Bio Rhythms

November 2020 Department of Biological Sciences

Of all the nerve!

Biological sciences and psychology launch interdisciplinary neuroscience program

The new Bachelor of Science in Neuroscience opened to students in fall of 2019. One year later, it already has over 300 majors, including 70 incoming first-year students! In addition to the Departments of Biological Sciences and Psychology, faculty in other departments, schools and colleges participate in the neuroscience program. A fusion of two of the university's most popular majors, it is not surprising that the program would be in high demand. There were only seven undergraduate neuroscience programs in the country in 1986, but this exploded to 251 programs by 2016. Nine other universities in Michigan, including MSU and U-M, also offer undergraduate programs in neuroscience.

Tom Fischer, a faculty member in psychology and long-time champion of undergraduate education at WSU, is the current director of the B.S. in Neuroscience Program. He took the lead a few years ago to write the proposal and steer it through the approval process. Now he is working to refine the program and keep pace with student demand. An exciting new development is the approval of a chapter of Nu Rho Psi, the National Honor Society in Neuroscience. The first students were inducted into the society on September 16. This is only the second chapter in the state of Michigan.

continued on p.3

"As a fusion of two of the university's most popular majors, it is not surprising that the program would be in high demand."

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Note from the Chair

We are still here

When I became chair of Biological Sciences, I knew that the next few years would be difficult. The university was changing its financial model. Our undergraduate and graduate programs needed updating and aging equipment needed replacement. But I had no idea how challenging it would actually be. In March the COVID-19 pandemic hit Detroit hard, closing labs and classrooms. All on-campus activities, other than the preservation of essential research materials and building maintenance, were forbidden. Classes moved online and will continue online through the fall of 2020. The university rapidly rolled out training in online instruction. Our libraries, which many students rely on for computers and internet, closed. Wayne State gave out hundreds of Chromebooks and purchased 1,500 laptops that were distributed to Pell-eligible freshmen this fall. High speed WiFi was set up in the Matthaei Physical Education Center parking lot, enabling students to do online coursework from the safety of their cars. Wayne State also established emergency funds for students. You can donate to a number of programs that provide direct aid to students at: **warriorfunder.wayne.edu/project/20410**

Colleges and universities all over the country will close permanently as a result of the COVID-19 pandemic. Our large undergraduate enrollment, metropolitan location and relatively modest tuition put Wayne State University in a comparatively good position. We will weather the storm but face historic budget reductions over the next few years and our path will be difficult. Please consider donating to the Biological Sciences Research Development Fund. We use these funds to repair equipment, send graduate students to meetings and offer matching funds for the purchase of major equipment. You can find a link at: **go.wayne.edu/bio**.

"We will weather the storm but face historic budget reductions over the next few years and our path will be difficult."

Despite everything, cranes continue to populate the skyline on campus and in midtown Detroit. Recent structural issues permanently closed the 2nd and 3rd Avenue bridges over route I94. This spring the 2nd Avenue bridge was demolished and replacement by a new bridge of pioneering design has begun (p.3). A partnership between Wayne State and the Detroit Pistons has enabled construction of a new basketball arena on campus, p.8. The new STEM Commons is completed but will not open until the pandemic wanes. Workers are now updating utilities and restyling Gullen Mall between the STEM Commons and Biological Sciences. We hope to feature the STEM Commons after its reopening.

In 2019, David Njus (Biological Sciences) and Tom Fischer (Psychology) collaborated with several other departments to launch an interdisciplinary program in Neuroscience. You can read an early report on this very successful new major on p.1. I am very proud of how our university and the Department of Biological Sciences rose to the challenges of the pandemic. You can find updates on student and faculty honors, awards and promotions on p.12.

Thank you for reading this issue! Please update your alumni information so that you continue to receive *BioRhythms*.

Vicky Meller

Read an update about native gardens, p.10

Of all the nerve! (cont.)

The Department of Biological Sciences is deeply involved in the neuroscience program. Our undergraduate advisors (Kim Hunter, Rebecca Russell, Antoinette Cunningham and Nora Alhussainy) advise the neuroscience majors. Two of our faculty, David Njus and Marianna Sadagurski, serve on the steering committee along with Chris Kelly from physics and astronomy. A number of biological sciences faculty (Justin Kenney, Mark VanBerkum, Joy Alcedo, Karen Myhr, Markus Friedrich and Miriam Greenberg) teach courses that are part of the neuroscience program.

The neuroscience program currently has two tracks - Behavioral and Cognitive Neuroscience and Cellular and Molecular Neuroscience - and more will be added. Building on foundational courses in biology, psychology, chemistry, physics and math, this major prepares students for advanced study in a variety of life science and health-related fields, professional degrees in medicine, nursing, veterinary medicine and physical therapy.

The field of neuroscience itself is exploding as new methods in molecular and cell biology have propelled research in this area. An aging population has also fueled an increasing emphasis on medical and social problems related to neuroscience. These factors are part of the great student interest in the neuroscience program and we are looking forward to our graduates making significant contributions in these areas in the years ahead!

Visualization of a taste sensory neuron in the worm *C. elegans*. The neuron cell body, axon and dendrite are labeled. This worm, expressing a fluorescent protein in a single neuron, was generated and imaged by B. Periera (Alcedo lab).

"The neuroscience program currently has two tracks - Behavioral and Cognitive Neuroscience and Cellular and Molecular Neuroscience - and more will be added."

Assembly of the central arch is taking place amid a thicket of cranes in a parking lot near the WSU Law School. It will be rolled across I 94 sometime in 2021.

Second Avenue Bridge Replacement

Network tied arch bridge will join Tech Town and iBio to main campus

Routine inspections of the 2nd and 3rd Avenue bridges over Interstate 94 found major structural problems in 2017 and 2019. Each bridge was immediately closed, disrupting traffic between campus and neighborhoods to the north. These closures also blocked the most direct routes between the Biological Sciences Building and TechTown, iBio and the WSU Police Department. The Michigan Department of Transportation (MDOT) is now replacing the 66-year-old 2nd Avenue bridge with the first network tied arch bridge in Michigan. It will feature a central arch with crossed hangers supporting the roadbed, a design with benefits in cost, strength and stability. The new bridge does not require a central pier, a feature that is important for a planned modernization of I-94 over the next 10 years. Construction of the arch, now taking place in a parking lot near the WSU Law School, is well underway. When completed the arch will be rolled into place over I-94 – a must watch event!

