DEPARTMENT OF BIOLOGICAL SCIENCES 2022 NEWSLETTER

HAPPY HOLIDAYS

WESTERN MICHIGAN UNIVERSITY

Department of
Biological Sciences

Holiday luncheon for faculty, staff and students in Haenicke Hall

Letter from the Chair

Dear Alumni and Friends,

It gives me great pleasure to introduce the Department of Biological Sciences newsletter for 2022. As you will see from this newsletter, our faculty and staff continue to work hard to enhance our research capabilities, educational opportunities for our students and outreach and engagement with our surrounding communities.

This past year saw the departure of Ms. Dorilee Crown, our Administrative Assistant Sr. Thanks Dorilee for your outstanding service to our department and for being such a wonderful colleague! Fortunately, we were able to hire Ms. Cristine Thomas as our new Administrative Assistant Sr. Welcome Cristine!

This past year also saw the departure of Dr. Jeremy Duncan. Thanks Dr. Duncan for your excellent support of staff, students and faculty colleagues! We wish you the best of luck with your future endeavors! Joining our ranks as a new assistant professor in the department is Dr. Andrew Thompson. Welcome Dr. Thompson!

John Spitsbergen: Chair
Department of Biological Sciences

Our undergraduate and graduate programs in Biological Sciences continue to thrive and we continue to have one of the highest numbers of majors of any department in the College of Arts and Sciences and University. You will see below that our students have received numerous awards from within and outside the university and many students have given research presentations at local, national and international scientific conferences.

I hope you enjoy this update from your department. As you read through this newsletter do not hesitate to contact me with any comments you may have concerning our successes and failures, and I would greatly appreciate any suggestions for ways we may improve the service we provide to our students, alumni and friends.

Graduate student Karla Kelly: 2022 winner of most interesting sweater!

Finally, I want to thank you, our alumni, donors and friends of the department, for your generous support of our students and programs. Your generosity enhances the teaching and research mission of our department by providing expanded opportunities for travel to distant research sites, travel to scientific conferences, and supports fellowships and awards for scholarship and research by our outstanding students. Thank You Very Much!

Go Broncos!

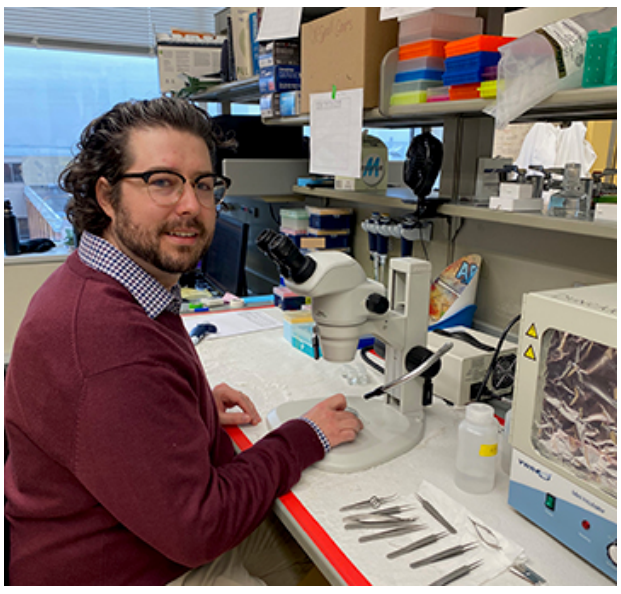
John Spitsbergen, Chair
john.spitsbergen@wmich.edu
Editor: Cindy Linn

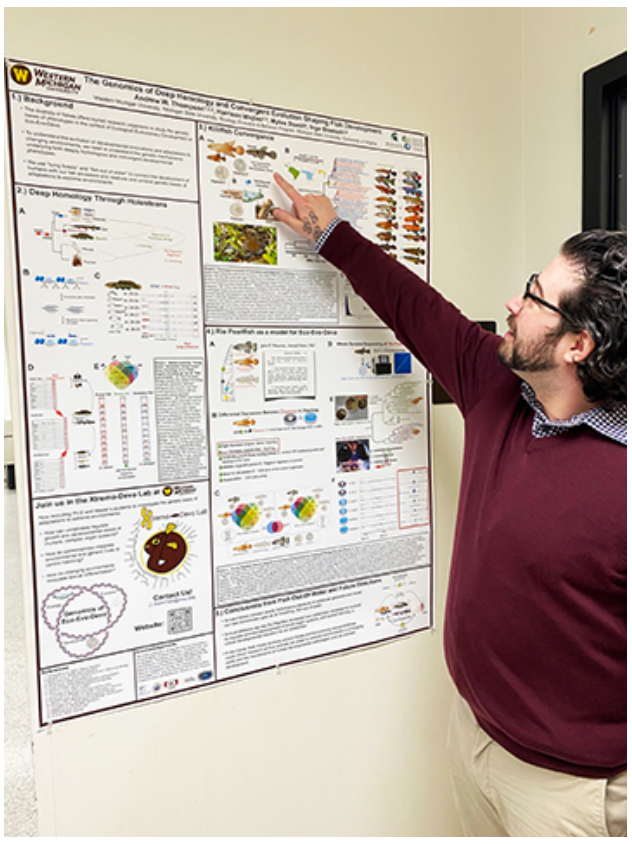
IN THIS ISSUE

FACULTY FOCUS:

ANDREW THOMPSON

Dr. Andrew (Drew) Thompson is a new Assistant Professor in the Department of Biological Sciences in the fall of 2022. He completed his postdoctoral research at Michigan State University and his Ph.D. at The George Washington University studying the evolutionary genetics of fishes. Drew became interested in biology at an early age after raising aquarium fishes and observing their diversity in his backyard creek while growing up in Western Pennsylvania. Research in the Thompson Lab attempts to understand the links between environment, evolution, and developmental gene regulation of fishes living in extreme environments. The lab uses cutting-edge technologies involving comparative genomics, transcriptomics, and functional genetic tools.

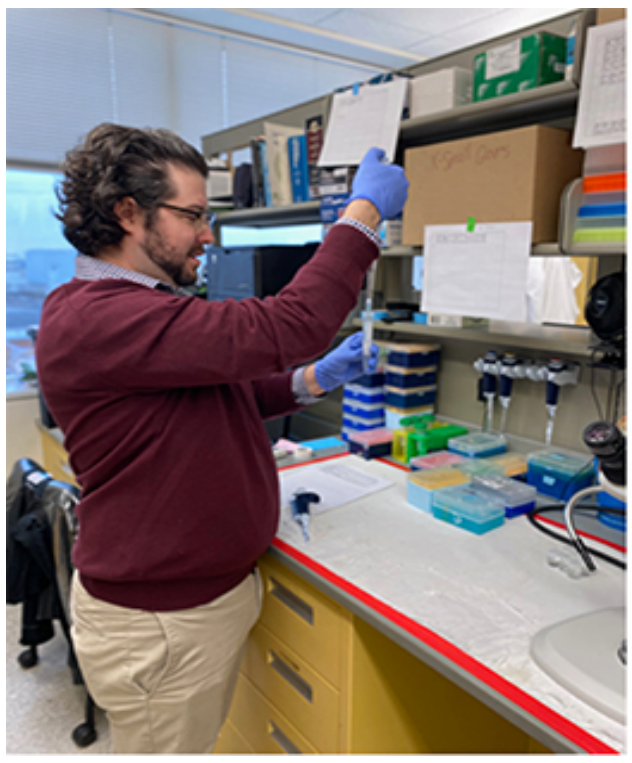


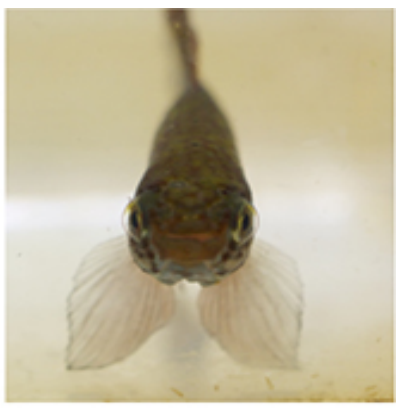


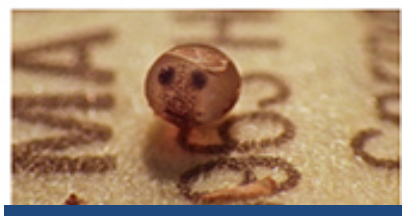
Since beginning his Ph.D., Drew has worked on establishing annual killifishes as a model system, specifically the Rio pearlfish, *Nematolebias whitei* to study the links between ecology evolution and developmental biology in an emerging area of biology known as Eco-Evo-Devo. Annual killifishes are small, colorful, tropical, freshwater fishes that use dormant embryonic stages and tough eggs to withstand seasonal drying of their habitats which results in death of the entire parental population. When the rains return and their pools flood, annual killifish wake up, hatch out, and begin a new life cycle.

Since killifishes naturally inhabit small puddles, they are very hardy and easily maintained. Killifish eggs can be kept in a desk drawer and shipped around the world making these “fish-out-of-water" an exciting outreach opportunity in the Thompson Lab. For his dissertation research at The George Washington University, Drew funded, constructed, and maintained his own killifish research laboratory with breeding stocks of over 20 species with grants from the National Science Foundation and the National Geographic Society. His work has been some of the first to investigate the genetic mechanisms of vertebrate suspended animation and environmentally-cued hatching. His lab will continue exploring these research themes in the Department of Biological Sciences at Western Michigan University to better understand how genes and environments regulate hatching and dormancy in a changing world.

Outside of the laboratory, Drew enjoys spending time outdoors camping, skiing, and scuba diving. He is an expert aquarist and uses this hobby to observe and photograph the beauty of nature. He especially likes practicing macrophotography in his spare time. He and his wife, Jacqueline, a librarian, are book collectors filling their home with books on nature, feminism, and Victorian English literature. Drew and Jacqueline have recently welcomed their first child, Aurelia (who already has her own, full bookshelf), and are excited for the family to become part of the Kalamazoo community.







Desiccated pearlfish

Rio pearlfish

Biological Sciences Alumni Achievement Award

ERICA WEHRWEIN, PH.D.

