DEPARTMENT OF MICROBIOLOGY & IMMUNOLOGY

UNIVERSITY OF MICHIGAN MEDICAL SCHOOL

2022–2023 HIGHLIGHTS

MICHIGAN MEDICINE
UNIVERSITY OF MICHIGAN

Featured story: The First Women in M&I

2022–2023 IN NUMBERS

243+
PEOPLE

Primary faculty: 30
Joint faculty: 17
Research track faculty: 11
Undergraduate students: over 30
Graduate students: 44
Postdoctoral scholars: 41
Research staff: 41
Administrative staff: 12
Facility manager: 1

7 PI FACULTY

in the top 200 out of 1100 entries for NIH funding: Vern Carruthers, Phil King, Eric Martens, Harry Mobley, Beth Moore, David Sherman, and Alice Telesnitsky

555
PUBLICATIONS

#10 RANKING

Blue Ridge NIH rankings:
We remained at #10.

22 CLASSES

over two years

$19.4

million in NIH funding for 2022

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CONTRIBUTORS

Marcy Balunas
Ekaterina Bethke
Halle Brown
Vern Carruthers
Camren Clouthier (photography)
Natalie Deeb
John Franklin
Halle Frey
Stephanie Himpsl
Fang Ke
Angela Kelly
Andrea Laboy Figueroa
Yasmina Laouar
Fenglei Li
Daniel Macedo de Melo Jorge
Natalia Matias
Ashley Mello
Beth Moore
Harry Mobley
David Mueller
Tomoyuki Murakami
Akira Ono
Elisabeth Paymal
Melanie Pearson
Kim Rize
Geoff Severin
Anukul Shenoy
Sheryl Smith
Alice Telenitsky
Fengrong Wang
Vicky Wang
Yifan Wang

Cover photo by Melanie Pearson, *Swarming motility by a mutant strain of* Proteus mirabilis

Photos: Thank you for the photos many of you sent!

M&I EXECUTIVE COMMITTEE

Beth Moore, Chair
Vern Carruthers
Phil King
Harry Mobley
Teresa O'Meara
Akira Ono
Melanie Pearson
Evan Snitkin

M&I FACULTY LEADERSHIP ROLES

Vern Carruthers
Associate Chair

Phil Hanna
Director BSL3
Director of Master's Program

Denise Kirschner
Director of Mentoring

Yasmina Laouar
Director of DEI Initiatives

Mary O'Riordan
Director of Graduate Studies

Patrick Schloss
Director of AP&A

MESSAGE FROM THE CHAIR

Dear Friends and Colleagues of M&I,

As we approach the end of 2023, I am excited to share our annual newsletter with you. The bottom line is that the department is thriving! In these pages you will meet our newest faculty hires, Dr. Yifan Wang and Dr. Anukul Shenoy. We are excited to welcome their expertise in parasitology and lung immunology to the department. We are in the middle of two new faculty searches, one for a virologist and one for a microbiologist and there are terrific candidates in our pool, so we look forward to expanding our junior faculty ranks! We also welcomed larger than average PhD and MS classes this year, which I think highlights the interest of the next generation of scholars in studying microbiology and immunology...likely the COVID-19 pandemic is playing some part in that!

Our faculty and trainees continue to excel in research, service and teaching as you will note in these pages. Our community is vibrant and our department is proud to house the undergraduate microbiology major on campus. A few things I would like to highlight this year. First, we are looking to build a database for our alumni and friends that our current students could use to seek out professional contacts and advice. If you are willing to be part of this, do drop me an email at bmoore@umich.edu. Second, I hope you will check out the article on the first three women faculty members in our department. This was a labor of love to seek out this information and we hope you will enjoy learning this history as well. Finally, as many of you may know we lost our dear colleague **Dr. Oveta Fuller** who was a pioneering virologist in our department and our first female Black faculty member. The department and her family are working to endow a lecture and prize in her memory that will establish an award for an early career scientist working in an area of importance for global health, infectious disease or health disparities. The winner can be anyone nationally or internationally, and will provide a memorial lecture in Ann Arbor and receive the prestigious award. I hope you will help us establish this important award in honor of a terrific colleague. You can read more about it and make tax-deductible donations to the fund through this link.

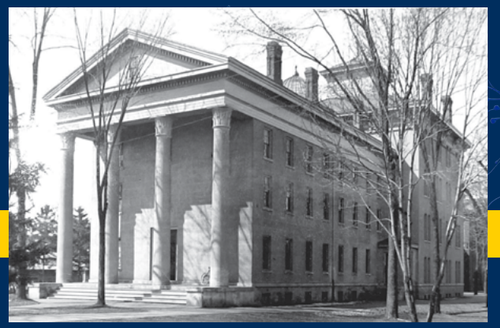
As part of our departmental history project, we created the timeline you will see below and this is now hanging in the department. We hope you will enjoy reading it here as well.