You can follow all I-94 bridge replacements on Twitter and Facebook: twitter.com/I94Detroit and facebook.com/I94Detroit.

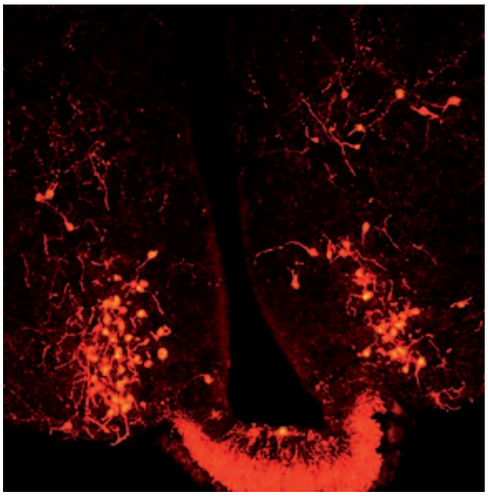
Research Highlight: Dr. Marianna Sadagurski

Taking it to the Streets: Fighting Urban Diabetes and Obesity

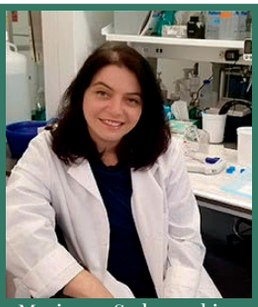
Benzene, a major component of air pollution in urban manufacturing areas, may be an underlying cause of type 2 diabetes and obesity, according to Marianna Sadagurski, Ph.D., WSU assistant professor of biology. She and her research group are conducting animal studies to investigate the role of benzene and have found that chronic exposure to low levels causes inflammation of certain brain cells that set the stage for the development of type 2 diabetes and obesity.

Tracking benzene

Benzene is a component of industrial emissions and motor vehicle exhaust, as well as cigarette smoke and e-cigarette vapors, and has long been known as a carcinogen, but Sadagurski was more interested in its part in sensing and regulating glucose levels. She explained that exposure to benzene causes an inflammation in certain brain cells, called glial cells and glucose-sensing neurons. Research over the past two decades has shown that these cells are involved in regulating appetite and metabolism (the process of converting food to usable energy), particularly through their combined ability to sense levels of glucose, as well as the hormones insulin and leptin, which work together to regulate metabolism. Insulin regulates glucose levels by delivering glucose to cells or storing it for future use, and leptin acts as an appetite monitor that tells an individual when to eat and when to stop eating. Benzene-associated inflammation can disrupt all of those functions, which can lead to type 2 diabetes and/or obesity, she explained.



Activation by DREADD-AAV of growth hormone receptor neurons in the hypothalamus (red-TdTomato)



Marianna Sadagurski received her bachelor's and doctorate degrees from Tel Aviv University, Israel. She was a postdoctoral research fellow at the Howard Hughes Medical Institute, Harvard University and Assistant Research Professor at University of Michigan before joining Wayne State University in 2016.

To determine the impact of air pollution, Sadagurski began by putting her students to work. "The talented undergrads in the lab did a search through the epidemiological studies to try to see what was known about air pollution in urban areas," she said.

Besides finding numerous studies reporting high levels of benzene in people who work in industrial factories, or who are regular tobacco smokers or e-cigarette users, the students also came across research publications showing lower but chronic benzene concentrations in children. In other words, simply living in the area was enough to introduce benzene to the system.

Sadagurski and her research group — led by a postdoctoral fellow in the lab, Lucas Debarba, in collaboration with the WSU biomedical engineering lab of Ulrike Klueh — then began controlled experiments with mice to "get a better understanding of whole-body metabolism, and what happens to the brain and neuroinflammatory signals with benzene exposure." Since genetics and nutrition can alter metabolism (her group has done considerable work showing the nutrition-diabetes connection), they tested genetically similar mice that had been fed the same diet, so the only variable was benzene exposure. The mice were "placed in a chamber, where they breathed air that contained defined concentrations and durations of benzene, and the researchers documented what happened.

Humongous effect"

The results were stunning. "We didn't expect to see this, but even within a few hours of exposing animals to benzene in relatively low doses, it was enough to trigger a humongous inflammation of glial cells and trigger a neuroinflammatory response in their brains," Sadagurski said. "And after they were exposed to a few hours of benzene each day for five days a week and for four weeks, the glial cells developed massive inflammation, the glucose-sensing neurons had developed massive resistance to insulin and leptin, and they had diabetes. In just four weeks!"

In addition, Debarba together with a grad student in the lab, Lisa Koshko, exposed pregnant female mice to benzene to see whether that would have any impact on their future offspring. "Again we had a controlled system where we knew the food the mothers ate, the day they became pregnant, and the benzene exposure, which we ended on the day before birth, so the young were born in the clean air," she recounted. "What we found was huge effects in the offspring, especially in males." This included substantial inflammation of glial cells and neuroinflammatory responses in the brain at birth, followed by the diabetes symptoms of severe high blood-glucose levels and severe insulin resistance by 9 months of age, which would be the equivalent of 30-40 years old in a human, she said.

"What we're seeing is not just that the offspring are sick at the beginning and it goes away; we're seeing this from birth to low middle age, and in mice that were never exposed to this pollutant except during gestation, and ate a normal diet," she reported. "This raises the question of whether predisposition in our children is due not only to nutrition, but also to the pollution that we have in some particular areas?"

