, so our challenge was to not only reduce our list of options, but to identify the best possibilities — and we did," he said.

The goal behind that particular discovery involving beta lactones was to convert them into tuberculosis metabolites, which are molecules that have been isolated from virulent strains of tuberculosis. Other researchers can use them as biomarkers for the disease or to help develop vaccines.

Green catalysts

Much of Dr. Kerrigan's work with catalysts is focused on organic compounds that contain phosphorus or nitrogen rather than faster metallics, not only because they're less expensive, but because they're more eco-friendly, too.

"We have to use more of the organic catalysts to generate a reaction, but we can recover, recycle and re-use them in a way that's more environmentally responsible," he said.

In fact, Dr. Kerrigan's group was the first to discover that phosphorus could be used as a catalyst for ketene reactions.

Some of Dr. Kerrigan's lab researchers are currently working to produce the tuberculosis complex molecules more efficiently. Perano is investigating how to use certain sulphur-containing compounds to make an array of biologically active compounds for industrial and pharmaceutical applications. He's particularly interested in methods for producing reactions in a molecule that's used by a major pharmaceutical company to produce an epilepsy treatment. Much of that work has led to publication in peer-reviewed journals.

New reactions, consistent effects

Another research area, ylide chemistry, involves researching enantio-selective and diastereo-selective reactions. As Dr. Kerrigan explains it, most molecules can exist in two forms that are mirror images, but non-superimposable — if you place one on top of the other, they don't match.

Because of that slight physical difference, each form produces a different biological effect in a reaction, too. Dr. Kerrigan's research is helping the pharmaceutical industry guarantee that a reaction involving the molecules will predictably and consistently produce the desired effect.

"Our research is directed at developing new reactions and exploring some of their applications. We want to shorten the existing route in reactions already known to be useful so that other researchers can be more effective with their work," he added.

By Sandra Beckwith, a freelance writer from Fairport, New York.

Nick Peraino, doctoral student in Health and Environmental Chemistry, researches the synthesis of gamma lactones from sulfoxonium salts in Dr. Kerrigan's lab.

Nessan Kerrigan, Ph.D., associate professor, Organic Chemistry

Dr. Kerrigan joined OU in 2006 after concluding work as a postdoctoral research associate at the University of Pittsburgh and the University of Glasgow, Scotland. He was also a process development chemist at Merck. A native of Ireland, Dr. Kerrigan received his undergraduate and doctoral degrees in chemistry at University College Dublin, Ireland.

His research interests include phosphine-catalyzed reactions of ketenes, stereoselective [3,3] sigmatropic rearrangements, solid-phase synthesis, transition metal-catalyzed reactions, ylide chemistry, natural product synthesis and organo-catalytic methodologies. He is published in the "Journal of the American Chemical Society," the "Journal of Organic Chemistry" and "Tetrahedron Letters."

"Catalytic Asymmetric Synthesis of Ketene Heterodimer β-Lactones: Scope and Limitations." Shi Chen, Ahmad A. Ibrahim, Nicholas J. Peraino, Divya Nalla, Mukulesh Mondal, Maxwell Van Raaphorst, and Nessan J. Kerrigan. *Journal of Organic Chemistry*. Article ASAP DOI: 10.1021/acs.joc.6b01481 (Web): August 04, 2016.

Sensing Safety

Valuable reactions at the electrode and human interface

Professor of Analytical Chemistry Xiangqun Zeng, Ph.D., researches new electrode interfaces and develops better chemical and biosensors. She holds six patents, has authored over 80 peer-reviewed papers and four book chapters and presented over 100 invited lectures and academic seminars.

The source of Dr. Zeng's greatest pride, however, is being a mentor.

Since 2001, more than 80 students have trained in her lab. They include nine visiting professors, 18 post-doctoral and 15 doctoral researchers, 21 master's, 26 undergraduate and six high school student researchers.

Fourteen former students or postdoctoral researchers have obtained highly competitive academic positions in the U.S., China, India and Saudi Arabia. Doctoral student Yijun Tang, a 2009 graduate, received tenure at the University of Wisconsin Oshkosh and his department nominated him for the prestigious national Henry Dreyfus Teacher-Scholar Award this year. Former postdoctoral student Dr. Yang Liu, now associate professor at Tsinghua University in Beijing, recently received the "Outstanding Young Investigator Award" in China.

"I just feel so proud of them," Dr. Zeng said. "I'm trying to pass my good work ethic and habits on to my students. The only way to motivate people is to help them to become self-motivated. If I feel that if they want to work hard, it's much better than if they are pressured to work hard."

Professor of Analytical Chemistry Xiangqun Zeng, Ph.D.

As a doctoral student at the University of Buffalo - SUNY, Dr. Zeng worked in the lab of Dr. Stanley Bruckenstein. Dr. Bruckenstein was trained by Professor Izaak Kolthoff, regarded as the father of analytical chemistry. "He is my 'academic grandfather,' Dr. Zeng said. "He passed on lots of good values to me and thousands of professors about how to become a critical scientist: how not to publish junk and to be extremely careful with your work."

Research with urgency

A need for sensor technology for national security, health care, the environment, energy, food safety and manufacturing motivates Dr. Zeng's research directions. She is also beginning an electrochemistry research program for energy applications such as fuel cells and lithium ion batteries.

"You have to do research that has urgency," she said. "Good tools to monitor for dangerous environmental agents or pollution are essential for health and safety. For example, some pollutants can trigger asthma and monitoring them can save lives."

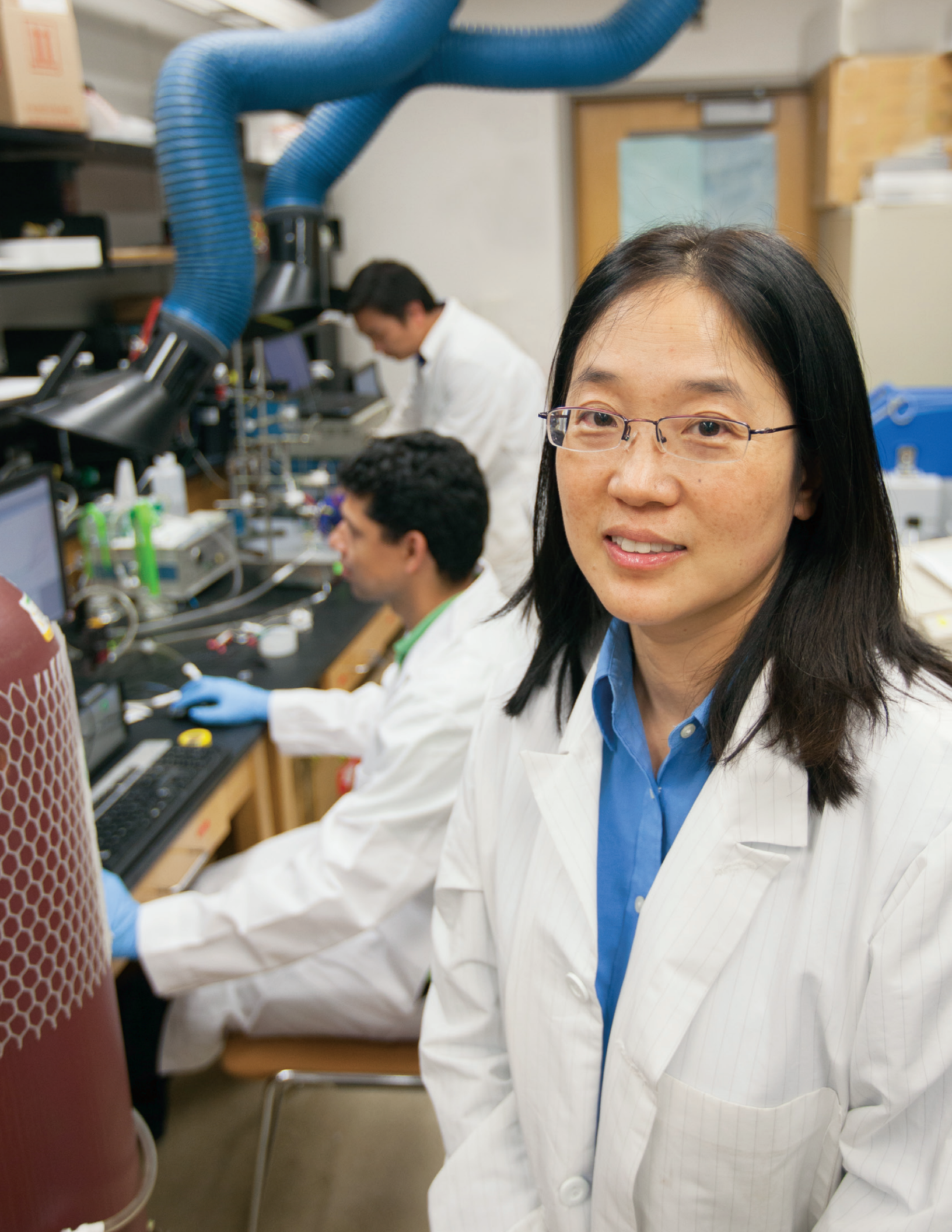
Gas sensors monitor the environment and can be used to analyze the presence of dangerous gases like hydrogen and methane in the air. Biosensors are used for diagnostics of diseases at the point of care.

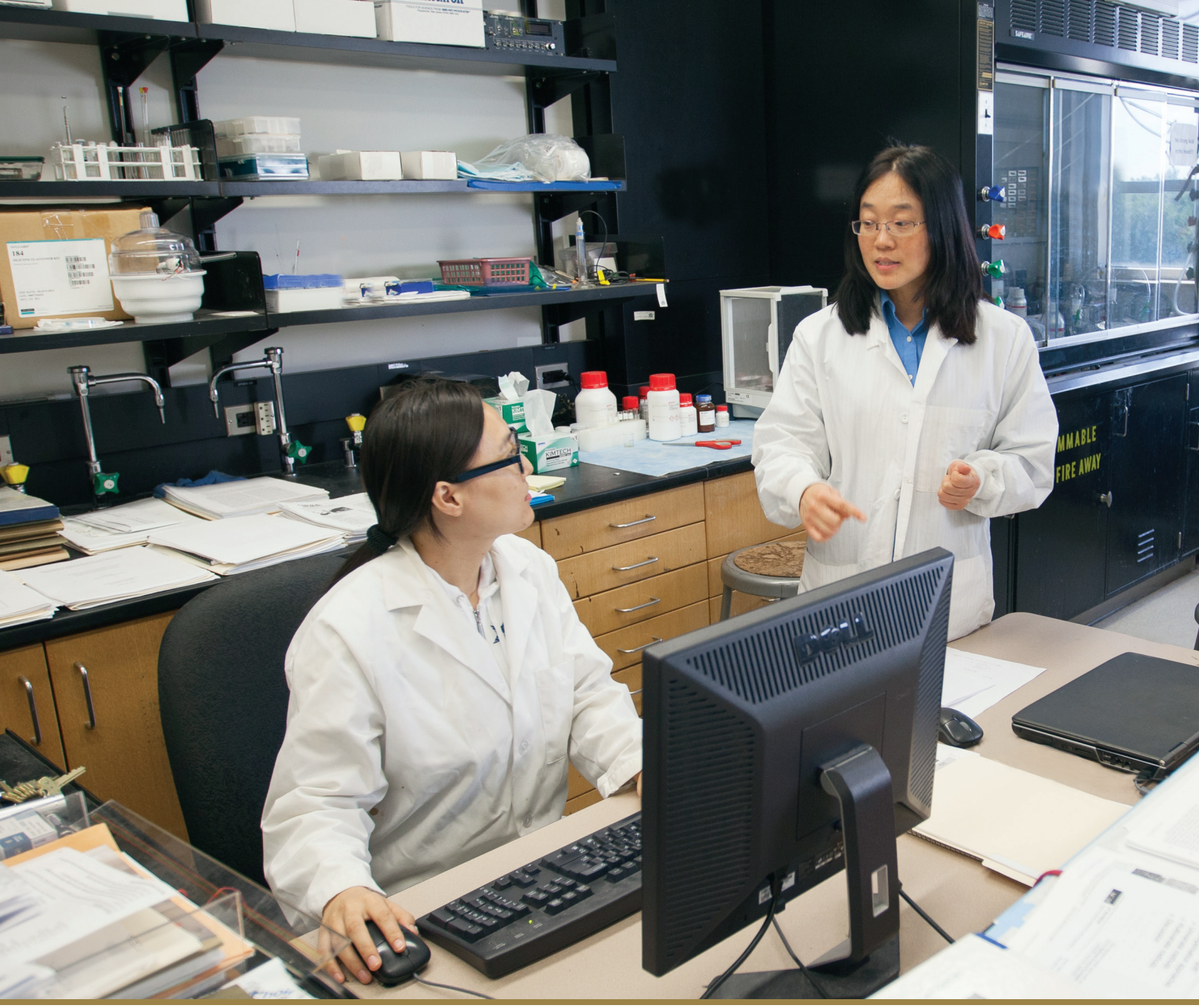
"That is really the direction — to develop very low cost, reliable sensors to provide patient data at the point of care, rather than waiting several days for a lab analysis to arrive at a doctor's office," Dr. Zeng said.

On the surface

Dr. Zeng's group explores the chemistry that occurs at the electrode interface where the electron transfer occurs.

Researchers can modify the electrode surface with recognition elements such as antibodies that can detect a specific antigen. Reactions such as reduction of oxygen at the interface are employed in fuel cell cathode reactions. Glucose oxidation is used in a diabetes glucose meter. These reactions can be studied for gas sensors and biofuel cell applications.