The department sends our best wishes to you and yours for a happy holiday season and a bright new year. If you are ever in Ann Arbor and want to visit us, drop me a line! Go BLUE!

Bethany Moore

Bethany B. Moore, Ph.D., ATSF, Nancy Williams Walls, Ph.D., Endowed Professor and Chair, Department of Microbiology and Immunology, Professor of Internal Medicine, Division of Pulmonary and Critical Care Medicine

Foundation of the University of Michigan (U-M) Medical School.
1850



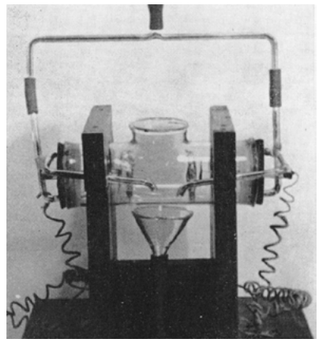
1850–1906, Medical School building

In France, Louis Pasteur confirms germ theory.
1862

THE EARLY WOMEN IN MICROBIOLOGY & IMMUNOLOGY AT MICHIGAN

By Beth Moore

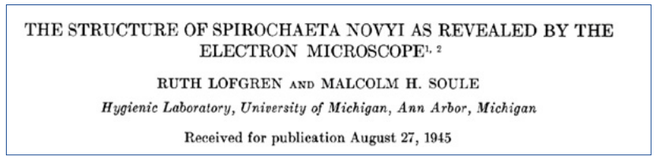
The Department of Microbiology and Immunology was interested in identifying our first female faculty members. Sadly, there were no historical departmental records that made it easy to identify them. However, with some help from the Bentley library on campus and some scouring of past Regent meeting minutes, we think we found them!



The electrodialysis apparatus used for the preparation of specimens for the electron microscope.

DR. RUTH LOFGREN, M&I'S FIRST FEMALE FACULTY MEMBER

Allow me to introduce Dr. Ruth Lofgren who was faculty in the Hygienic Laboratory (the forerunner to the Department of Microbiology and Immunology) from 1946 until she resigned in 1953. Dr. Lofgren earned her PhD in Microbiology in 1944 working under the direction of Dr. Malcolm Soule who was Chair of the Department. She was a pioneer in electron microscopy where she developed methods to prepare samples by electrodialysis and dilution. She first joined the faculty as an Instructor, but was promoted to Assistant Professor. She went on to have a remarkable life and to become an environmental advocate. She lived to be nearly 102. In some fascinating interviews, she talked about leaving Michigan in 1953 when Dr. Soule died and Dr. Nungester became chair. She felt the department was interested in studying biological warfare agents in the aftermath of World War II, and as a devoted Quaker, this went against her sensibilities. You can read the interviews here.



THE STRUCTURE OF SPIROCHAETA NOVYI AS REVEALED BY THE ELECTRON MICROSCOPE[1, 2]

RUTH LOFGREN AND MALCOLM H. SOULE

Hygienic Laboratory, University of Michigan, Ann Arbor, Michigan

Received for publication August 27, 1945

DR. DELNA GARRISON

The second woman hired in the department and the first to be granted tenure was Delna Garrison. After earning her baccalaureate here in 1933, Dr. Garrison served for seven years as a bacteriologist with the Michigan State Department of Health. During the decade after 1941, in addition to fulfilling family obligations, she earned her Master's Degree from the University, taught at Wayne State University and Eastern Michigan University, and served as Research Assistant and Research Associate at the University of Michigan Medical Center. Appointed an Instructor in Bacteriology in 1951, she was advanced to Assistant Professor in 1960, in which year she also completed work on her doctorate-and to Associate Professor in 1968. She retired in 1971 as an emeritus professor. She is seen in the faculty photo (above) from 1959 seated in the front row.

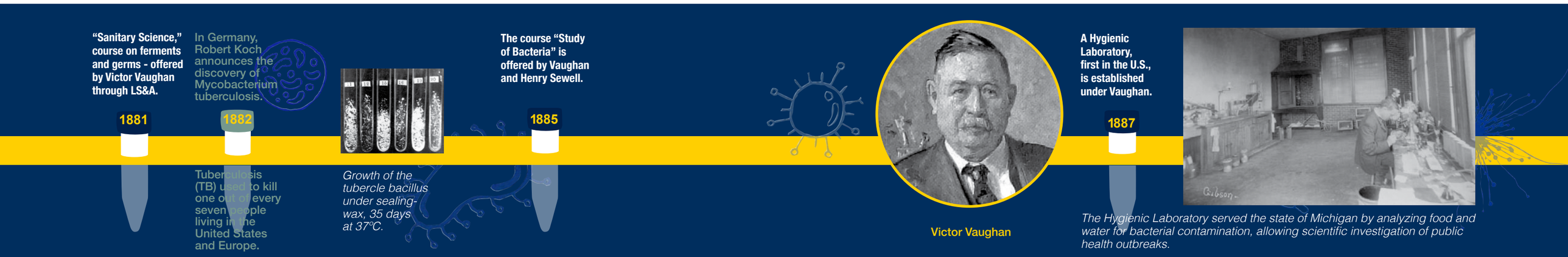
Dr. Garrison developed an assay for use of antigen-coated particles to detect antigen-antibody complexes in sera of patients with hypersensitivities which she presented at the American Academy of Allergy in 1952. In later years, she studied the role of histamine on bacterial infection in the lung and began studies to look at urinary tract infections, a topic still under investigation today in the department by the Mobley lab. She is also noted to have been an outstanding teacher of medical and graduate students.