Erica Wehrwein, Ph.D. gave an inspiring talk in November as this year's recipient of the Biological Sciences Alumni Achievement award and the College of Arts and Sciences Pillar Award. Dr. Erica Wehrwein obtained her BS from the Department of Biological Sciences and a M.S. from Dr. Spitsbergen's lab in 2001 where she analyzed neurotrophic factor changes after rodent activity. After receiving her M.S., Erica stayed at WMU for a year and worked with the neuroscience faculty in the department as a research associate where she was fortunate to work on many different model systems. Following her time at WMU, Erica obtained her Ph.D. at MSU in the Department of Physiology where she examined the role of cardiac transporters in hypertension. She then went to the Mayo Clinic in Minnesota for a postdoc position, where she analyzed blood pressure regulation. In 2011, she took a faculty position at MSU and is currently an associate professor at MSU in the Department of Physiology where she has been able to teach in many different venues at many different levels. Erica truly has a love of teaching and the Alumni Achievement award that she received from WMU is only one of several teaching awards that Erica had received over the last couple of years. In 2020, Erica received recognition as the top undergraduate instructor at MSU. Recently, she was also selected as the physiology teacher of the year by the American Physiological Society.

Dr. Wehrwein giving an Alumni Achievement Award presentation to the Department of Biological Sciences

During her presentation, Erica told the story of how she integrates psychology and physiology into an ever-expanding wide variety of research topics. Many of her studies have analyzed the psychological impact on health and wellness in physiological systems. For example, she discussed the role of slow deep breathing on stress hormones, blood flow, and control of blood pressure. Another example explored the relationship between cortisol and adrenocorticotropic releasing hormone with stress levels. Her results clearly support the finding that slow breathing exercises are important modulators of cardiovascular and neural physiology and that consideration of stress and psychological metrics may be useful predictors of physiological outcomes. We thank Dr. Wehrwein for her visit and for the insight into her exciting research and exciting career.

From left to right: Lifelong mentor, Ferne "Bud" Ellis, Mrs, Ellis, and Drs. Karla Koretsky (CAS Dean), Erica Wehrwein, John Spitsbergen (Chair), Cindy Linn

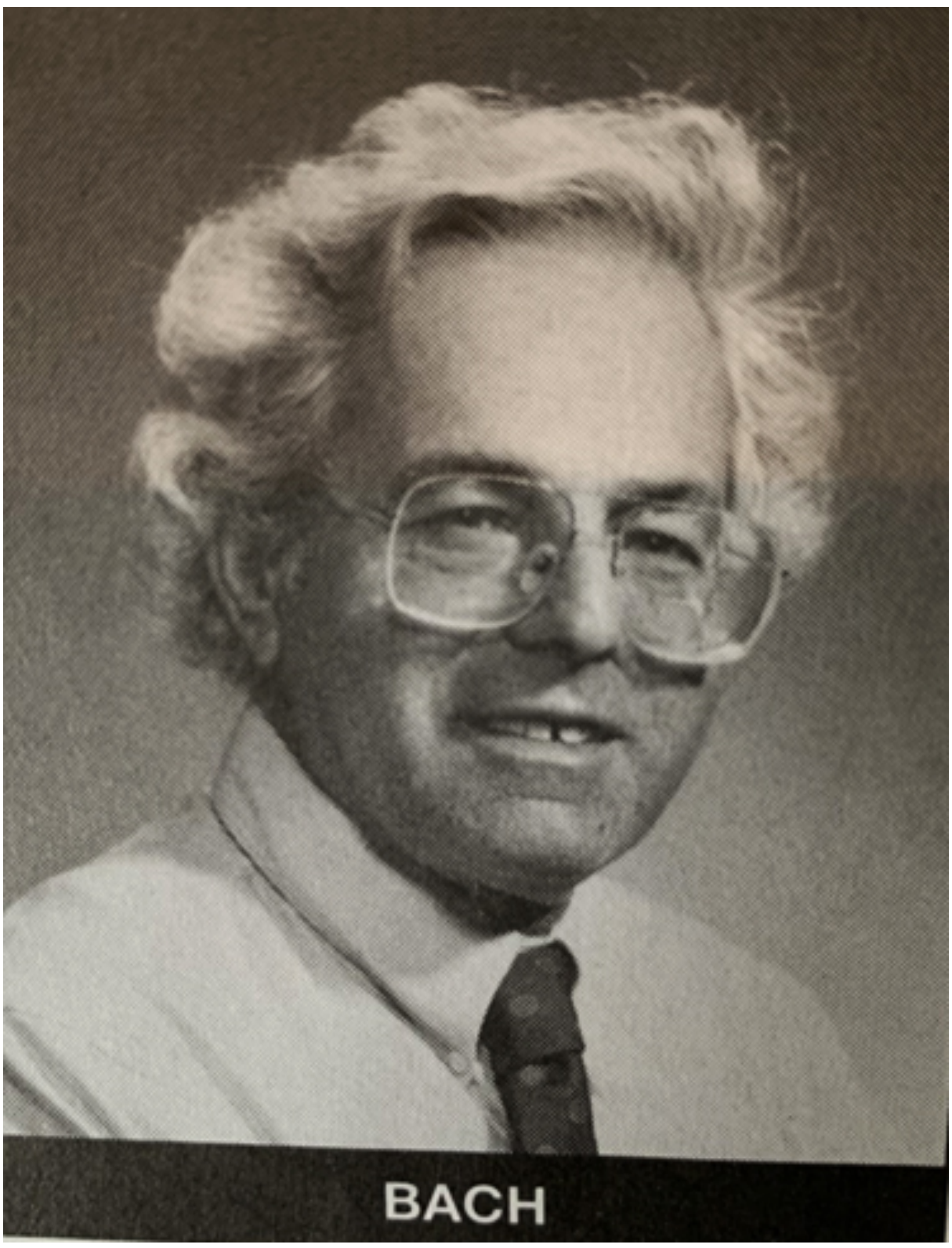
Dr. Wehrwein receiving the prestigious College of Arts & Sciences Pillar Award

MICHAEL K. BACH DISTINGUISHED VISITING LECTURESHIP SERIES

Established in the memory of Michael K. Bach, Ph.D.

Michael K. Bach, Ph.D. was a long-time immunology scientist who died at the age of 62. He was a Distinguished Scientist VI, representing the top of the Upjohn Company's Scientific path. He was recognized globally for his research in hypersensitivity and has authored a large number of publications in internationally recognized scientific journals. Dr. Bach helped this department in multiple ways, including participation in a 5000 level immunology course and developed a graduate 6000 level immunology course where every lecture was given in-person by an expert in his/her field.

Soon after his death in 1994, his wife, Shirley Bach, Ph.D., donated a respectful amount of money to help establish a seminar series in the department called "Bach Lecture Series in Immunology and Molecular Biology." The invited speakers in the lecture series are usually globally recognized scientists including members of the U.S. National Academy of Sciences. She regularly attended these lectures. The last one was a lecture given by Stephen J. Russell, MD, Ph.D. from Mayo Clinic, Rochester, Minnesota.

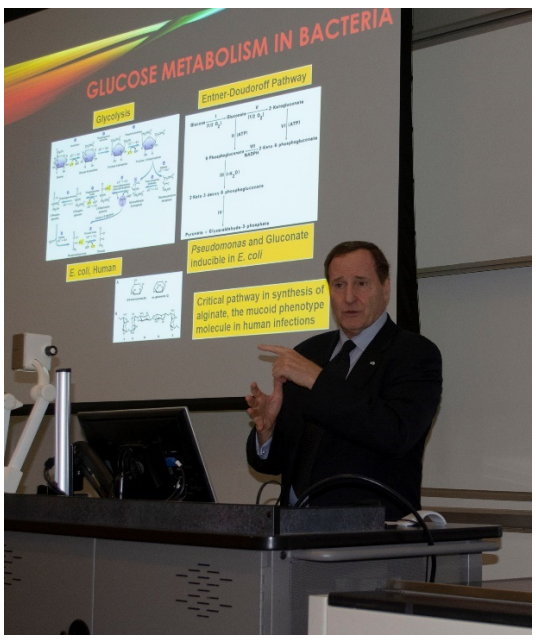


2022 MICHAEL K. BACH DISTINGUISHED VISITING LECTURER

STEVEN QUAY, M.D., PH.D.

Dr. Steven Quay honored us as a Michael K. Bach Lecturer in Biological Sciences at Western Michigan University on October 28, 2022. Dr. Quay began his research activities as an Honor's student at Western Michigan University where he analyzed glucose metabolism in Pseudomonas bacteria working with Dr. Robert Eisenberg. During his undergraduate stay at WMU, Dr. Quay received a BS in Biology, Chemistry as well as in Mathematics. He received his M.D. and Ph.D. from The University of Michigan, was a postdoctoral fellow at MIT with Nobel Laureate H. Gobind Khorana, a resident at the Harvard-MGH Hospital, and was on the faculty of Stanford University School of Medicine. His contributions to medicine have been cited over 9,600 times. Steven Quay is currently the founder of Seattle-based Atossa Therapeutics Inc. (Nasdaq: ATOS), a clinical-stage biopharmaceutical company developing novel therapeutics and delivery methods for breast cancer and other breast conditions. His current passion is the prevention of the two million yearly breast cancer cases worldwide. He has founded six startups, invented seven FDA-approved pharmaceuticals, and holds 87 US patents. Over 80 million people have benefited from the medicines he invented. Dr. Quay has also become active in academic politics and recently was asked to brief the U.S. Congress on his research investigating the origin of the COVID-19 pandemic.

From left to right: John Spitsbergen, Chair; Dr. Quay and Dr. Karim Essani (sponsor for Dr. Quay's visit).



Dr. Quay presenting his lecture in the Department of Biological Sciences

Dr. Quay began his Michael K. Bach Lecture identifying significant outcomes of research that was performed at WMU. These outcomes included understanding the Pseudomonas bacterial pathway, which has led to diabetes products under development. Dr. Quay also emphasized it was his research done at WMU that made him want to become a scientist. During his presentation, Dr. Quay emphasized the 7 main lessons he has learned along the way. 1). Problems aren't the problem; surprises are. 2). "The magnet and the man!" Sometimes it is better to ask forgiveness. 3) NO is never no until you quit. 4) Think BIG and don't be afraid to take a chance. 5). Identified as the second revolution: Be the ones that see things differently. As stated by Dr. Quay: "Be crazy or stay home." 6). Venture capitalists will always try to obtain 51% of a company so that they can have control. 7). IT'S ALWAYS PERSONAL!!!! We thank Dr. Quay for his visit and for the insight into his exciting career.