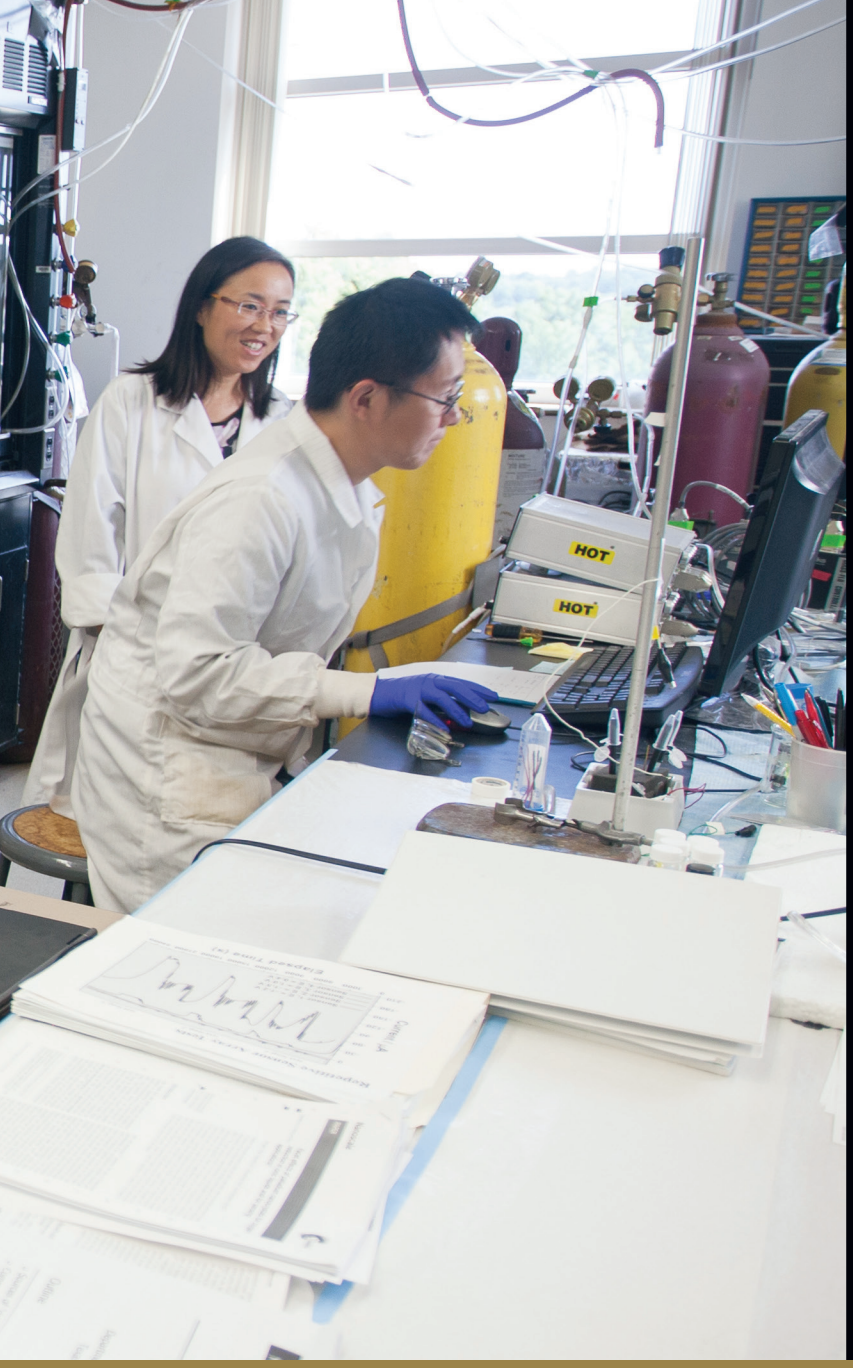
By modifying electrode interfaces with these new sensor recognition elements and understanding the mechanisms of interface reactions, Dr. Zeng's lab has discovered those interfacial structures and compositions that can meet the next generation sensor requirements.

"The end goal is to provide reliable measurements of chemicals and biological reagents with small, smart, mobile, robust sensor devices," Dr. Zeng said. "Besides developing sensor technology, we are exploring new directions in lithium ion battery electrolytes, electrocatalysis for fuel cells and solid state fuel cells and developing label free biosensors for point of care diagnostics of cancer and infectious diseases."

Granting a tour

Dr. Zeng adopted an American cultural ritual to promote her work: She visits funding agencies and goes on a lecture tour. "I started to realize that you need to publicize your work through lectures and personal interactions at meetings," she said. "Not only do you raise the reputation of your lab, you also attract the best people to come to join your research group. When your people move on to new positions, they serve as your ambassadors."

Her extramural funding totals over $6 million. Many projects are highly interdisciplinary and require significant collaboration from a diverse group of individuals. For example, Dr. Zeng's researchers and Dr. Andrew Mason, professor of electrical engineering at Michigan State University, are developing



Xiangqun Zeng, Ph.D., professor, Analytical Chemistry

Dr. Zeng has published 83 high-quality, peer-reviewed journal papers, holds six patents, has written four book chapters and given more than 100 invited seminars. She has a bachelor of science from Chengdu University of Technology (China); a master of science from Beijing Normal University (China). She earned her Ph.D. (in three years) and did postdoctoral studies (one year) from the State University of New York at Buffalo. She received Oakland University's Research Excellence Award (2015), International Service Award (2015), Academic Excellence Recognition Awards (2011 and 2012) and Young Investigator Research Excellence Award (2005). She was one of 12 women who were featured in "Women Who Changed the World: The Journey and the Joy" (Sunbury Press Inc., 2015).

Doctoral students in Dr. Zeng's (center) lab research gas sensors to monitor environmental pollutants. Min Guo receives feedback on her manuscript while Lu Lin teaches Visiting Scholar Yuhong Tian, Ph.D., about gas sensor experiments. Dr. Tian is associate professor, School of Metallurgical Engineering, Xi'an University of Architecture and Technology.

miniaturized wearable electrochemical sensors to assess acute exposure to airborne pollutants. Of a five-year, $2-million National Institutes of Health (NIH) grant supporting this project, approximately half funds Dr. Zeng's research.

Her lab also works toward sensor technology that will achieve previously unavailable specifications for the next generation of gas sensors for health, EPA and transportation applications. A 2012 grant from the Michigan Initiative for Innovation and Entrepreneurship (MIIE) funds the work.

Grants have also been awarded from the National Institute of Occupational Safety and Health (NIOSH), Office of Naval Research, the American Chemical Society, the National Institute for Environmental Health and Safety and private corporations. Several major grants are pending for new approaches in sensor and energy research: two NIH, one NIOSH and two National Science Foundation (Chemistry).

Patents

Often scientific knowledge is advanced through publications, but in situations with commercial potential, new results are often announced in patents. Dr. Zeng holds six, with one licensed to Cellgen Diagnostics.

For example, in 2011, Dr. Zeng and postdoctoral student Caide Xiao received U.S. patent 7,943,092 for a portable Surface Plasmon Resonance biosensor, an inexpensive and portable device that provides real-time monitoring to detect biomolecular interactions.

By Donna Mirabito, executive editor

Suicide prevention grant research team members (from left) Patricia Wren, Ph.D.; Lisa Hawley, Ph.D.; Michael MacDonald, Ph.D., and others determined how experience, knowledge and resources interacted with perceived efficacy to help others.

Vigilance

Suicide prevention grant research 'continues the conversation'

Even after his three-year, $612,000 suicide prevention grant concluded last July, Michael MacDonald, Ph.D., was working hard to ensure that the research would continue to educate current and future Oakland University community members.

"We need to support and create an environment where suicide prevention concerns of faculty, staff and students are listened to," said Dr. MacDonald, associate professor of education and Principal Investigator for the American Psychological Association grant program authorized by the Garrett Lee Smith Memorial Act. "We need to be vigilant."

Enhancing outreach

The grant included campus-wide research examining knowledge about suicide. The goal was to enhance outreach for faculty, students and staff and better enable them to recognize and assist people at risk for self-harm and suicide.

Researchers measured knowledge and perceived helping skills through a program of applied research that included annual needs assessments.

The research team — including Patricia Wren, Ph.D., associate professor of Health Sciences; Erica Wallace, health and wellness coordinator, Student Affairs; Julia Smith, Ph.D., professor of Organizational Leadership; and Lisa Hawley, Ph.D., associate professor of Counseling — determined how each person's experience with those who are suicidal and their knowledge of suicide information and resources interacts with their perceived efficacy to help others.

Researchers discovered that more awareness about suicide prevention resources led to a more informed community with an ability to respond to the needs of people in crisis.

Filling knowledge gaps

Dr. MacDonald and his team then built education opportunities to fill knowledge gaps, particularly with students. Often, students turn to fellow students in times of need and staff is also likely to have contact and be a resource, Dr. MacDonald said.

They created campus training modules and other resources. These remain available on the OU website for GRASP — Grizzlies Response: Awareness & Suicide Prevention.

"The grant was designed to provide a service, but we took it as an opportunity to engage in research to better understand the needs of the campus and to contribute to the knowledge base," Dr. MacDonald said.

Their work also provides opportunities for collaboration with school districts, suicide prevention coalitions, the Oakland County Health Division, and the Michigan Department of Health and Human Services.

Assisting school districts

"We have recently seen a rise in suicide during adolescence," Dr. MacDonald said. "It is important to support prevention, intervention, and post vention efforts. We're helping school districts like Avondale support their caring and capable teachers and helping students get the best support they need. Ultimately, this will prevent the suicidal behavior."

Engaging faculty and staff about successful conflict resolution and enhancing learning skills for younger students also are key ingredients. Every effort made at those levels is in the spirit of preventing mental health concerns down the line, Dr. MacDonald said. The grant provided materials and resources to enhance this culture of care, and also for courses in counseling, health sciences, education, and the Oakland University William Beaumont School of Medicine.

Dr. MacDonald continues to study how gaps in knowledge about suicide affect students, faculty and staff. He will discern how further education and communication can improve the climate so that they can more easily talk about concerns and obtaining help.

"We need to continue to provide an environment that assists others. It's an opportunity to continue the conversation."

By Cara Catallo, a freelance writer from Clarkston, Michigan.

Michael MacDonald, associate dean, School of Education and Human Services

An expert in suicidology with a background in teacher education and applied psychology, Dr. MacDonald has taught in Australia, Canada and the United States. He joined OU in 2002, developing courses in counseling, crisis intervention, prevention of self-harm and teacher education, among others. Dr. MacDonald's doctoral degree is in educational psychology from the University of Calgary. He holds a master's in applied psychology from the University of Toronto and bachelor's degrees in elementary education and psychology from the University of Windsor.

Hawley, L., MacDonald, M. G., Smith, J. B., Wallace, E., Wummel, B., Wren, P. (2015). "Baseline assessment of campus-wide general health status and mental health: Opportunity for tailored suicide prevention and mental health awareness programming." *Journal of American College Health*. Doi: 10.1080/07448481.2015.1085059. pub Apr 1, 2013.

Michael MacDonald, Ph.D.

Seeing Progress

The investigative fight for sight

Studying the intricate mechanics of sight is something that Andrew Goldberg, Ph.D., does with impassioned curiosity and drive, within the inspirational environment of Oakland University's Eye Research Institute (ERI).

Andrew Goldberg, Ph.D.

Founded nearly 50 years ago, the internationally recognized ERI promotes the University's teaching goals and research on the underlying causes of eye diseases that result in loss of vision and blindness. The ERI promotes collaboration between Oakland faculty, research associates, post-doctoral fellows, affiliated clinical faculty and students.

Eye detectives

The "wide-eyed apprentices" most encourage Dr. Goldberg, a researcher, teacher, mentor and author.

"It's rewarding to work with these incredible OU students who bring unbridled excitement to the research," said Dr. Goldberg, associate professor of Biomedical Sciences and principal investigator of the ERI's Goldberg Laboratory.

"To bring scientific knowledge back to our communities, students must learn by doing," he continued. "The ERI labs are the perfect environment for this. The training prepares them for placement in nationally competitive graduate and professional programs and for successful careers in science and medicine."

Millions need the efforts of these dedicated eye detectives. About 50,000 Americans lose their eyesight every year.

Retinal 'repair manuals'

"There's often a gap between science and medicine," Dr. Goldberg said. "For physicians encountering complex eye conditions in their practices, it's a bit like me landing on another planet and encountering a machine that needs to be fixed. Without a thorough understanding of how the machine works or a repair manual, it requires a lot of guesswork. Researchers continually work on developing those much-needed retinal 'repair manuals.' "

Dr. Goldberg's specialty is defining the eye's tiniest structures and how they work together.

"The retina is like the light-sensitive chip in a digital camera," he explained. "It contains a layer of photoreceptor cells that convert photons into electric impulses interpreted as images by the brain. When they're functioning well, the images are clear. When they're not, vision becomes fuzzy. Unfortunately, photoreceptors are easily damaged by disease and not easily repaired."

Protein stabilizing shell

For 15 years, Dr. Goldberg has been tackling questions related to dysfunction in the eye's retinal photoreceptor cells, studying the outer segment structure of these photoreceptors. He hones in on how the "pancake-like" stack of disks within the outer segments is created — and how genetic diseases sometimes disrupt it.

Dr. Goldberg's research focuses on peripherin/rds, an eye protein essential for organizing the disk membrane structure.

"We've discovered that the peripherin/rds protein forms a stabilizing shell around the periphery of the photoreceptor disk membranes," Dr. Goldberg said. "Membranes like being flat, so a specialized protein like peripherin/rds is needed to shape them for their biological function. We've discovered that large aggregates of this protein interact with lipids to mold and hold the membranes in place to create the flattened pancake structures."