DR. NANCY REID HARVIE

The third female faculty member was Dr. Nancy Reid Harvie. She was on faculty from 1964–1984. Dr. Harvie's research focused on fractionating and analyzing very low density lipoproteins in human plasma and she studied the interaction of bacterial cytotoxins with soluble lipoproteins in membrane models. She played a foundational role in teaching the medical technology students at Michigan as part of a joint venture between the college of Literature, Science and the Arts and the Medical School. Professor Harvie received from the ASM the prestigious Carski Foundation Award for Distinguished Teaching in 1984, the same year she retired to emeritus status.

Dr. Harvie is seen in the 1966 faculty photo (above). She is the third from the left in the back row. Delna Garrison is seen in this photo too, second from the right in the back.

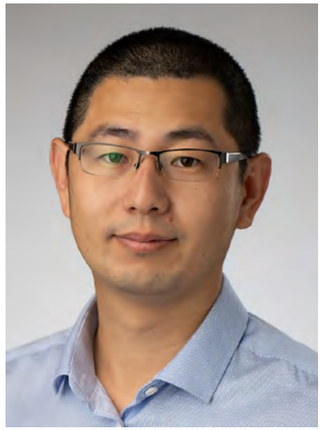
We salute these pioneering women in the Department of Microbiology and Immunology!



WELCOME TO M&I: NEW FACULTY!

We are thrilled to welcome two new Assistant Professors, Yifan Wang, DVM, PhD, a parasitologist and innate immunologist who joined M&I in January 2023, and Anukul Shenoy, PhD, an immunologist who joined M&I and the Division of Pulmonary and Critical Care Medicine in April 2023.

YIFAN WANG, PHD



Out of love for animals, Dr. Yifan Wang first became a Doctor of Veterinary Medicine (DVM) for large animals, graduating from Jilin Agricultural University, Changchun, China. One day, he had to take a blood sample from a sick horse to a lab, but there was a shortage of staff, and he was asked to help run the test. When he watched the pale liquid in the vial turn blue in reaction to the test, he was amazed.

> "I didn't know anything about what was happening in the little jar, but I knew that I was hooked!"

In M&I, Dr. Wang would like to pursue and expand his research on *Toxoplasma*-host interaction in different cell types and host species. Although different hosts have certain similar anti-*Toxoplasma* mechanisms, the species-specific response to the parasite presents some unique characteristics due to the differences in the host genetic background and susceptibility to the infection. For example, the mouse is far more vulnerable to the parasite than humans who have much stronger defenses against the infection. Dr. Wang is thrilled to have so many shared interests with other M&I faculty members who study host-pathogen interactions, looking for similarities and differences across viruses, bacteria, fungi, and parasites. Ultimately, Dr. Wang's research will inform the understanding of fundamental biological mechanisms, and hopefully the development of therapies against toxoplasmosis.

READ MORE

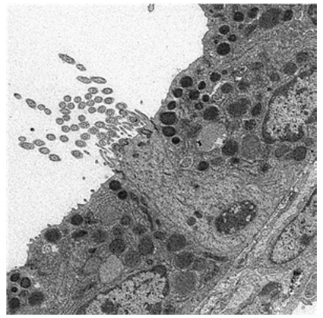
ANUKUL SHENOY, PHD

Epithelial cells, the cells that make the skin and envelop organs, are usually considered the shield of the body. But for Anukul Shenoy, PhD, an assistant professor who joined M&I and the Division of Pulmonary and Critical Care Medicine in April 2023, epithelial cells of the lungs are equally if not more essential to our survival since they help us breathe, fight against inhaled pathogens and repair damaged lungs.

> "Pulmonary epithelial cells are an integral part of the immune system arsenal."

At the University of Michigan, Dr. Shenoy will continue his work on the immune instructive and/or tissue reparative functions of lung epithelial cells. He will also search for potential epithelial targets that can be modulated to render the lung as a more hospitable and resilient niche for mucosal vaccine induced immune cells. That way the immune cells would already be located in the susceptible areas for pathogens, and would be faster to fight these and minimize damage than with a systemic vaccine.