FACULTY ACTIVITIES:

The majority of faculty members in our department have active funding for their research programs. Included below is a list of external grants, publications in scientific journals, and presentations by faculty and students at scientific conferences. As you can see our faculty and students are active in publishing in top scientific journals and in giving presentations at major national and international scientific conferences. We are convinced that a strong and vibrant research environment enhances our student's educational experience and adds value to a degree from our department.

Grant Funding 2022

Todd Barkman (Co-PI, Andre Venter PI)
Title: Mechanisms and Applications of Protein Analysis by Desorption Electrospray Ionization-Mass Spectrometry (DESI-MS).
Source: National Science Foundation

Wendy Beane
Title: Molecular mechanisms regulating neural regeneration in planarians.
Source: National Science Foundation CAREER Award

Wendy Beane (co-PI)
Title: RCN: Instrumentation for Quantum Biology (which aims to set up a formal community of interdisciplinary and multi-country researchers in the emerging field of Quantum Biology).
Source: National Science Foundation

Devin Bloom
Title: Systematics and Evolution of Migration in Clupeiformes (Herring, Sardines, Shads, Anchovies and Their Allies).
Source: National Science Foundation, Division of Environmental Biology

Devin Bloom
Title: Ecology of Dam Removals on the Kalamazoo River.
Source: Fisheries and Wildlife Service

Kathryn Docherty
Title: Mid-Career Advancement Grant: Incorporating carbon use efficiency into strategies for ecosystem restoration.
Source: National Science Foundation

Jackie Eng (PI, Michelle Hrivnyak, co-PI)
Title: Biological Implications of Gender Roles in Mobile Pastoralist Societies.
Source: National Science Foundation

Sharon Gill (Co-PI Maarten Vonhof)
Title: Examining Impacts of Military Noise on Bird Communication and Singing Behavior.
Source: Department of Defense, EQ1 Basic Research Program

Sharon Gill
Title: Referential alarm calling as a window into the mechanisms and evolution of a complex cognitive phenotype.
Source: National Science Foundation

Dave Karowe
Title: Research Experience for Undergraduates (University of Michigan Biological Station).
Source: National Science Foundation

Ben Koestler
Title: Identifying the formate-sensory mechanism in Shigella flexneri.
Source: National Institutes of Health

Cindy Linn
Title: Evidence of BrdU positive neurons in adult mammalian retina after treatment with an alpha7 nAChR agonist
Source: National Institutes of Health, National Eye Institute

Cindy Linn
Title: Neurogenesis and Recovery of Visual Function After Blast Exposure
Source: Department of Defense

Yan Lu (Silvia Rossbach, co-PI)
Title: BIORETS: Research Experiences for Teachers in the Biology of Plants, Animals, Microorganisms, and their Environments.
Source: National Science Foundation

Silvia Rossbach
Grant from Enbridge Energy regarding the project "Characterization of Microorganisms Involved in Hydrocarbon Degradation at a Crude Oil Spill Site"

Dave Rudge, Co-PI (PI Heather Petcovic)
Title: MI STAR
Source: Michigan Technological University

Tiffany Schriever
Title: Kalamazoo River Area of Concern Stream Habitat and Floodplain Restoration Ecosystem Assessment.
Source: Great Lakes Restoration Initiative (GLRI) coordinated through the EPA Great Lakes National Program Office (GLNPO).

Maarten Vonhof
Title: Field Application of Chitosan to Halt the Progression of White-Nose Syndrome in Bats.
Source: National Fish and Wildlife Foundation

2022 Published Papers

(**Bold = Biological Sciences Faculty**, underlined = Biological Sciences Graduate Student, *italicized = Biological Sciences Undergraduate Student)*

Nicole M. Dubs, Breck R. Davis, Victor de Brito, *Kate C. Colebrook, Ian J. Tiefel, Madison B. Nakayama*, Ruiqi Huang, *Samantha J. Hack, Brent Inkelaar*, *Talline R. Martins*, *Sarah M. Aartila, Kelli S. Albritton*, Sarah Almuhanna, *Ryan J. Arnoldi, Clara K. Austin, Amber C. Battle, Gregory R. Begeman, Caitlin M. Bickings, Jonathon T. Bradfield, Eric C. Branch, Eric P. Conti, Breana Cooley, Nicole M. Dotson, Cheyone J. Evans, Amber S. Fries, Ivan G. Gilbert, Weston D. Hillier, Pornkamol Huang, Kaitlin W. Hyde, Filip Jevtovic, Mark C. Johnson, Julie L. Keeler*, Albert Lam, *Kyle M. Leach, Audrey E. Ledvina, Jeremy D. Livsey, Jonathan T. Lo, Kevin R. Loney*, Nich W. Martin, *Amber S. Mazahem*, Aurora N. Mokris, *Destiny M. Nichols*, Ruchi Ojha, *Nnanna N. Okorafor*, Joshua R. Paris, *Thais Fuscaldi Reboucas, Pedro Beretta Sant'Anna, Mathew R. Seitz, Nathan R. Seymour, Lila K. Slaski, Stephen O. Stemaly, Benjamin R. Ulrich, Emile N. Van Meter, Meghan L. Young* & **Todd J. Barkman**. A collaborative classroom investigation of the evolution of SABATH methyltransferase substrate preference shifts over 120 million years of flowering plant history. *Molecular Biology and Evolution*, Volume 39, Issue 3, March 2022. https://doi.org/10.1093/molbev/msac007

Choudhary, Vishakha, Kevin Wu, Zhiyao Zhang, Mark Dulchavsky, **Todd Barkman**, James C. A. Bardwell and Frederick Stull. 2022. The enzyme pseudooxynicotine amine oxidase from Pseudomonas putida S16 is not an oxidase, but a dehydrogenase. *Journal of Biological Chemistry*. 298(8): 102251.

de Brito, V. Betancur-R.R., Burns, M.D., Buser, T.J., Conway, K.W., Fontenelle, J.P., Kolmann, M.A., McCraney, W.T., Thacker, C.E., **Bloom, D.D.** 2022. Patterns of Phenotypic Evolution Associated with Marine/Freshwater Transitions in Fishes. 62 (2): 406-423 Integrative and Comparative Biology

Egan, J.P*., Simons, A.P., **Bloom. D.D.** In Press. Time for speciation explains the latitudinal diversity gradient in Clupeiformes (anchovies, sardines, and relatives), a trans-marine/freshwater clade of fishes. Journal of Biogeography. *Bloom lab postdoc

Taphorn, D.C., Liverpool, E., Lujan, N.K., DoNascimiento, C., Hemraj, D.D., Crampton, W.G.R., Kolmann, M., Fontenelle, J.P., Werneke, D.C., Ram, M., **Bloom, D.D.**, Sidlauskas, B.L., Holm, E., Lundberg, J.G., Sabaj, M.H., Bernard, C., López-Fernández, H., Armbruster, J.W. In Press. Annotated checklist of the primarily freshwater fishes of Guyana. Proceedings of the Academy of Natural Sciences Philadelphia.

Ellen Badger Hanson, **Kathryn M. Docherty**. Mini-review: Current and Future Perspectives on Microbially Focused Restoration Strategies in Tallgrass Prairies. Microbial Ecology. (2022) Accepted.

Jaron Adkins, **Kathryn M. Docherty** and Jessica Miesel. Copiotrophic bacterial traits increase with burn severity one year after a wildfire. Front. For. Glob. Change (2022). https://doi.org/10.3389/ffgc.2022.873527

Xingyu Ma, Tengxu Wang, Zhou Shi, Nona R. Chiariello, **Kathryn M. Docherty**, Christopher B. Field, Jessica Gutknecht, Qun Gao, Yunfu Gu, Xue Guo, Bruce A. Hungate, Jiesi Lei, Audrey Niboyet, Xavier Le Roux, Mengting Yuan, Tong Yuan, Jizhong Zhou & Yunfeng Yang. Long-term nitrogen deposition enhances microbial capacities in soil carbon stabilization but reduces network complexity. Microbiome 10, 112 (2022). https://doi.org/10.1186/s40168-022-01309-9

Sadia I. Kana, Michael L. Monaco, **Steven L. Kohler, Robert Eversole and Karim Essani.** Colorectal cancer xenografts regressed by FliC expressing tanapoxvirus in an immunologically reconstituted mouse model. Japanese J. Gastroenterology (accepted for publication).

Grabarczyk EE, **Gill SA, Vonhof MJ**, Alabady MS, Wang Z, Schmidt JM. 2022 Diet composition and diversity does not explain fewer, smaller urban nestlings. PLoS One 17:e0264381.

Turcotte-van de Rydt AV, Petalas C, Sblendorio J, Pearl CA, **Gill SA**, Guigueno MF. 2022. Clutch abandoning parasitized yellow warblers have increased circulating corticosterone with no effect of past corticosterone or differences in egg maculation characteristics. Frontiers in Ecology and Evolution 10:711732

Cody H Pham, J Jordan Price, Jason M Tallant, **David N Karowe**. Climate change is predicted to reduce sympatry among North American wood-warblers. Ornithological Applications, Published online: 09 July 2022. https://doi.org/10.1093/ornithapp/duac025

Webster SE, Spitsbergen JB, Linn DM, Webster MK, Otteson D, Cooley-Themm C, **Linn CL.** (2022). Transcriptome Changes in Retinal Pigment Epithelium Post-PNU-282987 Treatment Associated with Adult Retinal Neurogenesis in Mice. J Mol Neurosci. 72(9): 1990-2010.

Spitsbergen JB, Webster SE, **Linn CL**. (2022). Functional changes in the adult mouse retina using an alpha7 nAChR agonist after blast exposure. *In Press Neurosci.*

Liu, Y, Veranso-Libalah, M.C., Kadereit, G., Quakenbush, J.P., Lin, C.-W., & Wai, J.S. (2022) Systematics of the tribe Sonerileae. In R. Goldenberg, F. Almeda, F. Michelangeli, (Eds.), Systematics, Evolution, and Ecology of Melastomataceae (pp. 793). Springer.

Eskandari, P., Beaver, C. L., **Rossbach, S.,** Maddipatla, D., Emani, H., Hanson, A., & Atashbar, M. Z. (2022). Flexible microplasma discharge device for treating burn wound injuries against fungal and bacterial infections. IEEE Journal on Flexible Electronics. Accepted.