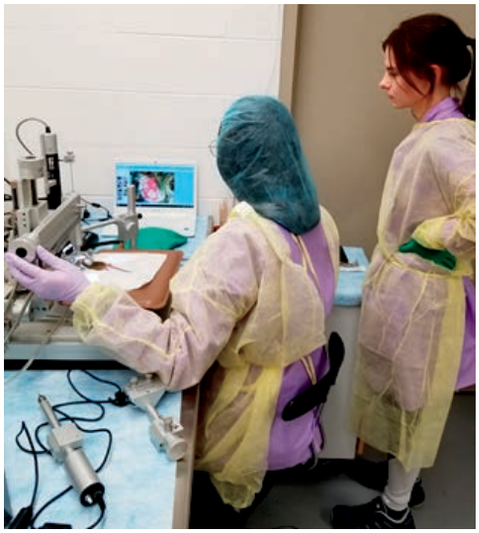
The good news

Sadagurski is the first to acknowledge that her group's findings are alarming. Short of waving a magic wand to eliminate benzene from the environment, or moving entire populations out of industrialized cities, does a solution exist? The answer, according to the group's newly published study, may be an anti-diabetes drug or possibly just a change in diet.

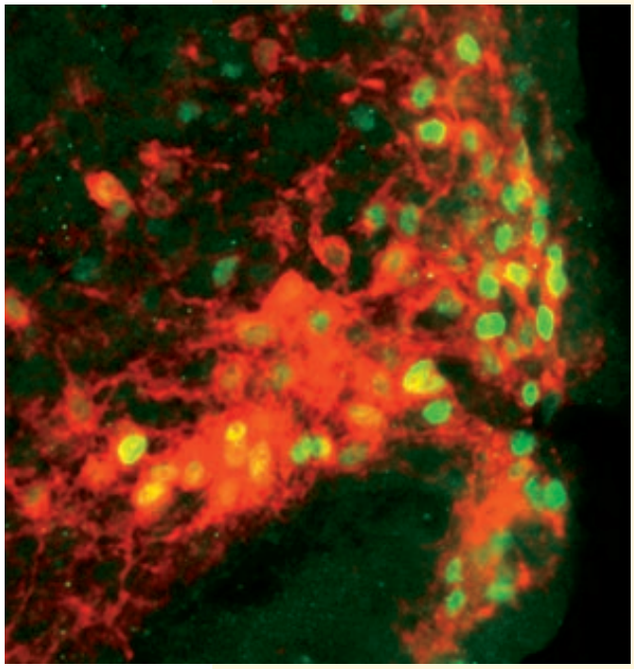
"Our study very strikingly showed that one of the clinically approved and very efficient anti-diabetes drugs, called acarbose, prevented any effects of metabolic imbalance in these animals, including glial inflammation, even among animals that had been exposed to benzene," she said. "Acarbose made the mice healthier, kept their insulin levels low, moderated glucose levels, and actually extended their lifespans."

In addition, the researchers noted that the drug's effects closely mimic those afforded by a low-glycemic-index diet, so by switching to that diet, "you're not far away from where you would be if you're exposed to benzene with using acarbose," she said. Likewise, she believes a low-glycemic-index diet — or some other diet that slows dietary carbohydrate digestion — during pregnancy could also counter the effects of benzene exposure on a child. "This diet can potentially be a strategy for reducing any type of negative metabolic effects that we observe under gestational or chronic exposure to benzene, especially for people who are living or working in highly polluted urban areas. That's the take-away."

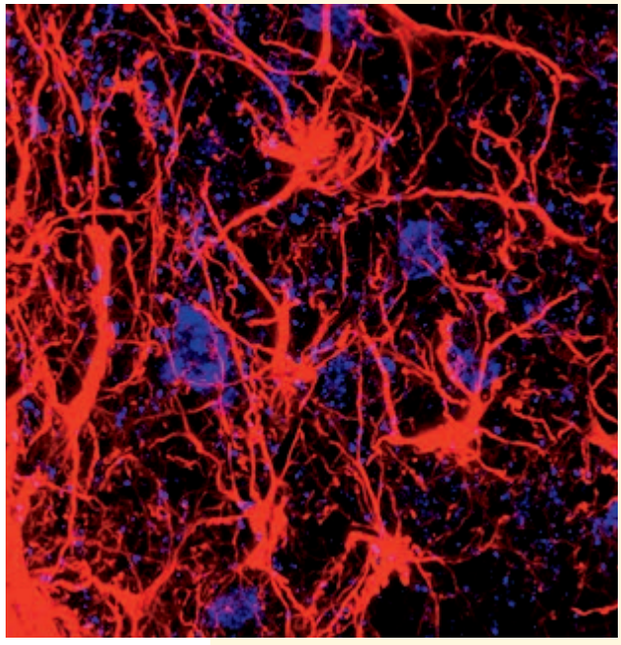
Back in the lab, Sadagurski's group is continuing their studies of predisposition to type 2 diabetes and obesity. One area of special interest stemmed from a finding that glial cells and glucose-sensing neurons could recover if benzene exposure only lasted for a couple of days. Debarba is embarking on a study to determine whether ending benzene exposure after longer periods could have similar effects. (This project is now funded by the Center for Urban Responses to Environmental Stressors, or CURES). "At this point, we don't know whether it will eventually resolve or if it causes permanent damage," Sadagurski said, "but it is one more piece of the puzzle that we are very interested in."



Postdoctoral fellow Juliana Lima and graduate student Lisa Koshko performing brain surgery



Activation of growth hormone receptor neurons (red-TdTomato, green-cFos)



Colocalization of hypothalamic astrocytes (red) with CART (blue)

"Benzene-associated inflammation can disrupt all of those functions, which can lead to type 2 diabetes and/or obesity"

Fighting to Save Native Fish

On the Brink of Extinct

When new species of fish are introduced into a lake, they can wreak havoc on the native fishes. In some cases, the introduced species may eat the native ones, causing the population to crash and sometimes disappear altogether. WSU Biology Professor Tom Dowling is helping to find ways to protect native species and maintain a healthy, freshwater biodiversity.

Dowling has been on the front lines of native-fish preservation for more than three decades. The work began shortly after he earned his Ph.D. from Wayne State University, when he accepted a faculty position at Arizona State University and began his still-continuing research on how hybridization (successful reproduction between two species) affects the evolution of fish biodiversity.