Significant NIH grants

He recently distilled more than two decades of experience into a book chapter, "Molecular basis for photoreceptor outer segment architecture," in *Progress in Retinal and Eye Research*.

"It's not about just one discovery or research paper," Dr. Goldberg said. "It's about the combined contributions of multiple labs and multiple lab contributors around the world to reach a point of critical mass. That's what moves human understanding forward."

External grants are vital for accomplishing this goal. To further his current research, Dr. Goldberg was recently awarded a $1.5 million, four-year grant from the National Institutes of Health's (NIH) National Eye Institute, one of five grants he has received from the NIH since 1999.

His next step of research will be to investigate how inherited defects in peripherin/rds cause disease. Dr. Goldberg suspects that these defects prevent the protein from creating and/or maintaining the stack of disk membranes needed for vision, perhaps by impairing the protein's ability to bend membranes.

By Mary Gunderson-Switzer, a freelance writer from Kathleen, Georgia.

"Every now and then, you are privy to one of nature's hidden secrets — something that nobody else on the entire planet knows. Those are privileged moments, and it's so rewarding to share them with our students."

Dr. Goldberg with undergraduate student Adam Seidel and Lab Manager/Research Assistant Breyanna Cavanaugh, M.S.

Andrew Goldberg, Ph.D., associate professor, Biomedical Sciences

Dr. Goldberg is an expert in the area of vertebrate photoreceptor structure. His laboratory studies the elaborate cellular architecture of retinal photoreceptors — the rods and cones — to understand their fundamental biology, and the cellular and molecular underpinnings for several forms of clinically significant inherited and acquired eye diseases. His research has been funded by the National Science Foundation, The Grass Foundation, National Eye Institute, E. Matilda Zeigler Foundation, Research Excellence Fund (OU) and Mid-West Eyebanks (now Eversight). His scientific collaborations extend coast-to-coast and internationally. Dr. Goldberg frequently serves as a manuscript and grant reviewer, including as a member of NIH study sections. On campus, his research-related activities include having served on and chaired the OU Institutional Biosafety Committee.

"Molecular basis for photoreceptor outer segment architecture." Goldberg AFX, Moritz OL, Williams DS. Prog. *Retina*. Eye Res. 2016, in press DOI: 10.1016/j.preteyeres.2016.05.003

Dr. Mourelatos and doctoral students Themis Koutsellis (center) and Dionysios Panagiotopoulos discuss a data-based algorithm to assess warranty forecasting.

Choices

Modeling uncertainty to guide auto design

There is always uncertainty associated with product design. When designing small, inexpensive items, a company can afford to produce lots of prototypes that it can use to guide decisions about design adjustments.

With vehicles, though, that's unrealistic.

"When you produce a car, you can only make very few prototypes. That's why designers need design methodologies that account for uncertainty so they can make choices when they have limited information," said Zissimos Mourelatos, Ph.D., professor of Mechanical Engineering.

Known as "design under uncertainty," this research area takes into account inherent variability and uncertainty caused by randomness and unpredictability that result from an imperfect model or lack of relevant data.

Ten doctoral students and two post-doctoral associates in Dr. Mourelatos' theoretical lab are researching design and decision-making under uncertainty in the automotive and other industries. The impact of random vibrations on vehicle design is a particular focus.

Oakland University students also benefit from the lab's research: Dr. Mourelatos has developed one undergrad and four graduate courses on vibrations; Noise, Vibration and Harshness (NVH); random vibrations; and reliability methods in engineering design.

For a university located in the middle of the nation's automotive industry, it makes perfect sense.

Former GM researcher

Dr. Mourelatos' research interests reflect his professional experience. He was a research engineer at the General Motors Research and Development Center for 18 years and an adjunct professor at the University of Michigan before joining OU in 2003.

More than $5 million in external funding in the past decade supports five full-time and five part-time student researchers; part-time graduate students are employed in the automotive industry.

The researchers use computers to create meta-models (response surface models), which are simplified versions of more complex models. Using response surface methodologies, they explore the relationships between variables that guide product design even if they are uncertain.

Because the lab's work is theoretical, researchers often conduct experiments at client vehicle dynamics labs. Their goal is to provide information that can guide design decision-makers as they address uncertainties in prototype and final product design.

Random vibration work interests Army

The U.S. Army research and development work on the impact of random vibrations on the performance and durability of military vehicles is relevant to Dr. Mourelatos' lab activities.

"Army vehicles not only need to perform according to specifications, they must also be durable under different operating environments, rough road conditions and even explosions," Dr. Mourelatos said. "All loading events are random and therefore impossible to characterize deterministically."

Much of what is uncovered through the team's research is shared in publications and conference presentations. Dr. Mourelatos co-authored the book, "Design Decisions under Uncertainty with Limited Information," contributed six book chapters to other works and published nearly 100 journal articles. In addition, he has delivered more than 80 invited presentations and many research seminars, plus keynote presentations worldwide.

"We are not the only researchers doing this work, of course, but we are at the forefront," he said. "As a result, we attract some of the best talent in this field to our lab, training students and professionals who can apply what they learn immediately to their jobs in industry."

Automotive industry demand for knowledge on how to make design decisions in situations with significant uncertainty attracts funding to the lab in a competitive marketplace.

"Our research has attracted an average of more than $300,000 in external grants each year," Dr. Mourelatos said. "That's definitely rewarding and validating of our work."

By Sandra Beckwith, a freelance writer from Fairport, New York.

Zissmos Mourelatos, Ph.D.

Zissimos Mourelatos, Ph.D., professor, Mechanical Engineering

Dr. Mourelatos has chaired OU's Mechanical Engineering Department and has served as the John F. Dodge Chair of Engineering. He researches design under uncertainty, structural reliability methods, reliability analysis with insufficient data, reliability-based design optimization, vibrations and dynamics, and noise, vibration and harshness. He has published more than 180 journal and conference articles and co-authored the book, "Design Decisions under Uncertainty with Limited Information."

Dr. Mourelatos is editor of the "International Journal of Reliability and Safety," guest editor of the "ASME Journal of Mechanical Design," and an associate editor of the "SAE International Journal of Materials and Manufacturing" and the "SAE International Journal of Commercial Vehicles." He is a fellow of the American Society of Mechanical Engineers and the Society of Automotive Engineers.

World Percussion

Ancient instruments link countries and cultures

Associate Professor of Music and coordinator of the World Music and Percussion programs Mark Stone travels the globe to perform, research and spread the influence of world percussion, spurred by a need to understand how cultures and countries relate to one another through music.

Mark Stone and the embaire, a traditional instrument of Uganda.

For Associate Professor Stone, music is a living tradition. “Music has always been used to bring communities together all over the world,” he said. “Through music, you get a sense of the oneness of humanity.”

Interest in world percussion is growing. At the most recent Percussive Arts Society International Convention in San Antonio, 20 percent of all clinics and concerts scheduled were world percussion events. Furthermore, most collegiate percussion programs in the United States now include some study of world percussion.

“There is a huge interest in music beyond its entertainment value,” Associate Professor Stone explained. “Music is healing, music is food for our soul, and our society needs that more than ever.” He notes corporations now hire percussionists to perform team-building exercises through drum circles.

Associate Professor Stone has attained international recognition for researching and performing the African marimba/mbira traditions of the gyil (Ghana), embaire/akogo (Uganda), karimba (South Africa) and the new Array mbira (United States).

Associate Professor Stone, who coordinates Oakland University’s World Music and Percussion program, has performed with the foremost musicians of India, Uganda, Ghana, South Africa, South Korea, Germany, Trinidad, Ecuador and the United States.

Performance is Associate Professor Stone’s research. “I don’t publish papers I publish recordings,” he said. “Kakaire,” his newest CD, features original compositions and arrangements celebrating world percussion traditions of Africa and India, paired with the violin. “Percussive Notes” (May 2016) describes the new sound as “an overabundance of acoustic beauty, compositional creativity and artful musicianship.”

Last summer, Associate Professor Stone presented his research and gave workshops and performances at an international marimba festival in South Africa attended by 1,600 marimba players from all over Africa. He was the festival’s only North American adjudicator.

From there, he went to a Ugandan village in East Africa, overjoyed to reunite with close friends from his time spent in Uganda as a Rotary Ambassadorial Scholar 18 years ago. They

performed together on the embaire xylophone, which Associate Professor Stone describes as “a huge traditional instrument where six people, three on each side, play the xylophone at the same time, digging a big hole in the ground underneath.”

Associate Professor Stone was introduced to music at age 6 when he took lessons from a neighbor to master the marimba, a large rosewood xylophone. The marimba originates in Africa and is part of a family of many related xylophone instruments.

A lifelong pursuit of the history of the marimba and its indigenous versions led him to remote villages in Ghana and Uganda, working with traditional musicians to research the Kisoga embaire and the Dagara gyil.

“It’s such an ancient tradition you can’t even put an exact year on a lot of it,” Associate Professor Stone said. “You ask people how old the gyil is and they just say ‘generations and generations.’ We know that instruments similar to the gyil were used in a 12th century West African court, so we know it’s at least 800 years old. But in their oral tradition, it goes back much further than that.”

In December, Associate Professor Stone will make his eighth visit to Africa when he returns to Ghana for two weeks on an Oakland University research grant. He will visit Bernard Woma, his mentor and longtime performance partner, playing at a big festival in Bernard’s home village. Dagara village elders will also put Stone through “gyil goba,” an intense initiation which translates to “master gyil player.”

If Associate Professor Stone passes the initiation, he will become the first non-Dagara to earn the prestigious designation. “For me it’s super exciting,” he said. “I have to practice a lot to get ready.”

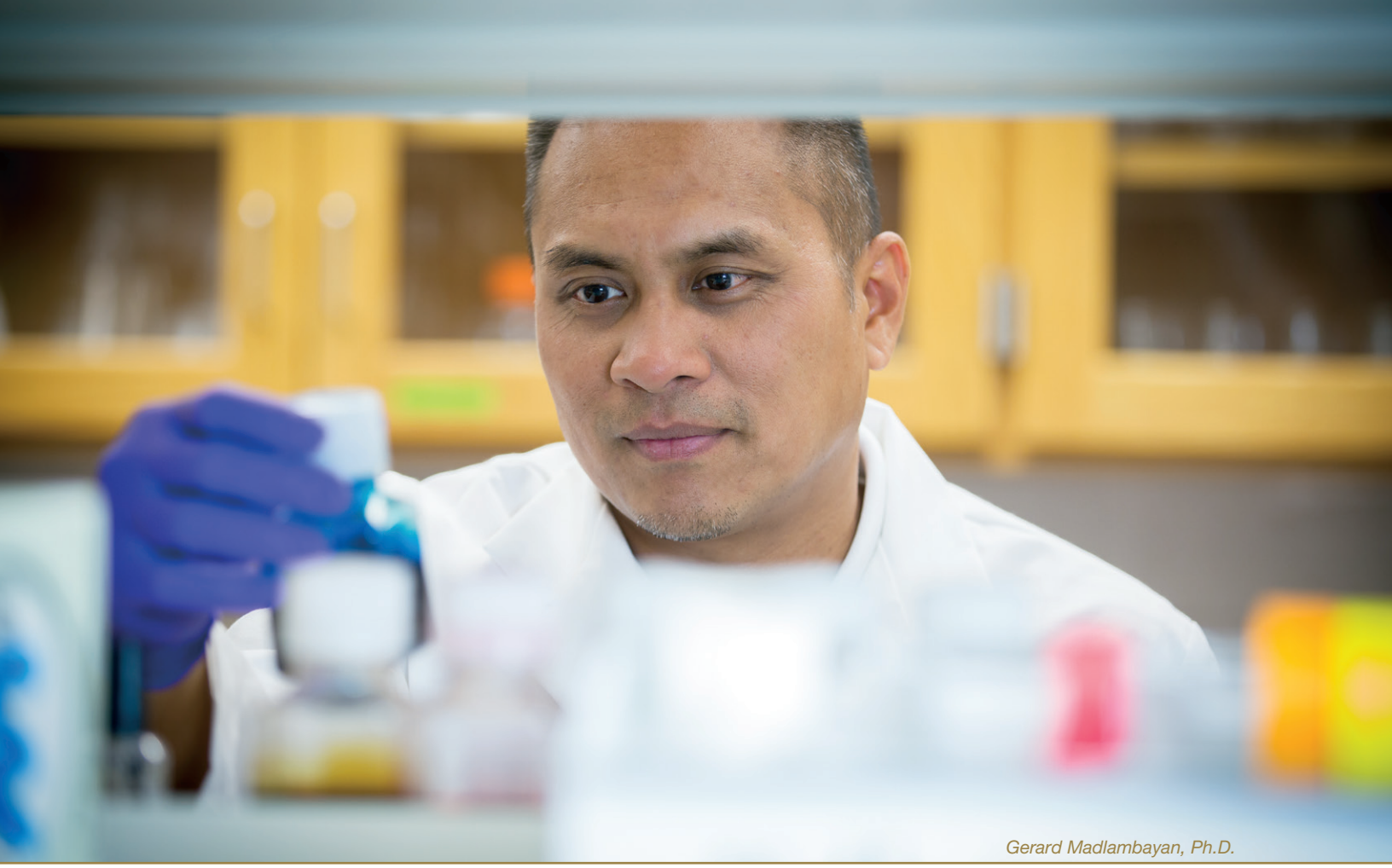
To listen to “Kakaire,” Associate Professor Stone’s latest recording, visit **markstonepercussion.com/recordings**.

By Rene Wisely, a freelance writer from West Bloomfield, Michigan.

Grammy-winning Ugandan artist Haruna Walusimbi came to OU and gave three concerts in 2015. After 18 years, Associate Professor Stone returned to Nakibembe village, Uganda, to reunite with friends, teachers and the Nakibembe Xylophone Group.