Bose, A. K., Beaver, C. L., Maddipatla, D., **Rossbach, S.,** & Atashbar, M. Z. (2022). In-vitro analysis of thin-film microplasma discharge devices for surface sterilization. IEEE Transactions on Radiation and Plasma Sciences 6:820–828. DOI: 10.1109/TRPMS.2022.3147468

Nyarko S. & **Rudge, D. W**. Using the History of Plate Tectonics to Teach Nature of Science. International Journal of Science Education, DOI: 10.1080/09500693.2022.2105977

Stewart, N. and **T.A. Schriever**. In Press. Local environmental conditions drive species replacement in Great Lakes interdunal wetland macroinvertebrate communities. Freshwater Biology. DOI: 10.1111/fwb.14008

Frazier, C.F. and **T.A. Schriever**. 2022. Patterns of Invertebrate Community Composition and Functional Structure Across a Dune Succession Gradient. Wetlands 42:75. https://doi.org/10.1007/s13157-022-01596-w

Edward A. Roth, **John M. Spitsbergen** and Alberto Cintron Colon. The neurochemistry of instrumental improvisation in adults: A feasibility and pilot study. Advances in Cognitive Psychology (accepted Feb. 2022).

Tolsma, Rachael; Pan, Haiying; Harris, Loyall; **Spitsbergen, John**; Li, Yong. Hypoxia-Induced Reprogrammed Myoblasts Enhance the Formation of Neuromuscular Junctions: A Pioneer Study. Journal of Cellular Biochemistry (accepted 09-23-2022).

Sungura R, Shirima G, **Spitsbergen J**, Mpolya E, Vianney J-M. A case-control study on the driving factors of childhood brain volume loss: what pediatricians must explore. PLOS ONE (accepted 11-18-2022).

Presentations

(**Bold = Biological Sciences Faculty**, underlined = Biological Sciences Graduate Student, *italicized = Biological Sciences Undergraduate Student)*

Hack, SJ., **Beane, WS.** Selected Talk: *When enough is enough: Planar cell polarity signaling is required for terminating regenerative growth.* International Society for Regenerative Biology Around the World Virtual Meeting, 2022.

Hack, SJ. and **Beane, WS.** 2022. Planar Cell Polarity: A stop signal for terminating stem cell-mediated regeneration. Society for Developmental Biology (SDB) 81st Annual Meeting, Vancouver, BC.

Hack, SJ. and **Beane, WS.** 2022. Different cell death pathways regulate stem cells during homeostasis vs. regeneration. Western Michigan University Homer Stryker M.D. School of Medicine 40th Annual Research Day. Kalamazoo, MI.

Kinsey LJ., Van Huizen AV., Qureshi S., **Beane WS**. *Targeting Reactive Oxygen Species to Modulate Stem Cell-Mediated Growth: A Developing Approach.* SDB-PASEDB 2022, Join Society for Developmental Biology and Pan-American Society for Evolutionary Developmental Biology Meeting, Vancouver, BC., Canada, 2022.

Qureshi S., Kinsey LJ., Qureshi S., **Beane WS**. *Reactive Oxygen Species Modulate Tissue Growth During Planarian Regeneration.* SDB-PASEDB 2022, Join Society for Developmental Biology and Pan-American Society for Evolutionary Developmental Biology Meeting, Vancouver, BC., Canada, 2022.

de Brito V, **Bloom DD.** 2022. Does Ecological Opportunity Influence Patterns of Phenotypic Evolution Following the Invasion of Freshwaters in Fishes? Joint Meeting of Ichthyologists and Herpetologists. Spokane, WA.

de Brito V, Betancur-R R, Burns MD, Buser TJ, Conway K, Fontenelle JP, Kolmann MA, McCraney WT, Thacker CE, **Bloom DD.** 2022. Species Interactions and Niche Conservatism Limit Phenotypic Diversification Following Marine/Freshwater Transitions in Fishes. The Deep and Shallow History of Aquatic Life's Passages Between Marine and Freshwater Habitats Symposium, SICB. Phoenix, AZ.

Ebendick-Corpus, B.E., S.R. Var, and **C.A. Byrd-Jacobs**. 2022. The effects of immune modulation on the recovery rate of zebrafish olfactory glomeruli after deafferentation. Michigan Chapter of the Society for Neuroscience Annual Meeting.

Rozofsky, J.P., J.M. Pozzuto, and **C.A. Byrd-Jacobs**. 2022. Potential sex differences in mitral cell dendritic morphology following injury and recovery. Michigan Chapter of the Society for Neuroscience Annual Meeting.

2022 - Beane WS. *Quantum Control of Stem Cells*. National Science Foundation (NSF): 2022 NSF Nanoscale Science and Engineering Grantees Conference, session on "Quantum Biology." Virtual Conference.

2022 - Beane WS. *Weak Magnetic Field Manipulation of ROS Signaling During Regeneration*. Session: Emerging potential evidence of quantum phenomena in biology, Quantum Bio BR Summit, Rio de Janeiro, Brazil. Virtual.

Eng, J. Bioarchaeological perspectives on human adaptation to life in "marginal" environments: high-altitude Nepal and beyond. 87th Annual Meeting of the Society for American Archaeology, 2022

Hack, SJ. Invited Talk: *Planar cell polarity signaling is required to terminate regenerative growth in the planarian Schmidtea mediterranea.* International Society for Regenerative Biology Web Series, 2022.

Mohamed A. Abohajar, Sarah A. Almuhanna, *Matthew E. Kornas*, *Wenceslao Martinez*, **Pamela E. Hoppe.** Muscle-Specific Expression of Dominant Negative UNC-82/NUAK Kinase in *C. elegans* Induces Organismal Wasting Without Disrupting Muscle Cell Structure. *C. elegans* Metabolism, Aging, Pathogenesis, Stress, and Small RNAs Meeting, University of Wisconsin, Madison, July, 2022.

Mohamed A. Abohajar, Sarah A. Almuhanna, *Matthew E. Kornas*, *Wenceslao Martinez*, **Pamela E. Hoppe.** Muscle-Specific Expression of Dominant Negative UNC-82/NUAK Kinase in *C. elegans* Induces Organismal Wasting Without Disrupting Muscle Cell Structure. *C. elegans* Development, Cell Biology and Gene Expression Meeting, University of Wisconsin, Madison, August, 2022.

Ojha, R and **Koestler, B**. "Shigella flexneri diguanylate cyclases regulate pathogenesis". Wind River Conference on Prokaryotic Biology, June 2022, talk. Estes Park, Colorado.

Ojha, R and **Koestler, B**. "Shigella flexneri DGCs regulate pathogenesis". WMed Research Day Conference, April 2022, talk. Western Michigan School of Medicine, Kalamazoo, Michigan.

Alfardan, A and **Koestler, B**. "Mechanism of formate binding proteins." 2022 Midwest Microbial Pathogenesis Conference, September 2022, poster. University of Wisconsin, Madison WI.

Churaman, C and **Koestler, B**. "The Role of Cyclic Dimeric Guanosine Monophosphate Specific Phosphodiesterases (PDE's) in Regulating Different Phenotypes in Shigella flexneri." 2022 Midwest Microbial Pathogenesis Conference, September 2022, poster. University of Wisconsin, Madison WI.

Linn DM, Spitsbergen JB, **Linn CL.** An alpha7 nicotinic acetylcholine receptor agonist induces new RGCs and ERG recovery in a mouse glaucoma model. ARVO abstract. Denver CO. 2022.

Spitsbergen JB, **Linn CL.** Neurogenesis and Functional Recovery of Adult Retinal Neurons in Mice after Blast Exposure. ARVO abstract. Denver CO. 2022.

Linn CL, Spitsbergen JB. ERG Functional Changes Associated with an Alpha7 nAChR Agonist after Blast Exposure in Adult Mice. MHSRS abstract. Orlando FL. 2022.

2022 - Beane WS. *Radical Oxygen Species, Weak Magnetic Fields, and Tissue Growth.* The Guy Foundation 2022 Autumn Series Programme, Quantum Mitochondria. Virtual Series.

2022 - Beane WS. *Planarians: A Model for Stem Cells, Regeneration, and Neuroethology.* BIORETS Faculty seminar, funded by a National Foundation of Science grant, Western Michigan University. Virtual.

2022 - *Qureshi S*, Kinsey LJ, and **Beane WS**. *Reactive Oxygen Species Modulate Tissue Growth During Planarian Regeneration.* Joint Society for Developmental Biology (SDB) and Pan-American Society for Evolutionary Developmental Biology (PASEDB) Meeting. Vancouver, Canada.

Quakenbush, P. Flower size and division of labor in buzz-pollinated flowers. Evolution 2022, virtual presentation, 21 June, 2022.

Schriever, T.A. Kalamazoo River Area of Concern ecosystem assessment. Annual AOC conference. 2022

Morin, M. and **T.A. Schriever**. Wetland Characteristics Influence Anuran Occurrence and Assemblage in Coastal Interdunal Wetlands. Joint Aquatic Sciences Meeting. May 20, 2022

Austin, A. and **T.A. Schriever**. Do Established Wetland Communities Influence the Succession of Isolated Created Wetlands? Joint Aquatic Sciences Meeting, 2022

VanGyseghem, Juliana, M. and **Spitsbergen, John, M.** The effects of exercise on tissue levels of GDNF and Estrogen in Male and Female Rats. Annual Kalamazoo Community Medical and Health Sciences Research Day, 2022.

VanGyseghem, Juliana, M. and **Spitsbergen, John, M.** The effects of sedentary aging and exercise on end plate area and morphology in female rats. Annual Meeting of the Michigan Chapter of the Society for Neuroscience, 2022.

Lopez, A.J., Cintrón-Colón, A.F., VanGyseghem, J. M. and **Spitsbergen, J. M.** Motor neuron cell body morphology with age, exercise and sex. Annual Meeting of the Michigan Chapter of the Society for Neuroscience, 2022.