"When you move out to the western United States, you become a conservation biologist too, because so many of the native species are threatened, endangered, or a candidate for listing. And a lot of that has to do with invasive species," he said. In fact, he noted, a large majority of the 80 or so fish species in Arizona waters are introduced, and many of the introduced species are invasive, which means they can displace native species and take over habitat.

In comparison, Michigan has some 150 species of fish, including dozens of introduced species, as well as 24 native species that are listed as endangered, threatened, or of special concern.

The high level of introduced species in Arizona led Dowling to quickly add a topic to his research program: saving the native fishes. "Much of my work has been focused on conservation genetics and management, and I have this big project now where I'm looking particularly at one native species, called the razorback sucker," he said. Recognizable by a large hump-like keel behind its head, the razorback (*Xyrauchen texanus*) grows to more than 2 feet long. "This is a species that used to be very abundant. They were a food resource for the indigenous peoples in the area prior to European settlement, and in the 1930s, there are records of people in Arizona going to canals when the fish were running and using pitchforks to scoop out the fish for the farmers to use as fertilizer." Today, however, the razorback is listed as critically endangered, which puts it on the brink of extinction.

Much of Dowling's attention has focused on Arizona's Lake Mohave (below Hoover Dam), where the razorback population has declined primarily because of three introduced species: small, so-called "panfish" known as bluegill (*Lepomis macrochirus*) and green sunfish (*Lepomis cyanellus*), [TD1] and a larger sport fish called a striped bass *Morone saxatilis* that can grow to 20-40 pounds and 3-4 feet long. These and other introduced fishes gobble up razorback larvae as fast as the females can produce them, leaving no young to replenish the population. Without intervention, the razorback population was destined to die out.

One solution was to rear razorbacks in a protected location until they got large enough to have a fighting chance and then release them in the lake. The traditional method of rearing involves putting a few razorback adults into a hatchery, allowing them to reproduce, and raising the young there. That approach can produce a large number of razorbacks fairly quickly, Dowling said, but it has a few drawbacks. One is that hatchery young descend from a limited number of adults, so they don't have the genetic diversity that healthy native populations possess.

Another is that hatchery holding areas are typically cement raceways or artificial ponds that have no resemblance to a lake habitat and are filled with only the reared species. As a result, when hatchery-reared fish eventually are stocked in the lake, they not only face a completely unfamiliar environment, but have undeveloped predator-avoidance behaviors. The latter is a problem because striped bass are large enough to eat most adult razorbacks.

Professor Thomas Dowling at Willow Beach National Fish hatchery, AZ with a juvenile endangered razorback sucker (Xyrauchen texanus)

Thomas Dowling received his bachelor's degree from the University of Michigan and his doctorate in Biological Sciences from Wayne State University. He was a postdoctoral research fellow at the University of Michigan before accepting a faculty position at Arizona State University. He returned to Wayne State University in 2013.

"When you move out to the western United States, you become a conservation biologist too, because so many of the native species are threatened, endangered, or a candidate for listing. And a lot of that has to do with invasive species."

Sampling for endangered Gila chub (Gila intermedia) in Sycamore Creek, AZ

That led us to try a creative approach in Lake Mohave back in the late 1990s," Dowling said, describing a multi-agency effort to bring back the razorback. "It turns out that razorback sucker larvae are phototactic, so if you can put a light in the water, they'll come to it," Dowling said. Using this method, the researchers were able to catch 30,000-40,000 larvae per year in the lake — before the introduced fish had a chance to eat them all — and put these larvae into the hatcheries to be reared until they grew to a large enough size (17 inches or so) to evade a bass, and then returned the razorbacks to the lake. "In doing that, we've been able to keep the razorback population at about 5,000, and also maintain most of the genetic diversity that was in the original source population dating to the 1980s," he said. "The problem, of course, is that the population is not self-sustaining. We need to go out every year, collect the 30-40,000 larvae, rear them and grow them up."

Dowling is now involved in a new approach that employs backwaters rather than hatcheries. The backwaters are small ponds that are isolated from Lake Mohave and the ravenous bluegill, sunfish and striped bass, while offering the larvae a more natural habitat, he said. The idea is to set up self-sustaining populations in the backwaters, and as the young grow and develop normal survival skills, the researchers can then move the razorbacks between backwater sites, or into Lake Mohave. "My role has been to use next-generation genetic-sequencing methods, such as developing a panel of single-nucleotide polymorphisms, to track the lake and backwaters populations to see how many individuals are reproducing and at what rate, so we can make sure we're getting a good genetic variation," he said. In addition, he and other researchers are investigating other aspects of backwater populations, such as the optimal population size and age structure.

Group picture — left top, left to right: Robert Roose, Kelly Pollard, Abby Wicks; bottom: Anna Boegehold, Corey Krabbenhoft

While that work is underway, Dowling is working with another research group employing a similar method to attempt to rescue the bonytail chub (Gila elegans) which is a type of native minnow that can live for 30 years and reach 16 inches long. The need is great because the bonytail chub only persists today in its native habitat through hatchery rearing efforts. "So far, researchers have developed some backwaters for them, but unlike razorbacks, they are quite cannibalistic, so it is going to be a challenge in terms of attaining self-sustaining populations," he said.

Through this work with the razorback sucker and the bonytail chub, Dowling and other researchers are gaining greater understanding of life history, genetic variation, and species preservation, and that insight will have broad application to other native-fish restoration projects in the United States and beyond, he said. "In today's world with changes in water usage (such as dams) and introduced species, we have a new normal that we're trying to get the native fish to adjust to, so we can maintain biodiversity and keep our ecosystems healthy." He added, "It's going to involve some level of partnership between researchers, environmentalists and users so can we generate co-existence and co-persistence in such a way that we can have everything: the introduced sport fishes and native species."

Undergraduates Miles Bowman and Kristen Kargol sampling the Clinton River for Johnny darters and round gobies.

Dowling and postdoc Trevor Krabbenhoft on the research vessel the Kiyi on Lake Superior preparing cisco for RNA worked

Cranes on the Skyline

When basketball resumes, Wayne State will be ready!