Mark Stone, associate professor of Music

Mark Stone, coordinator of the World Music and Percussion programs, is a percussionist and composer whose musical style results from a unique synthesis of multiple world traditions and innovation rooted in a deep knowledge of those traditions. Stone was a Rotary Ambassadorial Scholar at Makerere University, where he researched traditional Ugandan music and performed with the Nakibembe Xylophone Group. As a member of the Bernard Woma Ensemble, he has performed at festivals in Ghana and gyil concerti with the leading orchestras of Germany, South Africa and the United States. In 2012 and 2014, he toured India as a featured artist at the Bharat Sangeet Utsav Pan-Indian Music Festivals, collaborating with preeminent Carnatic musicians. In 2015, Stone was a clinician and adjudicator at Education Africa’s 4th International Marimba and Steel Pan Festival in Johannesburg, South Africa. This summer, he was a featured clinician and performer for the Quito International Percussion Festival. As co-founder of Jumbie Records, Stone has recorded 12 albums and produced several world music festivals in New York and Detroit.



Gerard Madlambayan, Ph.D.

Sticky Sabotage

Why do certain cells re-grow and cause leukemia relapse?

In the fight to beat leukemia, chemotherapy is a straightforward approach to killing cancer cells. In patients with acute myeloid leukemia (AML), the cell's interaction with its surroundings, or microenvironment, appear to allow the cancer to stubbornly survive and re-grow after treatment.

In 2016, the American Cancer Society estimates about 19,950 new cases of AML, a blood-based cancer that originates from leukemia-initiating stem cells. A disheartening 80 percent relapse rate follows chemotherapy.

Helpful cells next to harmful

Rather than focus directly on the cancer cell and how the cancer cell responds to chemotherapy, Assistant Professor of Biological Sciences Gerard Madlambayan, Ph.D., takes an interesting approach to discerning what causes the virulent relapse rate.

"I focus on how the microenvironment interacts with cancer cells to affect their growth, response to therapy and potential relapse following therapy," he explained. The microenvironment comprises various cell types as well as the extracellular matrix that holds our tissues together.

Endothelial cells, which line all blood vessels and are therefore in direct contact with leukemia cells, are part of the leukemia microenvironment and play a big role in the progression and relapse of blood-related cancers, according to his research.

Insidious relapse loop

"There are other researchers investigating the interaction of leukemia with endothelial cells" Dr. Madlambayan said, "and they are focused on understanding if endothelial cells affect the growth of leukemia. I'm more interested in identifying what initiates the interaction between leukemia and endothelial cells, and how we can circumvent this interaction using new therapies to prevent leukemia progression and relapse."

It's a sticky situation – literally.

Gerard Madlambayan, Ph.D., assistant professor, Biological Sciences

Dr. Madlambayan's research focuses on the role of the tumor microenvironment in the progression, growth and relapse of cancer. The tumor microenvironment comprises a variety of cell types including endothelial cells, stem cells and monocytes/macrophages that migrate to the growing cancer. Dr. Madlambayan's work has shown that these cellular constituents produce factors that alter the microenvironment, promoting tumor angiogenesis, radioresistance, chemoresistance, cell proliferation and relapse. Specifically, his work has shown that blood stem cells play a role in the growth of some cancers (lung and pancreatic) but not others (melanoma). He has also found that endothelial cells play an important role in the progression and relapse of blood related cancers (leukemia). The overall goal of his research is to apply his findings towards developing novel, clinically relevant treatment strategies using molecular agents or radiation to improve overall patient outcome. Dr. Madlambayan has published his findings in prestigious scientific journals, presented his work at national and international conferences and currently holds a patent for "Apparatus and methods for amplification of blood stem cell numbers".

His research showed that leukemia cells induce endothelial cells to become 'activated,' thus altering their behavior. One result is that the activated endothelial cells induce some of the leukemia cells to stick to them. His group found that when leukemia cells stick to endothelial cells, it renders them chemotherapy-resistant. These surviving leukemia cells can then re-grow to induce relapse.

The fact that leukemia cells themselves can produce the very conditions that activate endothelial cells identifies a positive feedback loop used by leukemia to ensure continued survival.

Internationally recognized for his research contributions, Dr. Madlambayan is currently funded by a three-year, $430,000 grant from the National Cancer Institute, which is a part of the National Institutes of Health.

Dr. Madlambayan has devoted nine years to delving into the mechanics of the process. His goal is to apply these findings toward developing clinically relevant drugs and drug delivery strategies to prevent the unwanted effects of endothelial cell activation.

Down syndrome study

As an offshoot to this research, Dr. Madlambayan is working with Drs. Yubin Ge and Jeff Taub at Wayne State University and Children's Hospital of Michigan to study AML in children with Down syndrome. Children with Down syndrome are shown to have substantially higher survival rates and lower relapse rates for AML than other children.

Using Down syndrome as a model, better treatment strategies may be developed that may prove more useful for non-Down syndrome AML patients.

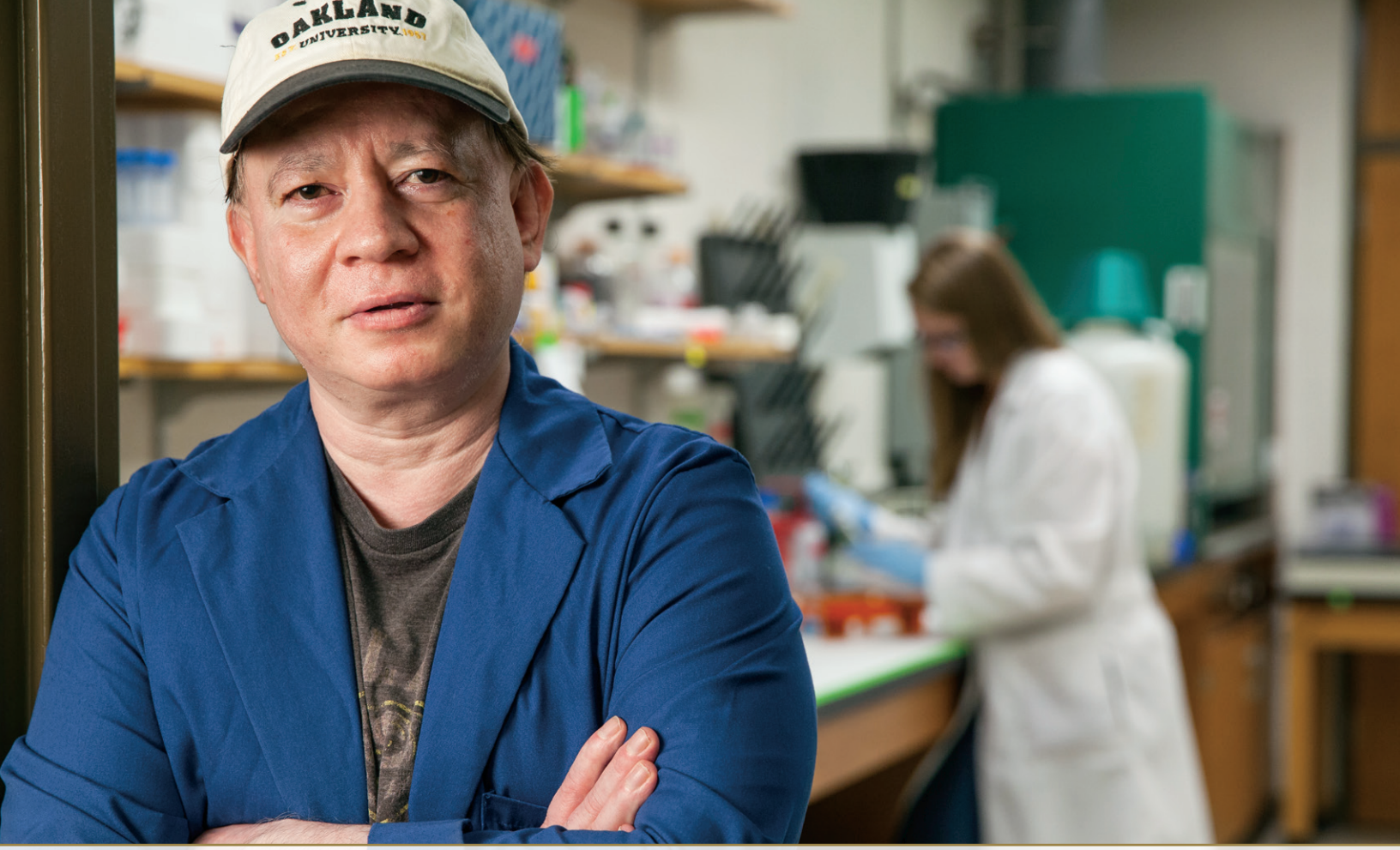
"The rate of children with Down syndrome developing leukemia is high because of the genetic mutations associated with Down syndrome," he explained. "That mutation induces a higher rate of leukemia, but these kids also respond much better to chemotherapy."

Why?

"With the Down syndrome patient samples, we're seeing that leukemia cells generally don't stick to the endothelial cells, which is great because that means they're not chemo-protected," he said. "Why do they stick less? That's what we're trying to find out."

By Mary Gunderson-Switzer, a freelance writer from Kathleen, Georgia.

Assistant Professor of Biological Sciences Gerard Madlambayan, Ph.D., and master's student Gau Shoua Vue discuss the analysis of cell surface phenotype using flow cytometry. Vue is working on understanding the role of endothelial cells in the growth and relapse of leukemia.



Kernels of Truth

DNA sequencing similarities in humans and corn

Shailesh Lal, Ph.D.

Is corn DNA the key to curing cancer? Shailesh Lal, Ph.D., professor of Biological Sciences at Oakland University, thinks it might be.

"Our genes are similar to corn, so the fundamental science that comes out of that can be translated into how genes are expressed in humans," he said. "Studying the genes in corn has helped us identify genes in humans associated with cancer."

Dr. Lal uses genomics, genetics and bioinformatics to research the fundamental processes that impact gene expression in plants. He focuses on the molecular and genetic analysis of U12 intron splicing and Helitrons in the maize (corn) genome.

Dr. Lal collaborates with OU's Gerard Madlambayan, Ph.D., (see story, page 20) to analyze how these newly identified genes can cause cancer using human cell lines. He has received three grants totaling more than $1 million, including a three-year, $800,000 grant from the National Science Foundation, to pursue his work.

His team uses a CRISPR/Cas9 (Clustered Regularly Interspaced Palindromic Repeat) process — a relatively new technique — developed for genetic engineering of higher organisms. "CRISPR is a bacterial-based, knock-out gene system we use to determine if genes identified in corn also play a role in human cancer," Dr. Lal explained. The name refers to the unique organization of short, partially palindromic repeated DNA sequences found in genomes of bacteria and other microorganisms.

Dr. Lal's study of maize as a model for seed and kernel development and gene types developed an offshoot for the agricultural industry: improved corn production.

"Corn is the most important crop in the world," he said. "The gene I study is required for the normal development of corn seeds and seed viability (seed germination). If you destroy this gene by using molecular biology methods, the mutant plant with the non-functional gene fails to germinate.

"The results of our studies suggest this gene is a master gene that determines the fate of the seed development," he explained. "By genetically manipulating the expression of this gene, we can potentially increase the yield of the corn. Thus, in addition to improving crop production via genetic engineering, my research has important biomedical relevance."

By Susan Thwing, a freelance writer from Rochester Hills, Michigan.

‘Extreme’ Microbes

Attachments to plants and metals may yield energy sources

Sara Blumer-Schuette, Ph.D.

Sara Blumer-Schuette, Ph.D., always chooses the more difficult, less-travelled path. Whether substitute teaching in a two-room schoolhouse in rural Alaska while writing her dissertation or setting up her Oakland University lab, the assistant professor of Biology takes the road Robert Frost made famous.

“My postdoc mentor would say, ‘You don’t always have to be the best at something, but you have to be different,’ ” she said.

That advice led Dr. Blumer-Schuette to discover and study different and difficult microbes: They flourish in the extreme heat of Yellowstone National Park’s hot springs and are tricky to grow. The microbes attach to plant cellulose to break it down and create a more efficient conversion to renewable biofuels.

Dr. Blumer-Schuette named the proteins tāpirins, meaning “to join” in New Zealand’s Maori language. She inspires graduate and undergraduate students in her lab, which focuses on microbes as a carbon source, to discover their own versions of tāpirins. Their emphasis is on microbes that degrade plant biomass and microbes that feed upon metals — a study pertinent to Michigan because of its iron-rich soil.