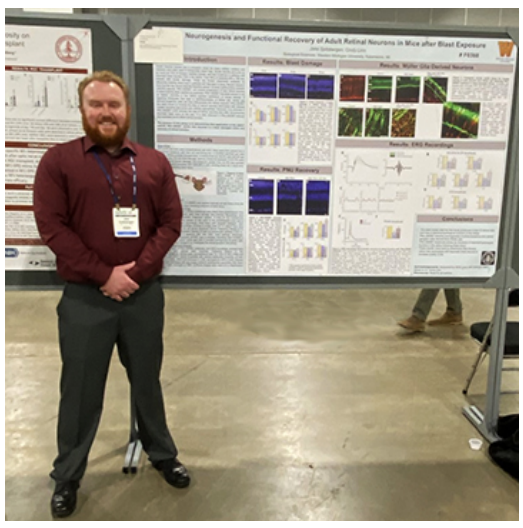
Alberto Cintrón-Colón and **John M. Spitsbergen**. From young to old: the effects of sedentary-aging and exercise interventions on structural plasticity of lumbar motor neurons, end plates and GDNF. Annual Meeting of the Society for Neuroscience, 2022.

VanGyseghem, Juliana, M. and **Spitsbergen, John, M.** The effects of sedentary aging and exercise on end plate area and morphology in female rats. Annual Meeting of the Society for Neuroscience, 2022.

Lopez, A.J., Cintrón-Colón, A.F., VanGyseghem, J. M. and **Spitsbergen, J. M.** Motor neuron cell body morphology with age, exercise and gender. Annual Meeting of the Society for Neuroscience, 2022.

2022 - Beane WS. *Quantum Biology and Stem Cells.* MI Dean's Meeting (Michigan Council of Colleges of Arts and Sciences). Western Michigan University. Virtual.

2022 - Beane WS. *A Spin Dynamics Approach to Manipulating Tissue Growth.* Cavendish Quantum Information Seminar Series, Hitachi Cambridge Laboratory and Cavendish Quantum Information Group, Department of Physics, University of Cambridge. Virtual.



Jake Spitsbergen presenting his ARVO poster

Graduate Student activities:

Student Activities

The past year has been an outstanding one for students in our programs in Biological Sciences. Students were included 69 times (44 undergraduate students and 25 graduate students) as co-authors on papers published in peer-reviewed scientific journals (see above), students gave 26 presentations at scientific conferences (see above) and received numerous grants and awards (see below).

Peter Quakenbush with mentor, Todd Barkman

Graduate Student Awards

Samantha J. Hack. Advanced Sequencing Technologies and Bioinformatics Analysis Training Tuition Scholarship. Cold Spring Harbor Laboratories.

Samantha J. Hack. Society for Developmental Biology Student Travel Award.

Samantha J. Hack. Invited Applicant, St. Jude Children's Research Hospital National Graduate Student Symposium.

Samantha J. Hack: Selected Attendee, Advanced Sequencing Technologies and Bioinformatics Analysis (Advanced Research Course), Cold Spring Harbor Laboratories. Cold Spring Harbor, NY. Nov 2022.

Samantha J. Hack: Selected Attendee, Optical Microscopy and Imaging in the Biomedical Sciences (Advanced Research Course), Marine Biological Laboratory. Woods Hole, MA. August 2022.

Ellen Badger Hanson - USDA-SARE Graduate research fellowship. Exploring the Effects of Prairie Restoration Management on Soil Microbial Carbon Storage for the 2022 North Central Graduate Student Grant: Amount awarded: $14,997

Lizzy Ketchum - George and Beatrice Fisher Gerontology Dissertation Prize 2022 from the Graduate College at WMU, for her dissertation "Forming Connections: The Cell-Autonomous Roles of GATA3 and NEUROD1 in Developing Auditory Neurons"

Ruchi Ojha - Betina Chapman Research Excellence Award – PhD

Peter Quakenbush - Gwen Frostic Doctoral Fellowship.

Peter Quakenbush – Leo C. Vander Beek Graduate Student Plant Biology Award

Sydney Sheltz-Kempf - Distinguished Biological Sciences Graduate Student

Jake Spitsbergen – Betina Chapman Research Excellence Award – MS

Sydney Sheltz-Kempf with Chair

Jake Spitsbergen with mentor, Cindy Linn

Research Day Award Winners

Western Michigan University Graduate College Research Awards

Alfardan, Abrar
Finnegan, Darby
Mokris, Aurora
Badger Hanson, Ellen
Hack, Samantha
Ojha, Ruchi
Kelly, Karla
Ray, Katelyn
Churaman, Candice
Diller, Sara
Sell, Jakob

Western Michigan University Graduate College Travel Grants

Finnegan, Darby
Morin, Morgan
VanGyseghem, Julie
Kinsey, Luke
Hack, Samantha
Ojha, Ruchi

College of Arts and Sciences Climate Change Research Graduate Scholarship

Christian Smith - Investigating the effects of Urbanization on Airborne Microbial Communities.
Bahar Saadaie - How Will Climate Change-Induced Increases in Wildfire Frequency Affect Soil Microbial Functional Group?
Ellen Badger Hanson - How Does Prairie Restoration Management Influence Soil Microbial Communities and Their Carbon Cycling?
Joe Figurski - Impacts of climate change-induced forest disturbance on amphibian populations.

Department Nomination for Graduate Research and Creative Scholar Awards - WMU Graduate College

Parks Marion – Masters Student Teaching Award
Alyssa Lopez – Accelerated Masters Student Teaching Award
Jake Spitsbergen - Masters Student Research Award
Aurora Mokris - Accelerated Masters Student Research Award
Elizabeth Ketchum - Ph.D. Student Teaching Award
Luke Kinsey - Ph.D. Student Teaching Award – All University Award
Victor DeBrito - Ph.D. Student Research Award

Annual Kalamazoo Community Medical and Health Sciences Research Day

Abrar Alfardan - Best Graduate Poster Presentation
Ruchi Ojha – Best Graduate Oral Presentation
Julie VanGyseghem – Third Place for Clinical or Health Services Research Oral Presentation

Graduate Student Focus

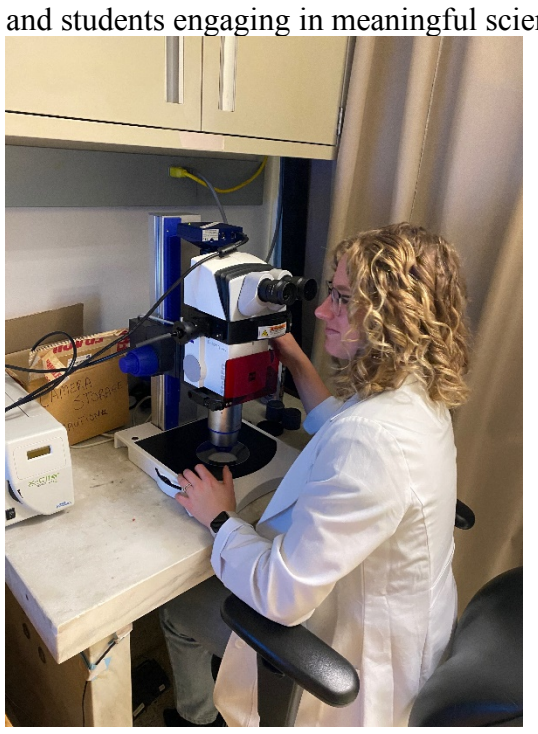
Samantha Hack,
Ph.D. graduate student

My name is Sam, and I am a PhD Candidate in Dr. Wendy Beane's Lab at Western Michigan University. I am a Michigan native, and have obtained both a B.S. and M.Sc. from the Biological Sciences Department. My current doctoral research utilizes the planarian flatworm system, which is an invertebrate model of adult stem cells and regeneration. My main research interest lies in uncovering how tissues 'know when to stop growing', or more simply, how does regeneration stop? I am also spearheading a project to uncover the role of cell death in the early stages of regeneration, where counterintuitively, dying cells can signal to stem cells and initiate the proliferative events required to replace missing tissues. This work has been supported by a Graduate College Student Research Grant.

The BIOS department has supported me in many ways during my early academic career, including financial support for attending conferences and advanced research workshops. Thus far, I have been selected to give four talks, including an invited talk at the International Society for Eye Research meeting in Gold Coast, Australia this coming February. I have also attended/given poster presentations at 3 conferences, including the Society for Neuroscience and Society for Developmental Biology annual meetings (Supported by a Graduate College and Society for Developmental Biology Student Travel Awards). Traveling to conferences has enabled me to build relationships with faculty and students in my research area and interact with post-doctoral recruiters.

With the support of my research mentor and other BIOS faculty, I have also been selected from pools of highly competitive international applicants to attend the following advanced research courses (all supported by training tuition scholarships or department support): Frontiers in Stem Cells and Regeneration (Marine Biological Laboratory, MBL), Optical Microscopy and Imaging in the Biomedical Sciences (MBL), and most recently, Advanced Sequencing Technologies and Bioinformatics Analysis (Cold Spring Harbor Laboratories, CSHL). These week to two week-long intensive courses have allowed me to explore cutting edge techniques, network with faculty from across the globe, and expand my understanding in a variety of research areas. I have brought back the skills and knowledge I have learned at these courses and implemented new techniques into my own research, including flow cytometry, RNA-sequencing, and bioinformatics of omics data. One of my current goals is to encourage other graduate students in our department to apply for these fantastic research workshops.

In addition to my own research activities, I have also had many opportunities to mentor undergraduate students in the lab and participate in outreach endeavors. I am currently working with two BIOS majors, and in the past, I served on Lee Honors College thesis committees. These opportunities have allowed me to improve my mentorship skills and are preparing me for an academic career. Lastly, I have been able to share my research and passion for science by curating hands-on learning activities for local high school students, and virtually through the Skype a Scientist platform. Interacting with students and trainees has been one of the highlights of my academic career. I am proud to be in a department that supports faculty and students engaging in meaningful science communication!



Outside of the lab, I like to walk my dog, fly fish, hike, read fiction/non-fiction, and travel. I hope to continue these many passions as I progress towards my long-term career goal of becoming faculty at a research institution. Thank you to my mentor, Dr. Beane, my department, and alumni for your continued support!

Graduate Student Focus

Ruchi Ojha, Ph.D. graduate student

I grew up in Ajmer, a town in North India and attended Sir Padampat Singhania University where I majored in biotechnology engineering. Soon after my undergraduate, I decided to take my career one step further and accepted a MS position at Western Illinois University. Here, I developed my own project, learnt new and advanced techniques and taught my first lab as a TA. My master's thesis project consisted of investigating the effect of *Bacillus thuringiensis* kurstaki and *Bacillus thuringiensis* israelensis infection on the growth and gene expression of a voracious corn pest, the corn ear worm (*Helicoverpa zea*). This project involved microarrays, real-time quantitative polymerase chain reaction (rt-qPCR), and statistical analyses to determine significant differences in the growth profile and mortality rate of *H. zea* in response to the disease.