In 2019 Wayne State Athletics entered into a partnership with the Detroit Pistons to build a new arena on the Wayne State campus, slated to be completed in 2021. The arena, near the corner of Warren and Trumbull, will host home games for a G League Pistons affiliate. It will also be the new home for men's and women's basketball and host inner-city athletics, tournaments and competitions. When we are able to gather again, some graduation ceremonies may also be held there! The new structure will have more than double the capacity of the nearby Matthaei Center, built in 1965 and currently housing swimming and basketball.

Artist rendering of arena interior courtesy of WSU.

The $25 million construction was financed by bonds, private donations and a 30-year lease agreement between Wayne State and the Pistons. In addition to bolstering athletics, Wayne State anticipates that this arrangement will provide internships in marketing, management, physical therapy and rehabilitation. But one detail has yet to be resolved — the name of this new facility.

If you always dreamed of endowing a building on Wayne State's campus, now is your chance!

You can follow updates on the construction of the new arena at: wsuathletics.com/news/2020/6/16/arena_headquarters.aspx

Arena under construction, midsummer of 2020: still a ways to go.

"In addition to bolstering athletics, Wayne State anticipates that this arrangement will provide internships in marketing, management, physical therapy and rehabilitation."

Alumna profile: Dr Leslie Mertz

Building a writing career from a fascination with nature

Freelance scientific writer Dr. Leslie Mertz forged a career out of her interest in nature and communication.

Have you enjoyed the profiles of researchers in BioRhythms? If so, you already know something about Leslie Mertz! Leslie is a professional science writer who creates the in-depth profiles of researchers for this publication. Holder of three Wayne State degrees, Leslie started out in fisheries and wildlife at Michigan State. Discouraged by the job prospects, she switched to journalism at Wayne State. After completing her B.A. she landed a job at a small newspaper in Utica, Michigan. With the freedom to scout and develop stories Leslie began covering science — and taking science classes. She ultimately returned to Wayne State for two more degrees, this time in biological sciences.

Leslie fell in love with fieldwork and teaching at the Fish Lake Biological Station. Working with Dr. Gangwere, an expert on Orthoptera (grasshoppers and their relatives), she spent part of a summer collecting in the Canary Islands. She then signed on for a Ph.D. surveying amphibians and reptiles in Michigan's Thumb. But throughout her graduate training she also wrote for marketing communications and public relations at Wayne State University. After graduation Leslie embarked on a career as a freelance writer and educator. She taught field courses, developed outdoor educational programing, wrote articles for a host of magazines and institutions and even authored books on science and about Michigan. Recognizing the need for an intermediate level guide to insects she launched the online guide Know Your Insects (knowyourinsects.org). Log on to view some of the thousands of insect photos from all over the world that have poured into her inbox.

"Science writing is a nonstop opportunity to explore new and wonderful advances with the most intriguing people in the world as your guides."

And she gets to travel. For instance, Leslie took advantage of a photography workshop in Sicily earlier this year to write an article on Sicilian vineyards for a fruit grower's magazine. But she feels that the best aspect of her career is that she is able interview anyone. "... you have access to amazing people who are doing some of the most interesting work imaginable. For instance, I spent a couple of hours chatting with Joe Kerwin, who was the science pilot on the first crewed mission to Skylab, which was the first U.S. orbital space station, and also the lead capsule communicator (capcom) or "voice of Houston" for Apollo 13. Wow, did he have the stories!" As she puts it, "Basically, science writing is a nonstop opportunity to explore new and wonderful advances with the most intriguing people in the world as your guides. What could be better?"

You can see more samples of Leslie Mertz's writing at:
nasw.org/users/lmertz

Dr. Ann Sodja retires after 38 years at Wayne State

A long career of insect biochemistry, research and teaching

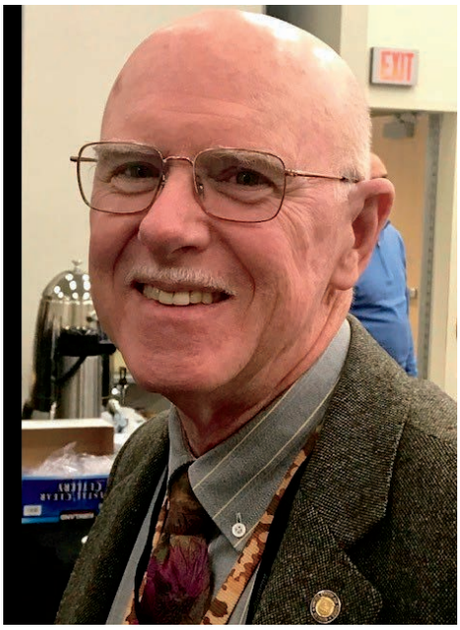
Dr. Ann Sodja in her mosquito rearing room in the basement of the Biological Sciences Building.

Dr. Ann Sodja retired this spring after 38 years on the faculty of the Department of Biological Sciences. Many of you will remember her biochemistry course, but she also taught evolution, molecular cell biology, metabolism, gene structure and function and several other courses. Dr. Sodja received a B.S. in chemistry from Ursuline College in Cleveland, an M.S. in biochemistry from Ohio State University and a Ph.D. from the University of California, Davis. She was an American Cancer Society postdoctoral researcher at the California Institute of Technology before her recruitment to Wayne State University. Over the course of Dr. Sodja's career, she directed the research of nine graduate students and over 100 undergraduates. She served as faculty advisor to the Pre-Professional Medical Society and, notably, Dr. Sodja's students nominated her twice for the President's Award for Excellence in Teaching.

During her time at Wayne State, Dr. Sodja tackled a number of problems in insect physiology that require deep knowledge of molecular biology and chemistry. These include a characterization of actin genes in *Drosophila melanogaster* (funded by the MDA and AHA), and a developmental exploration of these genes that was funded by NIH. More recently, Dr. Sodja identified and characterized a mosquito odorant binding protein, OBP 10. Odorant binding proteins are a large family of molecules with a broad range of sensory and physiological functions. OBP 10 interacts with a G-protein coupled receptor, suggesting that it may be involved in reception and transduction of olfactory signals. Dr. Sodja also collaborated with Dr. Eduardo Palomino and researchers in Nigeria to explore the use of natural and non-toxic compounds as mosquito repellants. In 2004 she was invited to present this work at the University of Ibadan and the University of Agriculture in Nigeria. During the rise of the West Nile Virus, Dr. Sodja was sought out by local television stations for interviews because of her expertise in mosquito biology. Dr. Sodja plans to use her retirement to work on a manuscript. And, when we are able to resume in-person seminars, we expect to see her in her customary spot in the front row of the auditorium.