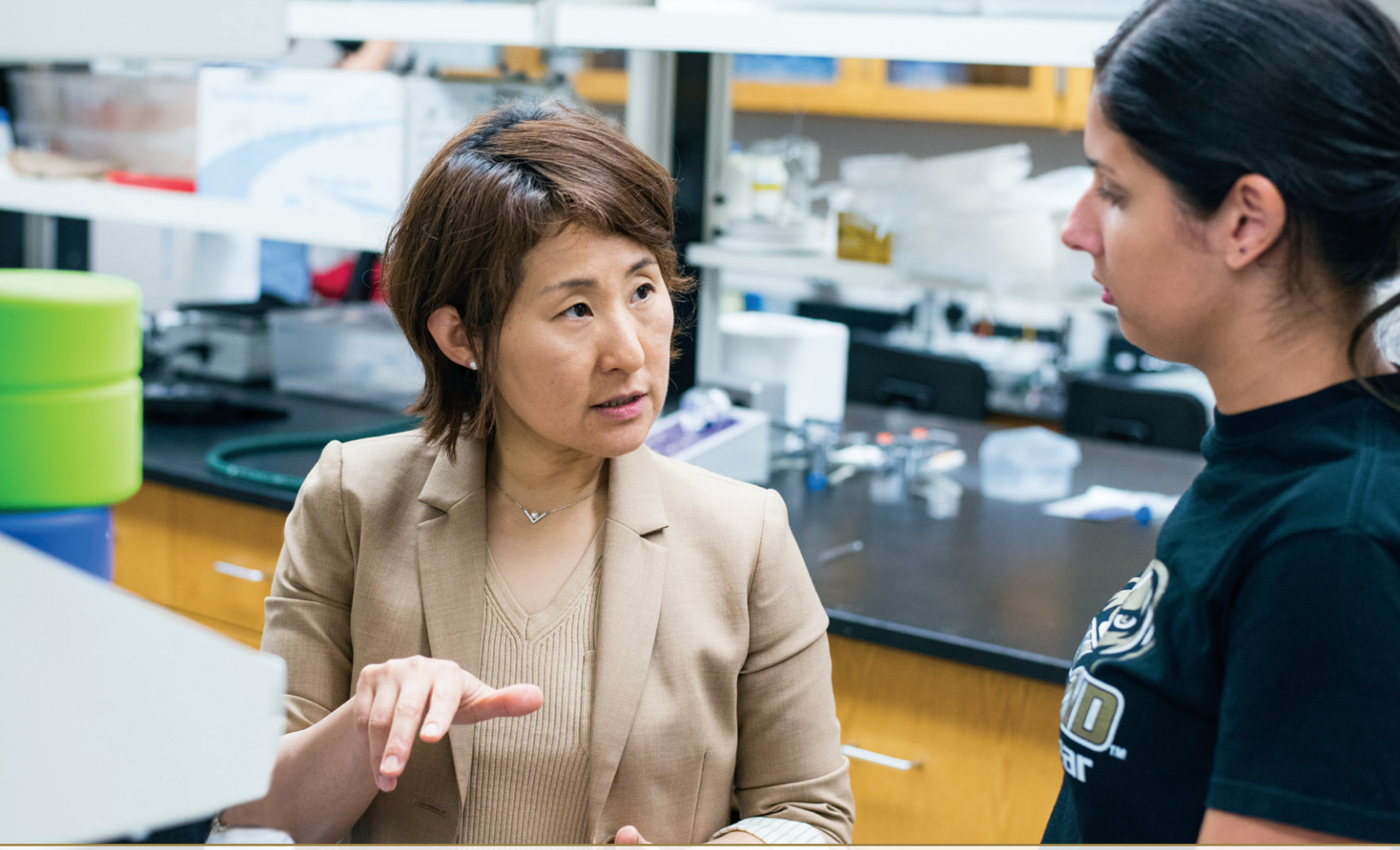
“We’re interested in how those organisms adhere to and form a biofilm on their energy source,” Dr. Blumer-Schuette said. “Both systems have appendages — they’re called pili — that stick out and are often sticky.”

She expects that in time, discoveries from her lab will help the average consumer. “My goal is to help develop microbes that are capable of efficiently degrading plant biomass so they can take that carbon from the plant and ultimately transform it to some sort of usable, valuable chemical,” Dr. Blumer-Schuette said. She received her undergraduate (wood science) and master’s degrees (forestry) from Michigan Technological University and her doctorate in plant pathology from Michigan State University.

Currently, Dr. Blumer-Schuette is working on securing multiple grants for the lab. Her first was from the Michigan Space Grant Consortium because NASA suspects that if it finds life on another planet, it will be microbial, with some of the microorganisms living in harsh environments.

Like her tāpirins, Dr. Blumer-Schuette lived in a harsh place and took the less-traveled path — cultivating a research environment that promises to benefit the environment.

By Rene Wisely, a freelance writer from West Bloomfield, Michigan.



Cells Misbehaving

Abnormal divisions provide clues to cancer

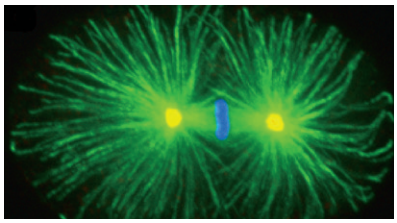
Assistant Professor of Biological Sciences Mi Hye Song, Ph.D., with senior Biological Sciences student Lauren DeMeyer.

The research of Mi Hye Song, Ph.D., starts at the very beginning with cell division. Dr. Song and her group are interested in understanding how cells divide without errors, which ultimately contributes to finding treatment options for cancer and other human diseases.

"We're actually looking at early embryos of the nematode, *Caenorhabditis elegans (C. elegans)*," explained Dr. Song, an assistant professor of Biological Sciences. "We're looking at a very early event, from fertilization to the first and second cell divisions." The genome of a genetically manipulative nematode, *C. elegans* shares strong similarities to that of humans.

Since 2001, Dr. Song has studied centrosomes, tiny organelles that are the primary microtubule-organizing centers in animal cells, which are essential for maintaining the fidelity of cell division. Using genetics and high resolution time-lapse microscopy, Dr. Song captures detailed steps of cell cycle progression in *C. elegans* embryos by mutating one gene at a time.

These observations will help determine which genes are responsible for proper cell divisions, and help pinpoint where, when or what goes awry during cell cycle progression. "Then we may be able to find out how to prevent these detrimental events from happening," Dr. Song said.



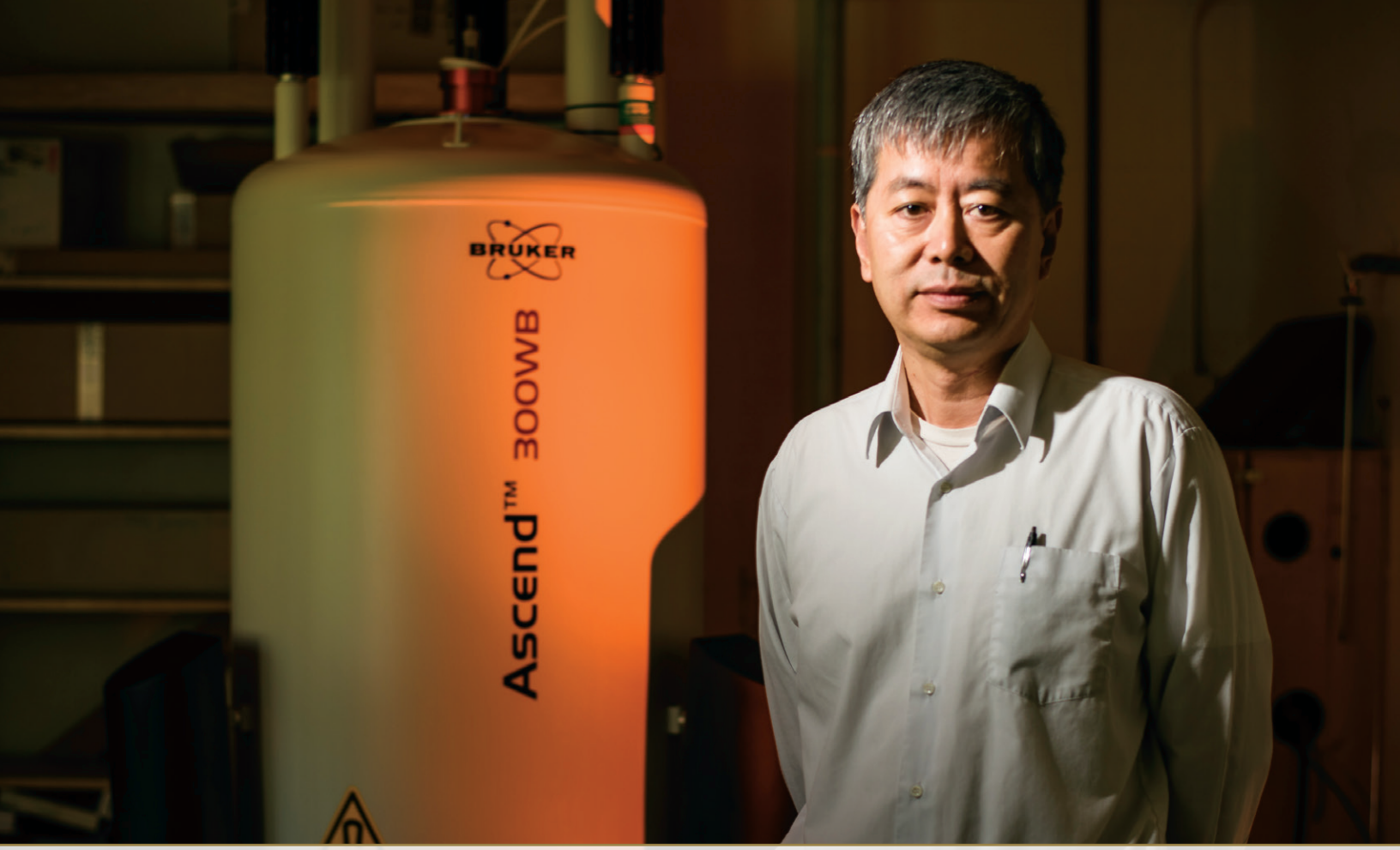
The C. elegans embryo illustrates cell division with micro-tubules shown in green, DNA in blue and centrosomes in yellow.

Ultimately, Dr. Song hopes to contribute to advancing cures for human diseases. Recently, her group found that RNA-binding proteins play a critical role in centrosome assembly. One of the proteins is found to be associated with human neurodegenerative diseases such as ataxia. Her research team currently focuses on identifying RNA molecules and characterizing their role in centrosome assembly, which will help understand the link between RNA-binding role in centrosomes and human pathology.

It all goes back to basic biology that provides fundamental mechanisms by which normal celluar processes occur — in order to attack human disorders, Dr. Song said.

"If you want to know how to stop abnormal cell divisions, we should understand how cells normally divide, first."

By Cara Catallo, a freelance writer from Clarkston, Michigan.



Cartilage Health

Monitoring early signs of degradation

Professor of Physics Yang Xia and a 7 Tesla superconducting magnet, part of a microscopic MRI he uses to non-invasively and non-destructively image internal structures of smaller samples with great sensitivity and higher resolution.

With a $2.2-million grant from the National Institutes of Health (NIH), Professor of Physics Yang Xia, Ph.D., is studying how to monitor what happens to the body before the disease sets in.

According to the Centers for Disease Control and Prevention (CDC), osteoarthritis is the nation's leading cause of disability.

As Dr. Xia noted, "At the moment, people have no way of monitoring how healthy their cartilage is before pain sets in, which signals advanced degeneration. We are trying to find out what the early signs of degradation are after a specific impact. If we can accurately monitor that, the next step would be to design a procedure or a drug to treat osteoarthritis."

An estimated 52.5 million adults across the country have doctor-diagnosed arthritis and 22.7 million report limitations due to the disease, CDC experts say. In 2003 alone, medical expenditures and lost earnings due to arthritis and other rheumatic conditions in the U.S. were about $128 billion.

"The major costs for arthritis care are the loss of productivity associated with the lengthy chronic disease and the cost of joint replacement," Dr. Xia said. "If the disease can be discovered early and monitored before the 'bridge of no return', a procedure could be developed clinically to slow down the disease progression or even reverse the degradation process.

"These developments will not only make people healthy and happy, they will also reduce the medical care cost on tens of millions who suffer from this debilitating disease."

There are six different microscopic imaging systems in the Xia Lab at Oakland University's Physics Department. Over the next five years, Dr. Xia will assemble a research team of colleagues and students who will use interdisciplinary microscopic imaging to study cartilage degradation. They will examine what happens to tissue after an impact from a sports injury, an accident or a wound suffered on the battlefield, for instance.

Dr. Xia's research is funded through 2021 by the NIH's National Institute of Arthritis and Musculoskeletal and Skin Diseases. Since 1999, the NIH has continuously supported his research with four, five-year R01 grants amounting to over $7 million.

Dr. Xia is also lead editor of a unique cartilage research book, "Biophysics and Biochemistry of Cartilage by NMR and MRI." Publication was tentatively set for October 14, 2016.

By John Turk, a freelance writer from Royal Oak, Michigan.

Gene Clue

Mutation may uncover process behind life-threatening clots

Randal Westrick, Ph.D.

Medical research company Aniara Diagnostica has awarded Oakland University Assistant Professor of Biological Sciences Randal Westrick Ph.D., a $10,000 grant to research a gene that affects the blood clotting process.

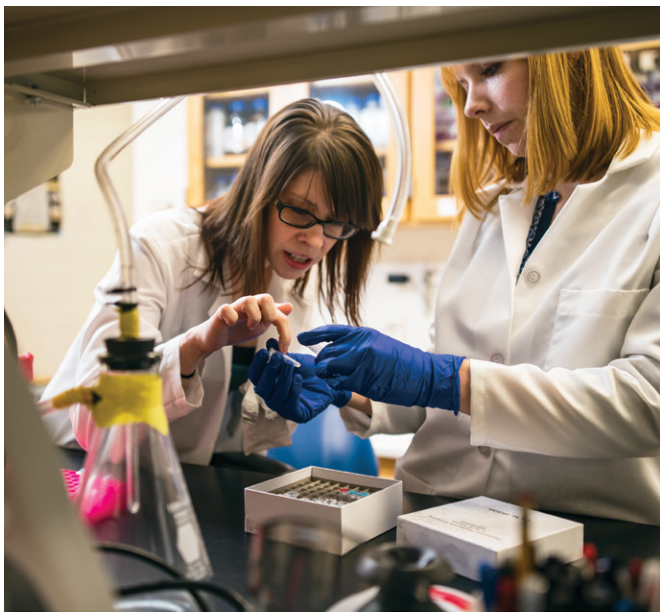
Diseases resulting in thrombosis are responsible for approximately 40 percent of deaths in the United States. Although susceptibility to thrombosis is estimated to be 60 percent heritable, at least two-thirds of the genetic risk for both venous and arterial thrombosis remains to be elucidated.