This experience helped me improve my laboratory skills and learn new techniques, and I was able to successfully complete projects and think critically about my findings. After the successful completion of my project and degree, I was offered a position as a lab technician in the DNA Sequencing Department at ACGT, Inc., at Wheeling, Illinois. I worked with a great team at ACGT, and learnt so much about sequencing projects. However, this experience helped me discover my passion for scientific research and I decided to return to academics and accepted a PhD position at Western Michigan University. The Biological Sciences Department has been wonderful and I feel happy to be here.

I am in my fifth year of my PhD studies with Dr Ben Koestler, where I work with *Shigella. Shigella* is a strict human pathogen that infects the colonic epithelium, resulting in bloody diarrhea. Interesting fact about *Shigella*: it evolved from *E.coli* in our gut and transformed itself to be pathogenic, mostly by gene loss, which were presumably impeding its virulence. I am interested in studying how the enzymes that synthesize the bacterial second messenger c-di-GMP regulate pathogenesis in *Shigella*. While *Shigella* is known to encode 4 DGCs, I was able to demonstrate that different DGCs regulate different *Shigella* virulence phenotypes, which we published. Right now, I am investigating how individual DGCs synthesize c-di-GMP and how this effects downstream phenotypes. To study c-di-GMP synthesis, I am quantifying c-di-GMP levels using LC-MS/MS and a new technique that allows us to measure c-di-GMP levels in live cells using fluorescence microscopy.

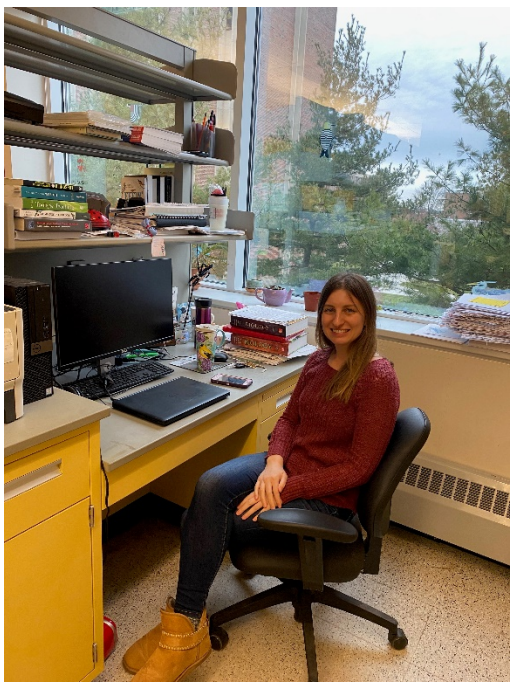
My graduate research has been a great learning experience and I know it will continue to be. Apart from the lab, I love to sit in nature and take lots of pictures. If I visit any place, I usually end up with ~500 pictures. I have been very fortunate to work with Dr Ben Koestler and learn so much about *Shigella*, new techniques, and how to be a good scientist. I am hoping to graduate next year when finally, I will call myself the first PhD from the Koestler lab.

Ruchi Ojha with mentor, Dr. Ben Koestler

Graduate Student Focus

Joanna Sbelondorio,
Ph.D. graduate student

I am a PhD candidate in Dr. Gill's Sound Ecology Lab. We study bird communication to understand how species and communities respond to both environmental change and threats (such as predators or nest parasites). Male birds sing to attract mates and defend their territories, meaning that successfully communicating with mates and rivals is vital in our noisy world. My specific project focuses on partitioning of song niches within and among bird communities. I ask questions such as: How do bird communities change their songs when they are exposed to human-generated noise? Since birds may sing while they migrate in the springtime, are breeding bird communities competing with singing migrants that are journeying through their territories? And, how do species' song niches vary geographically, and do these differences depend on the community they inhabit? My first first-author paper, which discusses how much migratory birds sing while they are journeying to their summer breeding grounds, is currently in the revision process and will officially be published soon. I also received grants from the Animal Behavior Society and the Field Museum in Chicago to study the evolution of song and plumage in warblers, and had so much fun on my recent visit to the Field Museum to measure the plumage coloration of their spectacular collection of bird skins.



At WMU, I'm the current instructor of the undergraduate ecology and evolution course, and this is my first experience teaching such a large class (~130 students). It has been an exceptional amount of work, but also a wonderful opportunity to explore who I want to be as a professor and what teaching techniques work best to engage students in course material and discussions. I have also mentored five undergraduate students from backgrounds in biology, medicine, and music, and it has been a pleasure to see them develop independent research projects and grow as scientists.

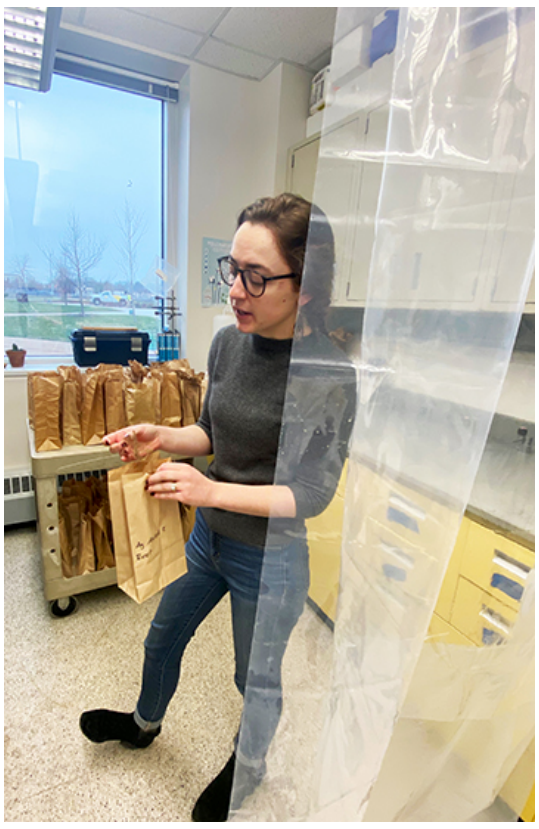
I was born in coastal New Jersey, but have lived in various states after college working as a field biologist and environmental consultant for renewable energy. South Texas in the Rio Grande Valley was my favorite place to live because of the amazing wildlife, great food, and access to the Gulf Coast. My favorite hobby is to go out looking for birds (birding!). I sometimes bird competitively or for conservation, but mostly it is an excuse to get outdoors, explore new trails, and see the bird diversity in a new place with other people who enjoy nature. I love natural sounds from birds to insects to frogs, and if you see me outdoors in the spring, chances are I will be carrying around a huge microphone. In Michigan my favorite time for recording birds is early spring, when the chilly air and snow-covered ground dampens background noise and songs are clear and amplified. I like to "write" poems, though I rarely write them down on paper. It's more of a mindfulness practice and a way to convert observations or feelings into a silly or whimsical form. I also enjoy baking desserts. Apple and peach pies are my favorite, but I've recently expanded into cheesecakes and buttercream cupcakes. I'm planning to graduate by summer of 2023 and go on to a postdoc with the ultimate goal of working at a university that balances research and teaching.

Winning Gingerbread House contest presented by Sharon Gill's students.

Graduate Student Focus

Ellen Badger Hanson, Ph.D. graduate student

Hello! I'm Ellen Badger Hanson, and I'm a third-year PhD student in Dr. Kathryn Docherty's lab at WMU. I'm from Minnesota originally, but over the last 10 years I've lived a little bit of everywhere – Iowa, Wyoming, Colorado, Montana, and now Michigan.



I am a microbial ecologist, and I'm curious about how the ways we manage land affect the microbes who live in the soil. Soil microbes are an important part of any ecosystem – they interact with plants, nutrients, and carbon in meaningful ways that can have an impact on management goals. Despite this, microbes are often overlooked in land management plans. It's not surprising they've been left out – there is a lot we still don't know about soil microbial communities, and they can be difficult (and expensive) to study. My goal with my PhD work is to shed some light on this, specifically in the context of prairie restoration. We know that current prairie restoration management techniques can increase plant diversity and reduce soil and nutrient runoff, but there is still a lot to learn about the microbes! I'm currently investigating how prairie restoration size and seed mix affect soil microbial community composition and carbon-cycling functions. I hope that my work can inform strategies to improve prairie soil carbon storage, as this could be one useful tool in the fight against climate change. I recently received a USDA-SARE grant to continue this research and published my first paper on it, both of which are making me very excited to keep exploring.

When I'm not at school, you can usually find me hiking, baking, or reading my latest favorite Sci-Fi/Fantasy novel. I'm very close to my family, so I try to get back to Minnesota as often as possible to see them. One of my favorite things is being an Auntie to my little niece and nephew! I have been very fortunate in my grad school journey to have a supportive husband, Philip, helping me to stay sane and, importantly, well fed – keep an eye out for his book "Care and Keeping of Your Graduate Student", which he keeps saying he'll write someday. I am extremely grateful to him and to my support team of family and friends for taking on this adventure with me!

Looking ahead, I am hoping to devote my career to teaching and applied research. It is my hope that the work that I do can be useful to land managers, ecologists, and anyone looking to be more intentional about how we use land and adapt to a changing climate. I'm excited to see where this takes me after my time at Western is through, but grateful to have a couple more years to learn and explore in Kalamazoo.

Graduate Student Focus

Sara Diller,
Ph.D. graduate student

I am a second-year Ph.D. student in Dr. Tiffany Schriever's lab studying river restoration and food webs. I am a proud Hoosier and call Goshen, Indiana home. While working on my undergraduate degrees at Indiana University, I took a field course in Montana and found a passion for freshwater ecology. I really enjoyed getting knee-deep in the rivers and seeing the diversity of organisms that were just beneath the surface. I then went on to study wetland ecology and conservation at Central Michigan University for my master's degree. I knew I wanted a Ph.D. eventually, but wanted to explore the workforce first, so I took a job as a contract ecologist at the US Geological Survey Great Lakes Science Center in Ann Arbor. My team investigated the influences of habitat quality and seasonality on fish community composition and diets in Great Lakes coastal wetlands. After several years at USGS, my passion for research was cemented and my confidence as a scientist had grown immensely, so I decided to take the next step and pursue a Ph.D. here at WMU. Dr. Schriever's lab was a perfect fit for my research interests, and she has helped me put together a really exciting project over the past year.