Four Wayne State degrees and a life of public service

Dr. Eisenbrey presents keynote address at research retreat

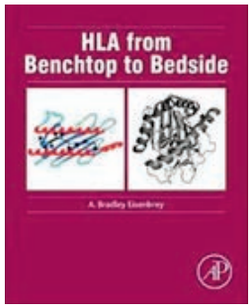


Dr. Arthur Bradley (Brad) Eisenbrey came to Wayne State University as an undergraduate with the intention of becoming an English teacher. He wrote his senior thesis on James Joyce and schizophrenia while working the midnight shift as an orderly in Harper Hospital. But after graduation a weak demand for English teachers forced him to take a job studying cancer immunology at Wayne County General Hospital, now closed. There he observed the cross-matching of tissue for a renal transplant and the seeds of a remarkable career were planted. Before long he was back at Wayne State for a M.S. in biology, biochemistry and immunology. A fortuitous conversation Bill Moore, now emeritus professor of biological sciences, inspired Brad to join our Ph.D. program. Brad's dissertation research took advantage of the diversity of the histocompatibility complex to trace evolution of a fish from the Sonora desert. He credits Moore, Leo Luckinbill and Carl Freeman for shaping his character as a scientist.

As a newly minted Ph.D., Brad accepted a postdoctoral position at the Mayo Clinic conducting allergy research, developing methods for T cell cloning and participating in clinical studies of allergy in humans. But lack of a medical degree limited his prospects in a clinical setting, and so it was back to Wayne State for his M.D., followed by a residency in Anatomic and Clinical pathology at William Beaumont Hospital in Royal Oak and a fellowship in Blood Banking and Transfusion Medicine at William Beaumont and American Red Cross in Detroit.

Brad directed transfusion medicine and pathology laboratories at William Beaumont, the Detroit Medical Center and at the Henry Ford Hospital System. He oversaw laboratories at the Karmanos Cancer Center, served as Medical Director of Red Cross Blood Services for Northwest Ohio and directed the Histocompatibility Laboratory at Gift of Life Michigan for five years. In 1988, Brad joined Michigan Air National Guard and trained as a flight surgeon. In this capacity he was responsible for the health of 2,500 reservists in Michigan and was deployed to Iraq and on humanitarian missions to Honduras. He also trained in aviation accident investigation and participated in numerous of these before retiring at rank of Colonel in 2014.

Throughout this runs a thread of teaching and mentoring. Brad taught at University of Detroit Mercy and still teaches at the University of Toledo College of Medicine and Health Sciences. He joined the faculty of Wayne State University School of Medicine in 1992 and continues to teach first and second-year students. Although now semi-retired, he is a popular guest lecturer in undergraduate classes in biological sciences. Throughout his speech Brad urged students to continue to engage in learning and teaching and stressed the importance of participation in professional societies and community groups. So how do you retire after a demanding career? In Brad's case, you write a book! His recently completed text for physicians and immunologists, "HLA from Benchtop to Bedside" (ISBN 9780128239766) is scheduled for release in January of 2021. It was a pleasure to welcome Brad Eisenbrey back to the department as the 2019 keynote speaker.



A comprehensive text for transplant surgeons, laboratory personnel and clinical scientists authored by Dr. Eisenbrey is slated for publication in January

Bioswale in bloom

Nature is Alive and Well at Lot 12!

The bioswale project at Lot 12 (and its sister site at iBio) is thriving – and doing its job. While reducing the amount of run-off that goes into the storm drain, filtering that water and letting it percolate, the abundant native plants are also supporting wildlife (even a pheasant!) and sequestering carbon. Stop by to listen to the lively insect orchestra, enjoy the monarchs as they fuel up for migration, or flush a flock of sparrows and a goldfinch or two - feeding on seeds. Take a walk on the wild side of Wayne!

Planting of the bioswale shown here was featured on page 7 of the 2018 issue of BioRhythms. For more pictures and information, visit the Warrior Wildlife blog at **s.wayne.edu/warriorwildlife**.

High summer in the Lot 12 bioswale features abundant blooms, bugs and birds. Photo by M. Serreyn

Student spotlight: PhD student Héctor Esparra-Escalera champions sustainability research

Biological sciences student on winning STEM Challenge Team

Ph.D. student Héctor Esparra-Escalera first heard about Wayne State at an invasive species workshop in Puerto Rico. The workshop was organized by graduate students from Donna Kashian's laboratory in partnership with the University of Puerto Rico Mayagüez (UPRM) and supported by the Howard Hughes Medical Institute. At the time, Héctor was an undergraduate at UPRM, where he went on to do a M.S. studying the ecological relationships between invasive snails on the island. When Donna Kashian's students returned to Puerto Rico for a second workshop, Héctor helped out with stream sampling and preparing the labs. Then hurricane Maria devastated much of Puerto Rico, including UPRM. Facing an uncertain future, Héctor applied to our Ph.D. program and is now a National Science Foundation fellow working to evaluate the effectiveness of Green Infrastructure on water sustainability in the T-RUST program (Transformative Research in Urban Sustainability Training).

Last winter, Héctor joined a group of Civil Engineering and Communications students to enter the Wayne State 2020 STEAM Challenge, a competition that inspires interdisciplinary groups to tackle social problems in the city of Detroit.

Together they developed DetroitAirNet, a proposal to install low-cost sensors to monitor volatile organic compounds (VOCs) throughout greater Detroit. These compounds are linked to preterm births and other health problems.

Héctor focused on the role of plants in VOCs emissions. He also established connections with other researchers that can use the data produced by this project. And they won! This year, $25,000 was split between the top three finalists.