"The formation of blood clots in the veins is a life-threatening situation," Dr. Westrick said. "Although this condition is hereditary, little is known about the genes and molecules involved."

Dr. Westrick said that his team has recently identified a mutation in a gene called Actr2 that plays a major role in blood clotting, but still don't know exactly how it affects the process.

"The grant will be used to perform detailed molecular and biochemical studies to identify how Actr2 affects the blood clotting process," Dr. Westrick said.

By John Turk, a freelance writer from Royal Oak, Michigan.



Doctoral students Amy Siebert-McKenzie (left) and Marisa Brake study the genetics of cardiovascular disease.

2016 Distinguished Professors

Maria Bryant, Ph.D., professor of Chemistry, and Todd Shackelford, Ph.D., professor of Psychology, were named Oakland University's Distinguished Professors for 2016 by the Board of Trustees. They and several members of OU's faculty were recognized at the annual Faculty Recognition Luncheon on April 6.

Maria Bryant, Ph.D.

Professor of Chemistry

Dr. Bryant, who joined the University in 1991, focuses her research on theoretically describing weak, non-covalent interactions that are unlike ordinary chemical bonds that require electron density for bonding. She is studying a weakly bound tetra-gold complex with possible photo-luminescent properties and applications in light emitting diodes.

Dr. Bryant has contributed 140 refereed papers to this field and her peer-reviewed journal articles receive thousands of citations. She has successfully raised $2.3 million in funding, primarily from the National Science Foundation (NSF). An innovative educator, Dr. Bryant improved student learning and sparked an interest in chemistry by developing one of the country's first computational chemistry courses where computer modeling and visualization convey complex concepts.

As a mentor, Dr. Bryant provides students with research and scientific publication opportunities such as contributions to her publication on gold chemistry and their honors and capstone theses on gold clusters and interactions. Through her NSF instrumentation grant, OU acquired its first high-performance computer used in the chemistry labs.

Dr. Bryant's master's and doctoral degrees are from the University of Wroclaw, Poland.

Todd Shackelford, Ph.D.

Professor of Psychology

Dr. Shackelford joined the University in 2010, serving as professor and chair of the Department of Psychology. In six years, he has raised the University's international profile in the field of psychology. To support a growing student enrollment, he recruited new faculty and developed Master of Arts and Doctor of Philosophy programs in the Department of Psychology, and attracted international scholars to interdisciplinary conferences on campus.

His research on sexuality and aggression from an evolutionary perspective has been published in more than 300 peer-reviewed journal articles and book chapters. His work has been cited more than 12,000 times.

Dr. Shackelford mentors several undergraduate, master's and doctoral students each year, regularly publishing with them and chairing numerous master's theses and doctoral dissertations. He is an editor and co-editor of professional journals and a grant reviewer for agencies that include the National Science Foundation and the National Institutes of Health.

Dr. Shackelford received his Master of Arts in Psychology from the University of Michigan in 1995 and his doctoral degree from the University of Texas at Austin in 1997.

Collaborate

Teaming resources to address research needs

Oakland University inaugurated three interdisciplinary research centers to share resources and secure external funding for innovative research underway on campus.

Electrical and Computer Engineering Department Chair Daniel Aloi (left), Ph.D., and Research Associate Professor Vasyl Tyberkevych (right), Ph.D.

Institute for Spintronic and Microwave Technology

Research by Physics and Engineering faculty and students is expected to transform microwave signal processing. The institute's main goal is to develop a next-generation microwave signal processing technology and antenna systems based on recent discoveries in microwave nano-spintronics.

Magnetic memory

A current of electrons made to exist in a spin-polarized state has a unique impact on the properties of magnetic materials. This fundamental effect was a basis for developing novel high-density, non-volatile magnetic memory.

Spin-polarized current can excite oscillations of the magnetization vector at microwave frequencies. This allows one to develop nano-scale sources of microwave electromagnetic radiation, spintronic antennas and signal processing devices.

Department of Electrical and Computer Engineering faculty members Jia Li, Ph.D., and Daniel Aloi, Ph.D., provide the institute's engineering core. Both have proven records of innovation with state-of-the-art microwave technologies and a sustained interest in applying the latest scientific advances to technical applications.

Dr. Li, associate professor of Electrical and Computer Engineering, specializes in statistical signal processing and algorithm development in communications and microwave imaging. She collaborates with Dr. Aloi, director of OU's Applied Electromagnetics and Wireless Lab (AEWL).

Providing expertise in the modem physics of magnetism and nano-spintronics are OU Distinguished Professors Gopalan Srinivasan, Ph.D., and Andrei Slavin, Ph.D., as well as Research Associate Professor Vasyl Tyberkevych, Ph.D.

During the last 10 years, these faculty members have cumulatively published more than 300 peer-reviewed articles related to magnetism in nanoscale structures, magnetic metamaterials, magnonics and spintronics.

Founding researchers (from left) Ravindra Khattree, Ph.D.; Vijayan Sugumaran, Ph.D.(standing), Subramanian Ganesan, Ph.D.; Fabia Battituzzi, Ph.D.; and Randal Westrick, Ph.D.

Center for Data Science and Big Data Analytics

Exponential growth in the volume of data generated in every research discipline has created a critical need for data analytics tools and techniques that rapidly process huge datasets ("big data").

A collaborative research forum for multiple units within Oakland University, the center facilitates multidisciplinary data science research that uses big data analytics techniques. The focus is on health care operations analytics, industrial and financial analytics, genome and evolutionary biology research, sensor networks and the internet.

Solving high-impact problems

Partnering with industry and other institutions, the center will also use cutting-edge analytics, informatics and computing methodologies to conduct research and develop innovative solutions that solve high-impact problems.

Leading the center are co-directors Vijayan Sugumaran, Ph.D., professor of Management Information Systems, and Ravindra Khattree, Ph.D., professor of Mathematics and Statistics. Dr. Sugumaran specializes in data and information modelling and has published more than 150 peer-reviewed articles in journals, conferences and books.

Dr. Khattree is an applied statistician and a fellow of the American Statistical Association who has developed modeling tools to evaluate and process large data sets for predictive analytics. He has published more than 80 peer-reviewed articles and two books.

Both faculty members have received the Oakland University Research Excellence Award.

The center's other founding researchers include Subramaniam Ganesan, Ph.D., professor of Electrical and Computer Engineering; Mark Isken, Ph.D., associate professor of Management Information Systems; Joseph Callaghan, Ph.D., professor of Accounting; Fabia U. Battistuzzi, Ph.D., assistant professor of Biological Sciences; and Randal Westrick, Ph.D., assistant professor of Biological Sciences.

Plans call for collaborating with other universities and developing innovative curriculum in big data analytics with project-based interdisciplinary courses. Within the School of Business Administration, OU anticipates new certificate programs and enhanced graduate programs in business analytics.

(Front row) Eddie Cheng, Ph.D.; Douglas Carr, Ph.D.; Amy Butler, OU INC; Vijayan Sugumaran, Ph.D.; Larry Herriman, Macomb OU INCubator; Lunjin Lu, Ph.D.; (Back row) Huirong Fu, Ph.D., center director; Xiaodong Deng, center co-director; Subramaniam Ganesan, Ph.D.; Khalid Mahmood, Ph.D.; and Hua Ming, Ph.D.

Center for Cybersecurity

Cybersecurity focuses on protecting computers, networks, programs and data from unintended or unauthorized access, change or destruction. Individuals and organizations are capitalizing on advances in computer processing power, telecommunication transmission speed and data storage capacity, digitizing their information assets and conducting more of their business and social activities in cyberspace.

Benefits bring concerns

While these advances bring benefits and convenience, they also create security concerns, as software is embedded in nearly every electronic device, including automobiles, medical equipment and personal devices.

Cyberattacks and system intrusions have increased dramatically, releasing sensitive personal and business information, creating financial losses and disrupting business operations.

The Center for Cybersecurity will advance interdisciplinary collaborative research and technology solutions, leveraging OU's partnerships and resources building on cybersecurity research, curriculum and outreach. The center will also position the University to seek external funding.

Center leaders are Huirong Fu, Ph.D.; professor of Computer Science and Engineering, and Xiaodong Deng, Ph.D., professor of Management Information Systems.

2016 Research Excellence Awards

New Investigator Research Excellence Award

Courtney Brannon Donoghue, Ph.D.

Assistant Professor of Cinema Studies
Department of English

Dr. Donoghue's scholarship is in the area of critical cultural cinema studies. Dr. Donoghue has completed and submitted the manuscript for her first book, "Local Hollywood," describing complex cultural aspects of production and distribution associated with international film distribution. Dr. Donoghue has also published numerous journal articles (two in top-tier journals) and presented at 10 conferences since joining Oakland University three years ago. Dr. Donoghue's scholarship is the culmination of professional interviews, thorough reviews of trade publications and observations at film festivals.

Research Excellence Award

Lianxiang Yang, Ph.D.

Professor of Engineering
Department of Mechanical Engineering

Dr. Yang's research is in the area of optical engineering (Digital Speckle Interferometry). Dr. Yang's publication record includes 179 peer-reviewed journal and conference papers, books and book chapters, and 11 patents or patent applications. Not only has his published work advanced the technology of digital speckle interferometry, it has also informed unique uses of this technology. His success in obtaining grants has also been impressive, averaging $200,000 per year since joining the faculty at Oakland University.

2016 University Research Committee Faculty Fellowship Awards

These awards promote and foster Oakland University faculty member research endeavors in any combination of stipend and research expenses. Recipients undertake a 15-week period of full-time research.

John Corso, Ph.D.

Department of Art and Art History

"Sheila Pepe: Shadows of Affect"

Contemporary artist Sheila Pepe draws in space with networks of crocheted fiber. As these crocheted environments take shape within a room, they also create accompanying networks of shadow. The shadows distinguish Pepe's work by immersing the viewer in an ethereal environment and by focusing the viewer's awareness on the precognitive experience known as affect. Drawing on the writings of French philosopher Gilles Deleuze and psychoanalyst Félix Guattari, this book interprets Pepe's oeuvre through the philosophy of affect. Affect in this sense is understood as unfolding from aesthetic experience, but appearing prior to the linguistic understanding of that experience. Pepe's work targets precisely this shadowy transition between sensation and cognition. She works like an architect, creating sites that instigate and frame affective response. Within those sites, Pepe juxtaposes objects with illusions and stasis with motion to create rich, multisensory artistic experiences.

Thomas Raffel, Ph.D.

Department of Biological Sciences

"Using Metabolic Theory to Predict Human Schistosomiasis Exposure"

Human schistosomiasis is a widespread and difficult-to-control snail-borne parasitic disease that affects people around the world, particularly in Africa and Asia. Developing better theoretical models to predict exposure risk could be extremely useful for control efforts, allowing us to warn people when and where they should avoid entering the water, for example. My lab's current research aims at developing better mathematical models to predict schistosome exposure risk in realistic fluctuating temperature environments by incorporating nonlinear responses and the effects of temperature on snail energy budgets.

Mi Hye Song, Ph.D.

Department of Biological Sciences

"The Role of RNA and RNA-Binding Proteins Linking Centrosome Assembly and Human Cancer"

Genomic instability, a feature of many cancers, is often associated with abnormal centrosomes. The number and structure of centrosomes must be precisely regulated to maintain the fidelity of cell division and normal development. Errors in duplication result in too few or too many centrosomes, leading to incorrect segregation of genetic content. Thus, understanding the molecular mechanisms of centrosome assembly should enhance our knowledge of cancer. The objective in this project is to understand how RNA-binding proteins and RNAs regulate centrosome assembly. Identifying centrosome-associated RNAs and RNA-binding proteins, and defining their critical roles, will reveal how RNA metabolism contributes to the centrosome assembly and human conditions. Our study can fine-tune the regulatory pathway of important factors so that we can devise drugs to kill cancers precisely by attacking specific molecules crucial for the growth of the cancer cells. By determining which genes can be controlled in any given tumor cells, we should aim for cancer treatments tailored specifically to each patient.

Zijuan Liu, Ph.D.

Department of Biological Sciences

"Regulation of Osteoarthritis by ZIP8"

Osteoarthritis (OA) is degenerative and especially prevalent among elderly women, with very limited treatment and prevention. The zinc transporter, ZIP8, discovered to be a critical gene in OA pathology, is a new mechanism involved in OA progression. Thus, expression of ZIP8 is a treatment target. The proposed studies will elucidate the stages of OA development where ZIP8 expression plays a major role and will provide definitive evidence of how ZIP8 expression levels affect cartilage maintenance. We aim to understand arthritis development regulated by ZIP8 in two genetically modified ZIP8 mouse lines. One line has an approximately 2.5-fold increased expression of ZIP8 and the other has decreased expression compared to normal mice. We propose to investigate the progressive changes of joint structures in each of two transgenic lines of mice and compare with controls at different ages from 6 to 18 months.

Evan Trivedi, Ph.D.

Department of Chemistry

"Detection of Breast Cancer with New Fluorescent Probes"

Optical imaging with a fluorescent probe is an emerging imaging technique that could replace X-ray mammography. The fluorescent probe is followed by irradiation with harmless light and detection of the fluorescent signal from the tumor through several centimeters of breast tissue. This same probe could be used as an intraoperative surgical aid during tumor resection so that the surgical oncologist can preserve healthy tissue. The focus of this research is the development of large rigid molecules for these diagnostic purposes. These molecules are brightly colored and absorb a great deal of light. They are highly fluorescent, offering several orders of magnitude higher sensitivity than X-ray mammography, and their properties are highly tunable. New probes will be subjected to a number of tests of efficacy. Their fluorescent properties will be tabulated. Probes with promising fluorescent properties will be advanced to initial studies in breast tumor cells, where they will be tested against tumor cells for toxicity, cellular uptake and intracellular fluorescence. At the completion of these studies, prospective probes will be ready for future advancement to preclinical small animal studies.