My research investigates the impacts of dam removal on ecological communities and food webs. I'm conducting my study on the Kalamazoo River, which has been severely degraded by dams and PCB contamination over the last century but there is now an ongoing effort to remove the dams and restore the river. I'm comparing community composition (primarily invertebrates and fish) and food web structure at locations along the river that are in different stages of dam removal and habitat restoration. I'm also taking a close look at the stomach contents of smallmouth bass, which are a key predator and favorite game species in the river. Last summer I learned how to use gastric lavage to collect stomach contents from fish and it was so much fun!

I'm particularly excited about the food web component of my research. Most post-restoration ecological assessments just focus on diversity and community composition. Food web structure, however, reflects species interactions and energy flow and is thus indicative of overall ecosystem function. I'm going to use stable isotopes assess the food webs, which will be a completely new skill for me that I look forward to learning.

I have also enjoyed interacting with the public while doing my field work. I can tell they really value the Kalamazoo River and look forward to its restoration. This project has made me realize how big of an impact local restoration efforts can have on communities, so after I graduate from WMU I hope to use my expertise to guide other communities in their local river/wetland restoration efforts.

When I'm not researching, I love to experiment with baking and work in my garden. My husband and I are going to start beekeeping next summer which I am ecstatic about! Most importantly, though, I love being a mommy to my rambunctious 3-year-old son, James, and fostering his own love of science.

Undergraduate Student activities:

The past year has been an outstanding one for undergraduate students in programs in Biological Sciences. 44 undergraduate students were listed as co-authors on papers published in peer-reviewed scientific journals, many students gave presentations at scientific conferences and many received numerous grants and awards (see below).

<u>Undergraduate Student Awards</u>
Shaneka Johnson - Presidential Scholar in Biological Sciences

Sarah Mominee - Merrill Wiseman Award in Microbiology

Hanna Korn - Hazel Wirick Scholarship – **Awarded through Kalamazoo Garden Club**

Cole Waldvogel - Hazel Wirick Scholarship – **Awarded through Kalamazoo Garden Club**

Hope Welter - Distinguished Senior in Biomedical Sciences

Hanna Korn - Distinguished Senior in Biology

Rae Miller - Distinguished Senior in Biology

Jake Fanizza - Distinguished Pre-Professional in Biological Sciences

Nastia Chan – Betina Chapman Research Excellence Award

Sarah Mominee - Margaret Thomas Du Mond Award

Kar Men Lee - Colin J. Gould Memorial Scholarship

Alex Kolstoe - Hazel Wirick Scholarship – **Awarded through Kalamazoo Garden Club**

Nastia Chan - Frank Hinds Zoology Award

Breanna Glovis – Dr. Scott and Mary Hodges Scholarship (pre-Dental)

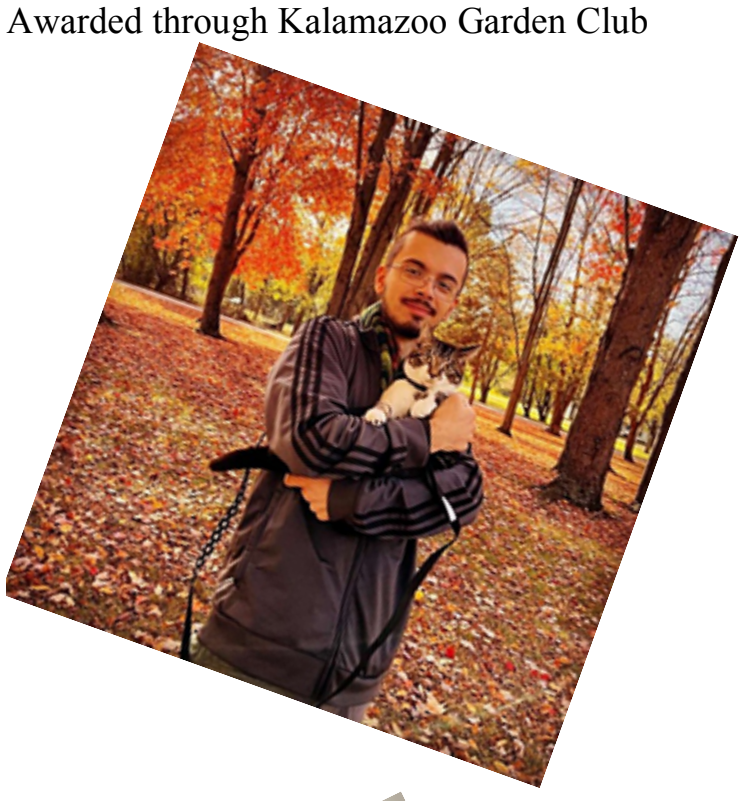
Nastia Chan – Dr. Roger and Diane Ulrich Completion Scholarship

Emily Lulofs-Hazel Wirick Scholarship – **Awarded through Kalamazoo Garden Club**

Gabe Vroman (Delano Scholarship)- **Awarded through Kalamazoo Garden Club**

Students at Spring Awards Ceremony

Gabe Vroman: Recipient of Delano Scholarship Awarded through Kalamazoo Garden Club



Emily Lulofs: Recipient of Hazel Wirick Scholarship

Undergraduate Student Focus

Ashley Dittmer

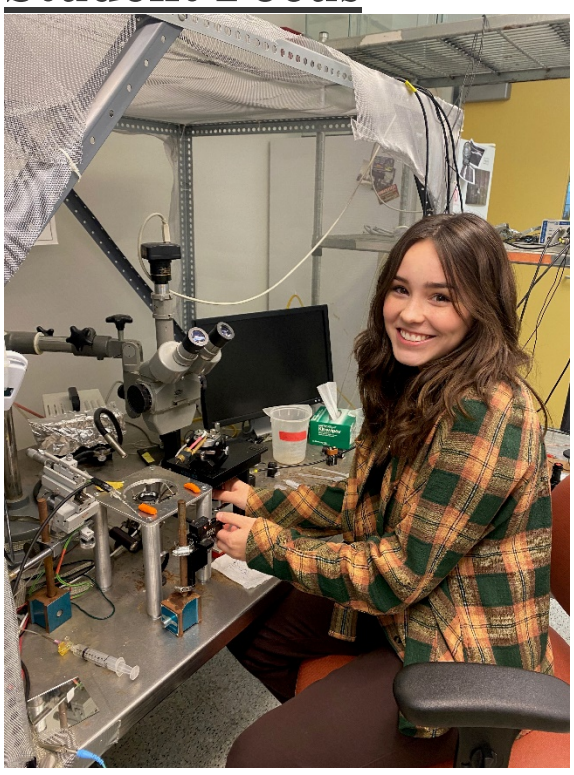
I grew up in Birch Run, MI where my mom worked nearby in Saginaw, MI as a nurse. I was obsessed with the hospital and was overjoyed every year on Bring Your Child to Work Day because my mom would let me hang out with a security officer who gave me a tour of the hospital. Naturally, I thought I wanted to be a doctor because I loved the hospital so much, so when Western Michigan University generously offered me the Medallion Scholarship in 2019, I decided to major in Biomedical Sciences and later go to medical school.

As a freshman, Dr. Benjamin Koestler gave me the opportunity to work in his lab as an undergraduate research assistant where I was first introduced to the field of microbiology. His passion for studying *E. coli* and *Shigella* are very contagious (no pun intended). Around this time I also discovered a podcast called *This Podcast Will Kill You,* hosted by two epidemiologists. I began to learn about a multitude of infectious diseases, and the role of public health in preventing outbreaks of these diseases. As a sophomore I decided I wanted to center more of my undergraduate education around.

public health and still focus on microbiology, but at the time WMU did not offer a public health minor, so I changed my major to a Student Planned Major so I could write out a major curriculum that supported my passions. After working in the COVID ICU as a nursing assistant in 2021, I decided that I didn't want to be a physician, rather I wanted to focus on infection prevention efforts and set my sights on epidemiology.

I am extremely grateful for the opportunities for self-discovery that the department of Biological Sciences has provided me. I have been able to perform research on the role of *E. coli* DGC genes in biofilm formation and be second author on a paper with PhD candidate, Ruchi Ojha. My research was able to be funded by the College of Arts and Sciences Research and Creative Activities Award that I won in December of 2020. Though I have since left Dr. Koestler's lab, I was able to continue research this past summer through an internship with the Michigan State University College of Human Medicine and Michigan Department of Health and Human Services where I studied how antibiotic stewardship efforts in Michigan hospitals have changed since the COVID-19 pandemic. This internship helped me realize that there was still work for me in the hospital setting, and I now plan to apply for hospital epidemiology and infection control Master of Public Health programs after I graduate from WMU this spring. I have been able to prepare for this coursework by working as a Learning Assistant for Dr. Rossbach's microbiology class, which has really deepened my understanding of microbiological concepts.

Undergraduate Student Focus



Gwen Sirrine

From the time when I first started to read, I have always been fascinated by the natural world and by biology. I did not initially think that I would end up studying it in college, but thanks to some incredible professors and teachers, I found the field that I truly love.

I grew up in Kalamazoo, Michigan and was homeschooled for my whole life. Being homeschooled allowed me to work at own pace and tailor my education towards my interests. It also gave me the opportunity to start working on my associate degree at Kalamazoo Valley Community College when I entered high school, at 14 years old. At first, my desire was to become physician's assistant, because working in healthcare has been a dream of mine since I was little. However, once I started taking my biology courses, my whole perspective changed. This was due to some amazing professors that had a huge impact on how I viewed the subject. By the end of my second semester there, I had changed my degree to biology and have never looked back.

I ended up graduating high school this past spring in three years rather than four and receiving my A.S. in biological sciences at the same time. WMU was the natural choice for me to transfer to, and I entered this past fall semester as a junior majoring in biomedical sciences with a minor in chemistry.

I like to keep busy, so in addition to these positions, I have also served as a health educator with youth in the Kalamazoo community, am the president of the Alpha Lambda Delta Honor Society on campus, and was a member of the COVID-19 Student Coalition on campus where I was able to create informational social media posts to help educate students on COVID-19, volunteer as a contact tracer at Sindecuse Health Center, and volunteer in the community at vaccine clinics. In my free time, I enjoy reading, watching Jeopardy with my roommate, and thrift shopping.