Héctor has a deep interest in education, natural resources and conservation. "I feel the need to work through education on behalf of a more inclusive environment and promote respect and care for natural resources." He looks forward to a career as an ecologist and educator who trains scientists and promotes sustainability research.

You can watch the winning Detroit AirNet pitch video at: **youtube.com/watch?v=mRuAMKWBXHk&feature=youtu.be.**

The pandemic comes to Detroit

Biological Sciences donates PPE to Henry Ford Hospital System

The coronavirus pandemic hit metro Detroit in March of 2020, shutting down research labs and moving classes online overnight. At the same time, Detroit hospitals were suddenly unable to meet the demand for masks, gloves and face shields. That is when Salmaan Farrukh (B.A. Biological Sciences '15), a recently hired strategic sourcing analyst at the Henry Ford Hospital System, was making cold calls to science departments at Wayne State requesting donations of protective gear from laboratories and classrooms. Dozens of research labs in biological sciences, and lab coordinators Krystyn Purvis and Maggie Tucker, collected a small mountain of gloves, masks, gowns, sanitation supplies and eye protection. Ph.D. student Michael O'Brien and his fiancé delivered these to the Henry Ford distribution center four days after the Department of Biological Sciences received the request. We still don't know how this pandemic will shape our university in the long term, but we are grateful to have had the opportunity to contribute to the initial battle against the virus in Detroit.

Alyssa Johnson and Michael O'Brien load donated gloves in front of Shapero Hall.

Biological Science researchers receive support, honors and promotions

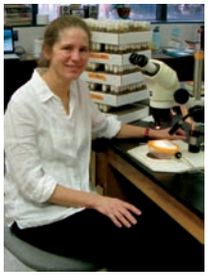
Awards and Honors

Athar Ansari won funding from the National Science Foundation to study the novel role of a termination factor in mRNA splicing. His research reveals a potential mechanism that coordinates the steps of transcription and mRNA processing.

Daniel Kashian won support from USDA for his work on ash tree regeneration.

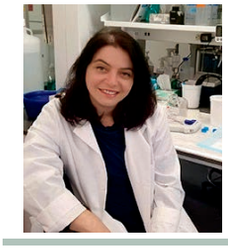
Miriam Greenberg won support from the National Heart, Lung and Blood Institute of NIH to study lipid metabolites as new treatment targets for Barth Syndrome. She also won another NIH award that will allow her laboratory to generate a new model for Barth Syndrome pathology.

Victoria Meller was elected an American Association for the Advancement of Science Fellow in 2019 for her discovery of the role of long and short non-coding RNA in X chromosome recognition during *Drosophila* dosage compensation.



Donna Kashian obtained support from the Michigan Sea Grant to make an outreach video highlighting the environmental role of marsh lands. She was also featured in two installments of the popular NPR Science Friday program discussing Great Lakes water issues. You can listen to podcasts of the shows that she appeared on by searching Science Friday Great Lakes.

Thomas Dowling won support from the US Bureau of Land Reclamation to develop DNA markers for monitoring endangered Colorado river fishes.



Marianna Sadagurski won support from Lactocore to test a novel peptide in a brain cell culture model. She also obtained a fellowship from the American Diabetes Association to support Chidera Uba, and undergraduate in her lab.

Glen Hood is part of an international collaboration that won USDA support to use next generation DNA sequencing to the study the origin of the European Cherry fruit fly, an invasive species now established in the Niagara regions of New York state.

Promotions and Tenure

Penelope Higgs has been tenured and promoted to Associate Professor. Dr. Higgs' laboratory studies signal transduction in a bacterial model of cell differentiation.

Jared Schrader has been tenured and promoted to Associate Professor. Dr. Schrader's laboratory uses a systems biology approach to study mRNA translation and decay in prokaryotic cells.

Donor Spotlight

Ms. Debra Keller

Gratitude and tragedy inspire a lasting legacy of student support

Debra Keller almost dropped out of Wayne State University. She was a chemical engineering undergraduate with two young children. Then she took a paid internship at GM and her husband got a minimum wage job. But financial aid is not designed for young families. Their combined incomes made Debra ineligible for the Pell grant that had kept the family afloat. She was on the verge of quitting to take a job that would support the family when Wayne State stepped in with a Board of Governors Scholarship that enabled her to graduate. Debra accepted a position at Ford after graduation — but this was not the end of her education! She completed a M.S. in polymer chemistry at University of Detroit Mercy and a M.B.A. from the University of Michigan, all while working full time.

In 1991 Debra lost her young daughter, Nicolette Therese Keller, to brain stem glioma or brain tumor. Nicolette had dreamed of becoming a biologist. To honor her memory and extend a hand to other aspiring young people, Debra and her husband endowed a scholarship for biology undergraduates in her name. Over the years, the Nicolette Therese Keller Endowed Scholarship in Biological Sciences has paid research tuition credits, enabled participation in special programs and helped students in financial need complete their degrees.

In 2007, Debra Keller took a buyout from Ford and she and her husband became gypsies. She worked as an engineering manager for Caterpillar, Vicorp and GM. They recently returned to southeast Michigan where she now works for RPM International, a company that manufactures paints and sealers. Debra's focus is maintaining a thriving company by implementing sustainable processes and hiring, training and coaching employees. When looking back on her career Debra maintains that "Wayne State set me up for all of this, the degrees and everything that came after." Her tenuous financial path to that first degree is familiar to many of our current undergraduates. We are grateful for the opportunity that Debra has given us to support these students.

Nicolette Therese Keller and her young sister. Nicolette dreamed of becoming a biologist.

Swing Dance in Biological Sciences!

Noel Night 2019

The Biological Sciences 2019 Noel Night Open House featured cookies and cider, drawing lessons in the Natural History Museum — and swing dancing! The Wayne State Swing Dance Club provided music and two shifts of dancers that gave amazing performances and lessons for anyone game to give swing dancing a try. In normal times the club meets regularly to dance. You can connect with the club and view scheduled of events on Facebook (facebook.com/wsuswingdance). Although Biological Sciences will not host a Noel Night Open House in 2020, we hope to welcome you back in 2021.