Ferman Chavez, Ph.D.

Department of Chemistry

"DNA/RNA-Assisted Self-Assembly of Nanostructures"

Generating one- and two-dimensional nanostructures based on inorganic nanoparticles provides materials with interesting magnetic, optical and electronic properties. Assembly of nanocomposites using DNA/RNA has recently been explored, and methods have been developed to attach single stranded DNA/RNA to nanoparticle surfaces. Mixing these particles with other nanoparticles bonded with complementary DNA allows composites with varying properties to be assembled through biological DNA base pairing. A composite made of ferromagnetic and ferroelectric nanoparticles allows for the formation of materials capable of converting magnetic fields to electric fields and vice versa. Sensors based on assemblies would allow the generation of powerful sensors to map heart and brain function and detection of very weak electric and magnetic fields, with applications in data storage and detecting buried electronic devices. Mixing nanowires coated with DNA/RNA and silicon wafers coated with complementary DNA/RNA in spatially defined locations would allow for the self-assembly of nanocircuits, ushering the miniaturization of micro circuits to the nanoscale.

David Shaerf, Ph.D.

Department of English

"Call Us Ishmael: A Moby-Dick Documentary"

"Call Us Ishmael," a feature-length documentary film currently in post-production, follows the legacy of Herman Melville's classic, "Moby-Dick." In addition to elucidating the historical and cultural background of Melville's life and the creation of the book, the documentary's central goal is to profile modern day aficionados who exemplify the artistic, cultural, academic and environmental impact of "Moby-Dick." It will ultimately advance the film's central goal of challenging conventional understandings of how we view "fan culture" and interest-based communities in relation to great works of literature. The post-production process will include time- and labor-intensive sourcing of archival and editing footage essential to the film's completion.

Brendan Krendell, Ph.D.

Department of English

"Urban Developments: Cities and Cinema at the Turn of the Twenty-First Century"

Fundamental changes to the way we live in cities have altered the relationship between urban life and the cinema over the last 25 years. By considering developments in urban culture and the media industries as mutually informative, we can better understand the ways that cities and cinema have both evolved. On one hand, specific patterns of urban settlement and development characteristic of postindustrial cities have led to the growth of distinct urban audiences that the motion picture industry has become more adept at exploiting. This manifests itself in the creation of circuits of specialty exhibitors, as well as the proliferation of new kinds of cinema targeted specifically at urban niche audiences. In separate case studies, I examine two phenomena linked to this: the impact of widespread urban gentrification on the media industries, and the targeting of commercial African-American cinema toward urban female audiences. Likewise, cities have increasingly looked to the media industries as an important tool in their efforts to promote development and define themselves within a global economy. Within this context, planners and policymakers have taken a newfound interest in the cinema, hoping to harness film culture in an effort to spur economic growth. In this book, I explore how that process plays out across three case studies: Toronto, New York and Berlin.

Joanne Freed, Ph.D.

Department of English

"Fun Progressive Fiction: Politics, Pleasure, and the New American Middlebrow"

What makes certain works of contemporary fiction so fun to read, despite their potentially polarizing themes? In this book-length study, I investigate the underlying narrative mechanisms of "fun progressive fiction," a term that I have coined to describe works of 21st-century fiction that address issues of race, class, gender and sexuality, transnationalism and the environment — often in combination — in ways that are unabashedly entertaining. The key to these works' broad appeal, I argue, is their flexible narrative address: Rather than overtly challenging readers' existing views, works of "fun progressive fiction" invite a broad, popular readership to engage with them in ways that are pleasurable and affirming. I draw on the tools and methods of rhetorical narratology to theorize this subtle effect of persuasion, which aligns readers' narrative desires with the work's larger political aims. Ultimately, I argue, the narrative address of "fun progressive fiction" reflects the ethos of personalization that defines 21st century American culture.

Derek Hastings, Ph.D.

Department of History

"Nationalism in Modern Europe: Identity and Belonging Since the French Revolution"

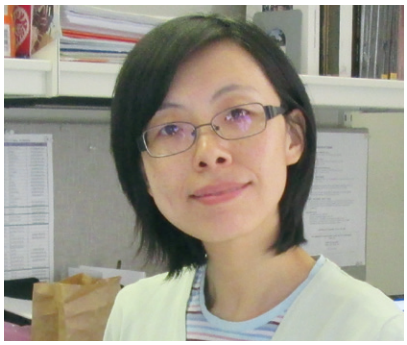
This expansive narrative history of nationalism in Europe from the late 18th century to the present will maintain a balanced comparative perspective across the continent's various regions. It relies heavily on archival materials (including government documents, police reports, club minutes, newspaper files and private correspondence), most of which are only available for on-site use in European archives. The fellowship will fund an archival research trip to Europe, with Vienna serving as a base. As the former capital of the Habsburg monarchy (which presided over more than a dozen different nationalities scattered throughout Europe), Vienna's archival holdings are incredibly rich. The city is also well situated for brief visits to archives in Prague, Bratislava, Slovakia, and Budapest, to supplement materials gathered from archives elsewhere in Europe.

James Naus, Ph.D.

Department of History

"Multiplicity and Transformation: Reevaluating Crusader Motivations in the Central Middle Ages"

It has been common in the modern era to explain crusader motivations in terms of material self-interest or protocolonialism or in explicitly religious terms. In each case, crusader motivations have been singular in nature and studied in isolation of broader changes taking place in the medieval world. By situating the topic within ongoing scholarly debates about power structures, the nature and complexion of the medieval nobility and literary studies, and by utilizing sources hitherto ignored in crusades studies, my work breaks new ground by showing that Crusaders were not motivated by any single cause, but rather by a wide variety of factors that were deeply rooted in the cultural traditions of the medieval nobility. These motivations, furthermore, changed over the Middle Ages in response to cultural and political developments. The Crusades impacted virtually every facet of the Middle Ages, and thus the broad impact of the proposed research is that it will allow me to better integrate the history of the Crusading movement into the wider history of medieval Europe.



Yan Li, Ph.D.

Department of History

"One World, One Language, One Alphabet: Soviet Influence on China's Language Education and Reform, 1949-1958"

This project examines the linguistic encounter between the Chinese and Russian languages in the 1950s when a socialist alliance was forged between China and the Soviet Union. Delving into a series of critical changes in the Chinese language policy contingent upon Soviet influence, the research focuses on three intrinsically related subjects: the promotion of Russian language education, new words borrowed from Russian, and the alphabetization of the Chinese script. With newly found archival material and a keen attention to the relationship between language and politics, the project illuminates the dynamic and tension between Soviet intervention and Chinese assimilation in the formative years of the Chinese Communist regime.

Li Li, Ph.D.

Department of Mathematics and Statistics

"Bases in Cluster Algebras and Their Geometries and Combinatorics"

A rapidly growing branch in mathematics, cluster algebra has far-reaching implications in many fields in mathematics and physics. This project will study the connection between geometries and combinatorics of some natural bases of cluster algebras and find a more explicitly computable description of these bases. A precise and explicit description of the relationship of several crucial bases are least understood today. The project is expected to give a completely different and simpler proof of the longstanding positivity conjecture and may also lead to proofs of several other conjectures which would play significant roles in cluster algebras. Significant applications to representation theory, in particular to the study of Lusztig's canonical bases, one of the main subjects in that field, are also expected. It will also have important applications to algebraic geometry, combinatorics and mathematical physics, and enhance and strengthen understanding of their connections.

Daniel Steffy, Ph.D.

Department of Mathematics and Statistics

"Fast and Accurate Computation of Cutting Planes for Mixed-Integer Programming"

The field of mathematical optimization offers many techniques to model and solve decision problems. Mixed-integer programming is one of the most widely used in practice to determine optimal routes for delivery vehicles, construct major league sports schedules, allocate resources in production planning problems and guide many other important decisions. The winning combination of sophisticated mathematical algorithms and the computing technology that enables these algorithms to be efficiently implemented is a key to this success. Computer implementations of algorithms to solve mixed-integer programming problems typically rely on numerical computation. This means that when storing and operating on numbers, the exact values are replaced by approximations. For example, in place of the number 1/3, an approximation such as 0.33 or 0.34 might be used. For computers, this approximate computation is significantly faster than using exact representations of numbers, but it comes at the expense of accuracy. As a solution algorithm might perform billions or trillions of operations and the small round off errors can accumulate and compound, resulting in potentially inaccurate results. The purpose of this proposed research is to study techniques to improve the computational accuracy of cutting planes, an important algorithmic tool used to solve mixed-integer programming problems.

Elizabeth Kattner-Ulrich

Department of Music, Theatre and Dance

"Transnational Trends in Modern Dance: Mary Wigman, Hanya Holm and the Birth of a New Art Form"

Formal, technical modern dance began in Germany in the 1910s with Expressionist Dance, whose strongest advocate was Mary Wigman. By the late 1920s, Wigman had established herself and her art. After Wigman's closest collaborator, Hanya Holm, became an integral part of the American dance movement in the 1930s, aspects of Wigman's dance were absorbed by the American movement. This study is significant in that it will explore the connection between the German and the American movements. The rise of National Socialism and Wigman's collaboration with the Nazis led to American dance distancing itself from its German roots. This discrepancy has been studied in recent years, but the direct, choreographic connection between Wigman, Holm and other pioneers of American modern dance has not been explored. Using a combination of current and contemporary published material and extensive archival research in both the U.S. and Germany, this project will explore how Holm's work with Wigman allowed her to create a bridge between German and American modern dance, bringing the two movements together and creating a new form.

Martha Escobar, Ph.D.

Department of Psychology

"Learning and Memory Consequences of Chemotherapy Treatment"

There are approximately 1.5 million new cancer diagnoses each year in America, and 68 percent of these individuals will survive the disease with the aid of chemotherapy and radiation. While effective in addressing cancer, these treatments not only have serious physical side effects but also result in difficulties with learning, memory, and executive function processes. This chemo brain state develops early in treatment, and may persist years after treatment in up to 40 percent of all cancer survivors. This research will provide a basic model of chemo brain that can be used to assess behavioral and pharmacological interventions aimed to ameliorate the deleterious effects on cognition of chemotherapy. Mice undergoing chemotherapy treatment will be assessed on their capacity to remember location, events occurring in a location and events independent of location. This project will also assess their capacity to change what they know about a previously encountered item and their capacity to ignore a noninformative event. Together, these tests will provide the basis for a more focused investigation on the mechanisms underlying chemo brain as well as possible palliative and preventative therapies to ameliorate the cognitive side effects of chemotherapy.

Virgil Zeigler-Hill, Ph.D.

Department of Psychology

"The Interpersonal Consequences of Pathological Personality Traits"

The purpose of the proposed study is to examine how individuals with pathological personality traits are perceived by the individuals who inhabit their social environments. More specifically, the proposed study will ask 300 community members (i.e., Targets) to provide self-reports of their pathological personality traits before recruiting up to seven friends and family members (i.e., Perceivers) to provide informant reports concerning their perceptions of the Target. The measures completed by the Perceivers will include (1) the perceived aggression of the Target, (2) the perceived moral qualities of the Target, (3) the perceived likelihood that the Target will perpetrate transgressions toward others (e.g., the Target will lie to someone else), and (4) the perceived likelihood that the Target will be the victims of transgressions (e.g., someone else will lie to the Target). Pathological personality traits involve disturbances in the way individuals think about themselves and other individuals, so I predict that individuals who possess high levels of pathological personality traits will be perceived less favorably than other individuals. For example, I expect that individuals with high levels of antagonism will be perceived to be highly aggressive and likely to perpetrate transgressions against others, whereas individuals with high levels of negative affectivity will be perceived as highly susceptible to victimization by others.

Cynthia Sifonis, Ph.D.

Department of Psychology

"Examining Game Play Transfer and the Development of Sense of Place in an Augmented Reality Game"

Video games are becoming a form of entertainment, relaxation and socializing for a large proportion of the population. Consequently, it is important to examine the effects of extended game play on individuals. Research on video games has demonstrated both positive and negative effects of gaming. Oritz de Gotari & Griffiths (2014) demonstrated that extended game play can result in automatic thoughts and involuntary behaviors associated with the game, known as Game Play Transfer (GTP). However, extended game play can also encourage community building and socializing between players (Steinkuehler & Williams, 2006). A neglected area of video game research is that of Augmented Reality Gaming (ARG) in which players play in the real world using smartphones. In AR games, the game world is represented as an overlay in the real world. Whereas AR has been examined for its potential for education, little research has examined potential positive or negative effects of playing AR games. If playing video games causes bleed over of actions and responses from the virtual world to the real world, would playing AR games make it even more likely for players to experience transfer from game to real life? If so, could some of that transfer be positive in terms of building and maintaining real world friendships and community? The current research will use surveys to determine the degree to which the factors affecting GPT in AR games is similar to that affecting GTP in video games and whether playing AR games increases sense of place for gaming locations.

Kanako Taku, Ph.D.