During my time at KVCC, I was a part of the Phi Theta Kappa honors society and made the Dean's list each semester I attended. I graduated with a 4.0 GPA and have maintained that at WMU as well. Since enrolling at WMU, I joined the Lee Honors College and am president of the WMU biology club on campus. Over this past semester I have also begun research for my honors thesis in Dr. Jellies's neurobiology lab.

Since starting in the lab, I have been able to grow in not just my knowledge of neurophysiology, but also have learned about the importance of good lab practice. I've also adopted new laboratory skills related to the field that will serve me for many years to come. I have even been fortunate enough to have an interesting find of my own regarding the UV light response of the retzius neuron in our model organism, the medicinal leech (*H. medicinalis*). This will be the topic of my thesis and the focus of my research during my time in the lab. Research had been something that I aspired to do since I decided to major in biology. So, getting to be a part of a lab and building my own project has been a lot of fun and very fulfilling. I greatly enjoy working with the leeches and learning about the ever-changing field of neurobiology.
Outside of classes and time at the university, I love to play the piano which has been a hobby of mine for the past 14 years. Playing at church or at events is something I've done for many years now. I have always been a lover of books, and I enjoy spending time with family and friends as often as I can.
I am so excited to continue my education at WMU for the next couple of years as I grow in my love for the sciences and for research. It has been such a blessing to have such wonderful faculty that have come along side me and have supported my goals from day one. Ultimately, working in healthcare is still my primary goal, so after graduation, I plan on attending medical school to become a physician. I hope to be able to serve those through my profession and use whatever skills I have to aid and help others. I know that the opportunities that I have been given here at WMU will be a great assistance in getting there and I will always have people who will support and uplift me along the way.

Alumni Quote

The time I spent at Western had a significant influence on my life and future career. I learned something new every day in my time at Western. The opportunities that I was provided allowed me to advance my education and dive into fascinating research topics at the same time. I had the absolute pleasure of studying in a lab that encouraged me to discover and follow my passion for research in the field of neuroscience. Working on my thesis project with my advisor and the other graduate and undergraduate students in the lab was truly a wonderful and rewarding experience that made me the scientist that I am today. The skills and experiences I gained from my time at Western helped me to start my career in the scientific research industry and I am incredibly thankful for the support and guidance I received during my time there. Go Broncos!

Jake Spitsbergen
Masters of Science – 2022
Western Michigan University
Eurofins Lancaster Laboratories

Outreach Activities

Besides active interest in research, teaching and service to the University, many faculty members are dedicated to outreach activities that bring their research interests and knowledge to the community. Below are just a few of the many outreach activities that faculty and students were involved in for 2022:

The BIORETS Program: Drs. Yan Lu and Silvia Rossbach recently received funding from the National Science Foundation to start a Research Experiences for Teachers Sites in Biological Sciences (BIORETS) program at WMU. This program provides summer research and training opportunities to 36 middle and high school science teachers over the course of the three-year program (2022 – 2024), in the laboratories of WMU faculty mentors (https://wmich.edu/biology/biorets). This BIORETS program also provides a platform for Biological Sciences faculty and graduate students to integrate research, teaching, and service together. Here is the list of the nine BIORETS teacher participants, their host labs and research projects in Summer 2022:

- Sara Glisson, Coloma High School, Koestler Lab: Phage hunting in municipal waters
- Bailey Green, Dowagiac Middle School, Bloom Lab: How selective pressures of different environments cause changes in functional traits of Silversides
- Jennifer Lacy, Lakeview Middle School, Hoppe Lab: Does blocking the CED-4 apoptotic activator protein in Caenorhabditis elegans prevent wasting induced by UNC-82
- Ann Ponicki, Mattawan High School, Linn Lab: Methods of exploring neurogenesis in adult rodent retinas
- Liz Ratashak, Vicksburg High School, Beane Lab: Structure and function: Planarian nervous system
- Amanda Solloway, Cassopolis Middle School, Lu Lab: Toxicity of perfluorooctanoic acid (PFAS) on plant growth and development
- Melissa Teed, F.C. Reed Middle School, Rossbach Lab: Bacteria are everywhere: Beaches, rivers and even in turtles
- Torrey Wenger, Bloomingdale Middle and High School, Gill Lab: What is sound ecology?
- Kelsey Wydendorf, Portage Central Middle School, Bloom Lab: Shifts in locomotory demands throughout ontogeny drive functional trait differences in juvenile and adult alewife fish

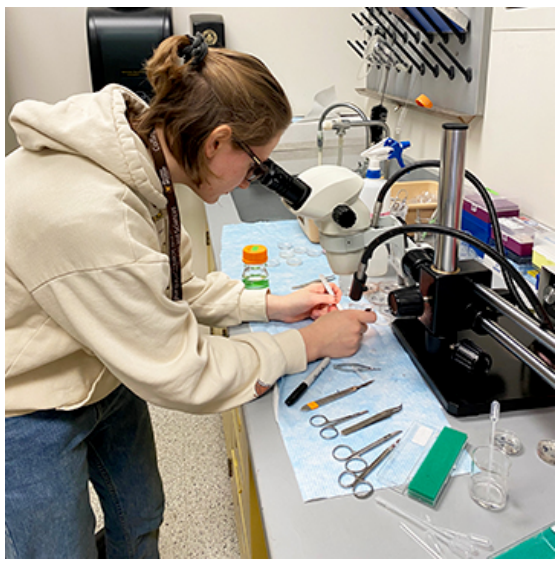
The Bioret Participants for Summer 2022

Biorets Teaching Modules

Jakob Sell (graduate student) and Dr. Silvia Rossbach spent a day in Bridgeman F.C. Reed Middle School, with Melissa Teed's 5th graders (3 different classes) to convince them that "Microbes are fun! Melissa was one of the BIORETS teachers last summer.

Mattawan AP Biology Students' Campus Visit: Faculty, staff and students of Biological Sciences hosted the campus visit of 32 AP Biology students from Mattawan High School on December 6, 2022, as part of the Research Experiences for Teachers Sites in Biological Sciences (BIORETS) program led by Drs. Yan Lu and Silvia Rossbach (https://wmich.edu/biology/biorets). The 32 high school students were brought to WMU by their teacher Ms. Ann Ponnicki, who participated the BIORETS summer program in Dr. Cindy Linn's laboratory. The campus visit started off with a presentation about the College of Arts and Sciences (CAS) by Ms. Gabriela Saliwanchik, Manager of CAS Undergraduate Recruitment and Outreach, and Ms. Diana Blouin, Director of CAS Academic Advising. The students then visited the Finch Greenhouse in Wood Hall and five research laboratories in Haenicke Hall. Dr. Silvia Rossbach and graduate students Jakob Sell, Alex Kolstoe, Hope Vanzo-sparks, and Luke Kinsy served as the tour guides.
Here is the list of interactive activities the AP Biology students participated during the campus visit:

- Plants in the Finch Greenhouse and how greenhouses work, hosted by Mr. Chris Jackson
- Extracting retinas from rats and pinning tissue for processing, hosted by Dr. Cindy Linn
- Zebra fish aquarium and fish embryo development, hosted by Drs. Rachel Warga and Don Kane
- How does the planarian flatworm regenerate an entire worm from just a tiny fragment of the original, hosted by graduate students Samantha Hack and Rae Miller and undergraduate students Isabela Georgetti de Carvalho and Caitlin Conway-Nolff in Dr. Wendy Beane's laboratory
- Importance of actin and myosin filament assembly in nematode muscle contraction, hosted by Dr. Pam Hoppe and graduate students Mohamed Abohajar and Jacob Mastenbrook
- Leaf pigment extraction and measurement, effects of light, hormones, and PFAS pollutants on plant growth and development, hosted by Dr. Yan Lu.



Mattawan High School student pinning out adult rat retinas while touring Dr. Linn's lab

The pictures below were obtained during a Coloma High School Outreach visit. An undergraduate student, Pooja Acharya, and graduate student, Samantha Hack, (both in Wendy Beane's lab) brought planaria for different activities to a biology class at the school!

In August 2022 Dr. Kathryn Docherty participated in the Farm Field Day at the Edward Lowe Foundation, where land managers, farmers and scientists got together to talk about conservation, particularly in agricultural ecosystems. The importance of conservation corridors (or prairie strips), which benefit aboveground biodiversity as well as belowground soil health were discussed. By incorporating these conservation areas into agricultural ecosystems, they re-introduce native plant diversity into the landscape. This provides nectar, host plants, nesting material, habitat and migration corridors for native birds, insects and other animals that are threatened due to habitat loss. Belowground, they decrease soil erosion, enhance soil carbon storage and help combat greenhouse gas emissions, benefitting farmers by increasing crop yields and decreasing crop pests.

Faculty Awards

Wendy Beane was named as a recipient of the Western Michigan University 2022 Emerging Scholar Award.

Dr. Beane at a high school STEM outreach event:

Tiffany Schriever and Kathryn Docherty- were selected for the Climate Change Across the Curriculum (CCAC) Learning Community. This award by the Office of Faculty Development (OFD), in collaboration with the Office for Sustainability (OfS) and the Climate Change Working Group (CCWG)

Tiffany Schriever – Dr. Darrell R. Latva Biological Sciences Teaching Excellence Award.

Staff Awards

Chris Jackson –received a semiannual Make a Difference Award in 2022. Chris Jackson has worked many years in the Department of Biological Sciences as a Greenhouse Specialist. He is particularly deserving of the award because of the positive impact his work has had for both student success at WMU and for the SW Michigan community more broadly.

Please Support Biological Sciences

In times when state funding is decreasing, the support we receive from friends and alumni is vitally important. To help support the mission of the department, you can donate online (via credit card) by using the following link.

https://wmich.edu/biology/giving Please select "Make a Donation" at the bottom of the page. Donations should be made directly to the Department of Biological Sciences.

If you prefer to donate by mail, please make your check payable to "WMU Foundation: Biology" and send to the following address:

WESTERN MICHIGAN UNIVERSITY
College of Arts and Sciences
Department of Biological Sciences

The Department of Biological Sciences
1903 W. Michigan Ave
Kalamazoo, MI 49008-5410

Thank you for considering a gift to the WMU Department of Biological Sciences.
Have a happy holiday season! Go Broncos!!!!!