Pictured left: Wayne State swing dancers (left to right) Efren Munoz, Chloe Langlois, Makayla McGuffin and Alejandro Lozano perform in the lobby of Biological Sciences.

2019-2020 Scholarship and Prize Winners

Without our donors, we would have been able to support our students for the current academic year. The following scholarships have been awarded to biological sciences students.

Graduate Awards

P. Dennis Smith Award for Research in Genetics
James Aretakis

Stanley Ellis Memorial Graduate Research Award
Mahmoud Suliman
Qing Chen
Praneet Kaur Marwah
Deniz Sifoglu

Department Retreat Poster Prize
Brooke Feeley
Shashwat Mishra

Thomas Rumble Fellowship
Mohammed Bharmal
Behdokht Jan Fada
Mahmoud Suliman

Department Retreat Poster Prize
Mohammed Bharmal
Katherine Dwyer
Reem Makki

Graduate Teaching Awards
Graduate Teaching Assistants
Dave Lall
Anindita Mitra
Bianca Pereira

Instructional Assistants
Krystal Bakkila
Emily Powell

Graduate Research Awards
Zhuqing Liang

Undergraduate Awards

Nicolette Therese Keller Endowed Scholarship in Biological Sciences
Simran Hehar
Molly McKeon

Kathryn and Gary Armstrong Endowed Scholarship
Chantal Garcia
Alex Kuang
Saba Hussain

P. Dennis Smith Award for Research in Genetics
Reema Smadi

We are proud of the successes of all our graduates, and are eager to learn about your career. A new biological sciences alumni LinkedIn network will help you keep in touch with us, and with other graduates. We invite you to join through the new alumni portal at our website: go.wayne.edu/bio.

A little help from our friends

We hope these newsletter articles, which highlight the accomplishments and endeavors of our students and faculty members, have shown you that our department is dedicated to providing an education that reaches for higher and higher standards. We want our graduates to receive the recognition that comes with a degree from a highly reputable department and university. These are worthy goals, but they are expensive. Your past contributions have helped us. Your future contributions will ensure our continued success.

External circumstances, such as state or federal budget cuts, can delay attaining these objectives, and stall our ambitious plans in the dream stage.

Please help us reach these goals. Your generosity allows us to modernize our teaching and research facilities, promote collaborative research and teaching efforts, send graduate students to national and international conferences to present their papers, acquire equipment items to maintain our ability to perform cutting-edge research, and confer scholarships and awards to our undergraduate and graduate students. Even this newsletter is made possible by the resources you give us. If you agree that these are worthwhile projects, please help us by giving to one or more of the funds listed on the donor form in this newsletter or online at go.wayne.edu/give-bio. And THANKS in advance!

Does your employer match your gift?

More than 1,000 companies in the United States have matching-gift programs that will, in effect, double or triple your gift to Wayne State University. Check with your employer to see if it has such a program.

To participate, notify the appropriate person — usually someone in the human resources or community relations office — that you would like to have your gift matched. Arrangements will then be made to send your gift to us along with or followed by a second gift, courtesy of your firm's gift-matching program.

Sounds easy? It is! Please take advantage of this opportunity, and help us double or triple your gift.

Our Newest Alums

We are proud to introduce our newest doctoral and masters graduates

The following students have completed degrees at the master's level:

Master's of Science

M.S. Biological Sciences

Lisa Hanna, 2019. Advisor Aleksandar Popadić
Presentation Title: Spiracles, trachea, and glands: development and evolution of insect respiratory system

Asia Hightower, 2020. Advisor Edward Golenberg
Presentation Title: Functional specialization of alternative zinc finger proteins in vegetative and reproductive meristem regulation

Julia Sosin, 2019. Advisor Daniel Kashian
Presentation Title: Successional changes in plant ecological species groups and fuels on a jack pine-dominated landscape in northern lower Michigan

M.S. Biotechnology

Lisa Koshko, 2020. Advisor Marianna Sadagurski
Presentation Title: Metabolic reprogramming by *in utero* maternal benzene exposure

Aaron Kren, 2020. Advisor Victoria Meller
Presentation Title: Visualization of the effects of MSL recruiting elements on chromosome location

Master's of Arts

Hazar Younis, 2020

Doctoral Level

Those receiving Ph.D. degrees include:

Brooke Feeley, 2020. Advisor Penelope Higgs
Dissertation Title: The role of SER/THR phosphorylation on MRPC, a master transcriptional regulator controlling the *Myxococcus Xanthus* developmental program

Han Cheong, 2019. Advisor Mark VanBerkum
Dissertation Title: Abelson tyrosine kinase links axon guidance receptors to cytoskeletal dynamics through protein-protein interactions mediated by its C-terminal domain

Zuzer Dhoondia, 2020. Advisor Athar Ansari
Dissertation Title: Termination-independent role of Rat1 in cotranscriptional splicing in budding yeast

Shashwat Mishra, 2020. Advisor Joy Alcedo
Dissertation Title: Specific sensory neurons and insulin-like peptides modulate discrete stages of *C. elegans* oogenesis in response to food quality

Abby Wicks, 2019. Advisor Thomas Dowling
Dissetation Title: Evolutionary ecology of the native Johnny Darter *(Etheostoma nigrum)* and the invasive round goby (*Neogobius melanostomus)*: a genomic perspective

We are extremely pleased to acknowledge our most recent undergraduate degree recipients and welcome you to the status of alumni!

Since Fall 2019, we are proud to say that we have added 224 undergrads to the rank of alumni. Of those graduates, 41% have graduated with distinction.

Way to go, Warriors!

WAYNE STATE UNIVERSITY

Bio Rhythms

Department of Biological Sciences
1360 Biological Sciences Building
Wayne State University
Detroit, MI 48202

Donor form

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College of Liberal Arts and Sciences

I would like to make a contribution to support the Biological Sciences Department at Wayne State University:

- ☐ Biological Sciences Department Scholarship Fund (222823)
- ☐ Biological Sciences Department Annual Fund (220726)
- ☐ Other: _____

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- ☐ Please send me information on supporting WSU in my Estate Plans
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