Department of Psychology

"Effects of Mortality Salience and Personality on Posttraumatic Growth and Group Entitativity"

A growing body of research indicates that some people experience personal growth as a result of highly challenging life events, a phenomenon referred to as posttraumatic growth (PTG). Recent work has questioned to what extent this phenomenon is real or illusory. If this phenomenon includes both aspects, then under what circumstances does the illusory or authentic aspect of PTG emerge? Terror Management Theory posits that humans respond defensively to reminders of death by enhancing their self-esteem and by strengthening their connections with their in-group. PTG should be higher after a mortality salience (awareness of one's mortality) induction if PTG is produced by a defense mechanism and, therefore, is illusory. If this effect is more evident among Americans, then the reasons why a higher PTG has been observed among Americans than other cultures may become clearer. The current research proposal tests this research question by cross-culturally examining the conditions in which PTG is likely to reflect illusory or authentic growth. With a sample of college students from the U.S. and Japan, in specific Aim 1, we will test the effects of mortality salience on PTG and perception of group entitativity (i.e., quality of groupness). In specific Aim 2, we will investigate how the effects of mortality salience on PTG may or may not be manifested by examining the mediating role of positive personality traits (e.g., humility) and aversive personality traits (e.g., narcissism). These studies will advance knowledge and open opportunities to develop a more effective and culturally sensitive intervention program.

2016 University Research Committee Faculty Fellowship Awards

Albert Meehan, Ph.D.

Department of Sociology, Anthropology, Social Work and Criminal Justice

"Data Bias Problems with Police Camera-Car Archives: Examining Officer Compliance with Policy Regarding Microphone Use"

I have been granted access to a police department's camera-car archive, now digital and interconnected with their records management system. The change to digital systems, combined with other organizational changes, enables the collection of a representative sample of videotaped traffic stops for each patrol officer (n=29), avoiding the systematic biases inherent in VHS camera-car archives identified in the past research. Funding will support analysis of officer compliance with microphone use in camera-car recordings of traffic stops and collection and analysis of ride-along/interview data to provide organizational and community context.

Terressa Benz, Ph.D.

Department of Sociology, Anthropology, Social Work and Criminal Justice

"Out of Necessity: The Dialectics of Gun Carry in Detroit"

Gun violence in Detroit, Michigan, is an everyday reality and the police force is largely absent from daily life due to years of austerity measures. Detroit residents no longer rely on the police, whose average response time to a 911 call is 50 minutes to 24 hours. Further, fewer than 10 percent of cases known to the police are solved and rape kits remain untested for decades. Out of this relatively lawless environment, a variety of self-protection strategies have emerged, from the buying of guard dogs to the increasing percentage of the population obtaining concealed pistol licenses (CPLs). This project will play an important role in advancing knowledge about self-protection, gun ownership, and gun violence intervention strategies. Work of this nature on self-protection is scarce. This grant will fund a minimum of 20 interviews with Detroit residents and CPL holders to explore the strategies they use to protect themselves in a city without reliable law enforcement.

Lori Burrington, Ph.D.

Department of Sociology, Anthropology, Social Work and Criminal Justice

"Neighborhood Effects on Adolescent Alcohol Use: Does Familiarity Breed Complacency?"

In contrast to other forms of problem behavior, alcohol use facilitates social affiliation and is prevalent among adolescents who are socially advantaged, popular and otherwise well-adjusted. Thus, alcohol use may be more likely among adolescents residing in neighborhoods that are close-knit and socially organized, regardless of the level of neighborhood disadvantage. This study will examine the relationship between measures of neighborhood social organization (such as the extent of social ties and mutual trust among neighborhood residents) and individual adolescent alcohol use (net of neighborhood economic disadvantage, individual characteristics, and family and peer determinants).

Erik Fredericks, Ph.D.

Department of Computer Science and Engineering

"Exploring Run-Time Assurance Techniques in Adaptive Embedded Systems"

Consider an autonomous vehicle that has been developed to safely deliver passengers to their desired destinations. This vehicle leverages an array of sensors that monitor road and traffic conditions and has been thoroughly tested in simulation. However, an unexpected combination of sleet and snowstorms has caused the roadways to be completely iced over and the vehicle's sensor array to be effectively blocked. These conditions were never accounted for in the simulation environment, and as such, the autonomous vehicle may not be able to make an informed decision that will ensure the safety of its inhabitants. This situation is often referred to as the "reality gap," or the difference between simulation and reality. In terms of software simulation, the reality gap can occur as a result of ill-defined requirements, unexpected environmental conditions and unaccounted for manufacturing tolerances. This research project aims to explore the reality gap from a software engineering perspective. In particular, this project will explore the reality gap by examining the effectiveness of run-time software testing, or testing that is performed during normal system operations, on an embedded system. Expected outcomes include development of an experimental testbed for investigating software assurance techniques, corroboration of previously developed run-time testing techniques, and optimizations and/or extensions to those run-time testing techniques to support a fully-realized system.

Peng Zhao, Ph.D.

Department of Mechanical Engineering

"Toward Resolving a New Engine Knock: A Mechanistic Study on Stochastic pre-Ignition (SPI) in Spark-Ignition Engines"

A new form of engine knock, stochastic pre-ignition (SPI), has been observed in engines even before the onset of spark. SPI is inherently intermittent, hard to control and extremely damaging to engine hardware, therefore significantly limiting fuel economy gains. I propose examining the underlying mechanisms for SPI using a fundamental approach. Different scenarios of SPI could be systematically classified into three groups: 1) autoignition caused by interactions in the gaseous phases; 2) autoignition caused by interactions between the liquid droplets and gaseous phases; 3) autoignition caused by interactions between the solid particles and gaseous phases. By scrutinizing these potential causes (1-3), insights will be gained into the fundamental mechanisms triggering SPI. The project includes numerical simulations with parametric studies on factors affecting the autoignition process. The physico-chemical interaction in each group (1-3) will be identified by the methods of sensitivity and reaction network analysis. To further validate, I propose conducting an experiment using an isothermal flow reactor and gas chromatography with time-of-flight mass spectroscopy.

Kasaundra Tomlin, Ph.D.

Department of Economics

"Assessing the Efficacy of Consumer Boycotts of U.S. Target Firms: A Shareholder Wealth Analysis"

This paper will analyze the effectiveness of U.S. boycotts from 1978 to 2013, examining the affect of actual boycotts and boycott threats on the welfare of U.S. firms in the form of shareholder wealth (stock returns). I will identify business-related boycotts and union-sponsored boycotts and include a social responsibility category identifying boycotts related to animal rights, living wages in less-developed countries, racial/sexual discrimination, human rights and environmental issues. Categorizations will include ideological and political/religious boycotts. I will analyze how boycott effects vary by firm attributes such as size (number of employees), financial leverage, advertising intensity, number of competitors and net income.

Caitlin Demsky, Ph.D.

Department of Management and Marketing

"Daily Workplace Incivility: Effects on Employee Well-Being"

Workplace incivility is a prevalent workplace stressor involving behaviors that violate workplace norms of civility and have ambiguous intent to harm (e.g., condescending remarks, ignoring or excluding others). While existing literature has identified a range of negative outcomes associated with workplace incivility, we know much less about the dynamic effects of workplace incivility on employee well-being. The current study seeks to explore the associations between daily reports of workplace incivility and two indicators of employee well-being: employee sleep and recovery from work demands. Data will be collected via a daily-diary study of full-time employees across various organizations. Implications of this research include the ability to examine the dynamic effects of workplace incivility on employee well-being, particularly on under examined outcomes such as sleep and recovery from work demands. Spousal support for recovery is introduced as an unexplored buffer of the association between workplace incivility and well-being. The current study has implications for researchers and practitioners seeking to provide employees with the tools necessary to combat the negative effects of workplace incivility.

Florence Dallo, Ph.D.

Department of Health Sciences

"Does Pay-for-Performance Improve Diabetes Preventive Care Measures? The Case for Arab, Asian, non-Hispanic Black, and non-Hispanic White Patients in Michigan"

Research shows that non-Hispanic blacks are more likely to receive recommended diabetes tests compared to non-Hispanic whites. The literature rarely includes Arab Americans, a large, growing, immigrant minority population in Michigan. To reduce health disparities in diabetes care, physicians are incentivized (i.e. pay-for-performance) by the insurance company when they administer the following: a test to assess glucose control; a cholesterol test; an eye exam; and monitor for kidney disease. This project will estimate whether these measures have improved when comparing pre- and post- pay-for performance, in 2004 and 2014, respectively. This is the first study to evaluate whether pay-for-performance improves, worsens, or does not change diabetes measures for racial and ethnic minorities in the state of Michigan.

Student Researchers

Steven Louis, Ph.D.

Electrical Engineering

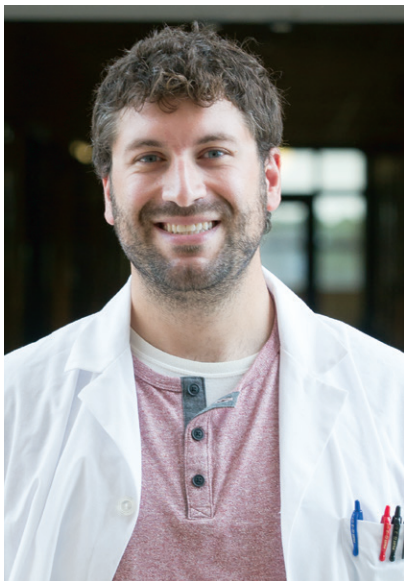
Development of Applications for Spin Torque Nano-Oscillators

Master of Science in Physics, 2015; presented at several international conferences; awarded a National Science Foundation summer fellowship in China; recipient, Provost Graduate Student Research Award and University Research Committee Student Travel Award

Faculty Mentors: Jia Li, Ph.D., associate professor, Electrical and Computer Engineering Department, Vasyl Tyberkevych, Ph.D., research associate professor, Department of Physics

Why you chose this research: "Pure curiosity."

After graduation: "More scientific research! Funding for a post-doctoral fellowship."



Nick Peraino, doctoral student

Biomedical Sciences: Health and Environmental Chemistry

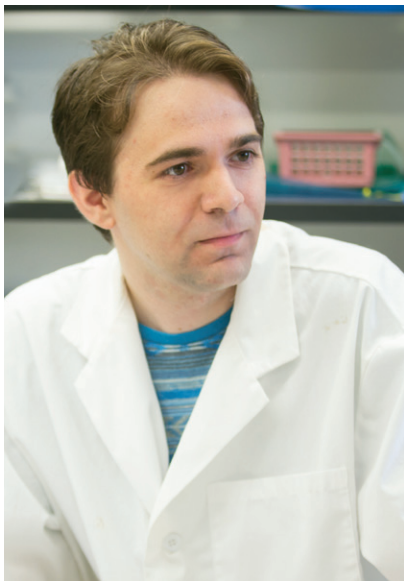
Synthesis of Gamma-Lactones from Sulfoxonium Salts

Six publications, with another submitted; two presentations at national conferences, two Oakland University presentations

Faculty Mentors: Nessan Kerrigan, Ph.D., associate professor, Organic Chemistry, Department of Chemistry

Why you chose this research: "Lactones are important biologically active compounds and synthons."

After graduation: "Employment in research or industry."



Norman Leo, B.S.

Chemistry

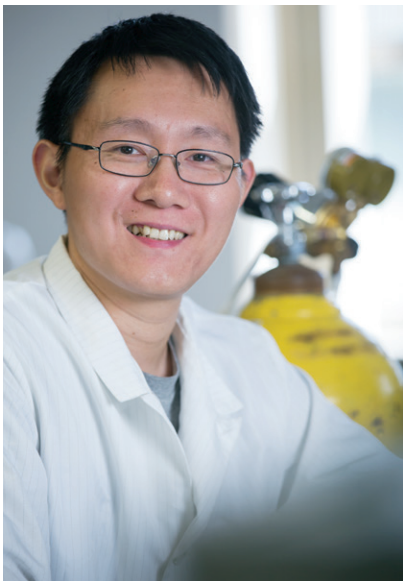
Peptide Folding

Oakland University academic scholarship

Faculty Mentors: Xiangqun Zeng, Ph.D., professor, Analytical Chemistry, Department of Chemistry

Why you chose this research: "Peptides are the building blocks of all life. Peptides exhibit extraordinary complexity, yet can offer unique simplicity. Understanding peptides and how they interact can revolutionize the fields of bioanalytical sensors and shed light on misfolding protein diseases such as Alzheimer's."

After graduation: "Pursue a doctoral degree in chemistry."



Lu Lin, doctoral student

Chemistry

Novel Ionic Liquid Based Electrochemical Gas Sensor and Sensor Array

Oakland University First-Time Graduate Student Scholarship, 2012; University Research Committee Student Travel Grant, October 2014

Faculty Mentors: Xiangqun Zeng, Ph.D., professor, Analytical Chemistry, Department of Chemistry

Why you chose this research: "Reliable sensing devices are indispensable in our everyday life, especially those exhaust gas sensors in the automotive industry and emission gas sensors in mines and/or the chemical industry."

After graduation: "Continue seeking opportunities to extend the development of gas sensor-related products."

Sheng-Nan Qiao, Ph.D.

Eye Research Institute

Neural Circuits of the Retina

Published "Multiple cone pathways are involved in photic regulation of retinal dopamine," in Scientific Reports | 6:28916 | DOI: 10.1038/srep28916; attended the Oakland University 2016 Graduate Student Conference.

Faculty Mentors: Dao Qi Zhang, Ph.D., assistant professor, Biomedical Sciences, Eye Research Institute

Why you chose this research: "I took a neuroscience class in my undergraduate and was attracted by the complexity and plasticity of our central neuro-system. The retina is an approachable and well organized organ, actually a piece of the brain, which leads us to further explore the secret of the brain more conveniently. Visual function is so important for us to perceive the outside world — and there are a lot of questions that need to be answered."

After graduation: "After earning my Ph.D., I plan to find a doctoral position in the United States and continue doing some interesting research."

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