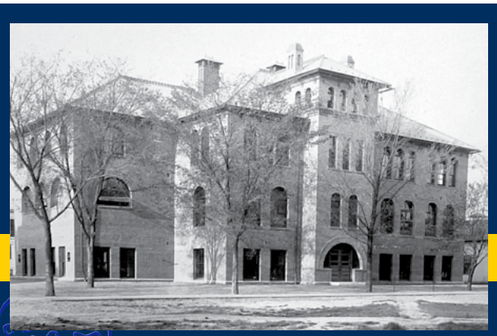
READ MORE



Electron micrograph of a mouse airway epithelium

PRESIDENT S. ONO

M&I welcomes President Santa Ono. He is an occular imunologist!!



1888 — Vaughan and Frederick G. Novy take a course under R. Koch in Berlin, and visit the Pasteur Institute in Paris.

1888–1902, Physics-Hygiene Building

1889 — Vaughan and Novy offer the course "Laboratory in Bacteriology," first of its kind in the U.S.

1890 — Novy initiates a required course in bacteriology for medical students.

Frederick G. Novy

1900 — Aspirin, a stable form of acetylsalicylic acid, was commercially marketed for the first time.

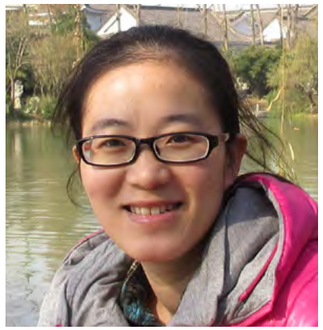
1901 — Publication of the "1901 Report of the Plague Commission." Novy is the sole bacteriologist on this Commission to investigate the outbreak of bubonic plague in San Francisco.

WELCOME TO M&I: NEW RESEARCH TRACK FACULTY!

HALEY BROWN, PH.D., KOROPATKIN LAB

Dr. Brown attended the College of Wooster where she received her Bachelor's degree in Biochemistry. She then worked at the NIH for a year before attending the University of Wisconsin – Madison where she completed her Ph.D. in Biochemistry. Dr. Brown recently joined the Koropatkin laboratory and is excited to combine her background in structural biology with techniques in microbial genetics and manipulation to study how our gut bacteria take up complex carbohydrates.

When not in the lab, Dr. Brown enjoys running, classical music, and finding new beers to try.



FANG KE, PH.D., SHENOY LAB

Dr. Ke hails from China. She received her Ph.D. in Immunology from the Shanghai Jiao Tong University School of Medicine in 2013 where her research focused on defining the immunoregulatory potential of skin-derived mesenchymal stem cells in a mouse model of multiple sclerosis (MS) (*i.e.,* experimental autoimmune encephalomyelitis (EAE)).

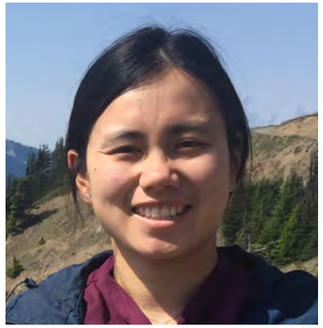
In 2017, she moved to Dr. Irina Grigorova's lab to research the factors that regulate development of antibody responses against pathogens while preventing generation of autoantibodies and autoimmunity in T cell dependent immune responses. Her major research project focused on dissecting the mechanisms of B cell tolerance in germinal centers (GCs) that are critical to prevent development of autoreactive memory B cells and long-lived plasma cells. Dr. Ke joins the Shenoy Lab of Barrier Immunobiology to study how immune cell and epithelial cell interaction remodels the immune responses in the lung.

When not in the lab, Dr. Ke enjoys spending time with her son and her husband, and likes traveling and hiking.

FENGLEI LI, PH.D., CHOUDHURI LAB

Dr. Li completed his Ph.D. at the University of Science and Technology of China under the supervision of Dr. Zhigang Tian, uncovering a new subset of liver-resident γδ T cells maintained by gut microbiota-derived lipids. Currently guided by Dr. Kaushik Choudhuri, Dr. Li delves into the mechanics of endogenous γδTCR and Chimeric Antigen Receptor (CAR), while also studying microvesicles released by activated αβ T cells.

Apart from his research, Dr. Li enjoys spending time with his family, playing soccer, watching movies, and reading.



FENGRONG WANG, PH.D., CARRUTHERS LAB

Dr. Wang is from China. She received her B.S. in Biochemistry from SUNY-Oswego and Ph.D. in Biochemistry and Molecular Biology from the Johns Hopkins University. Her graduate research focused on studying the mechanism that governs keratinocyte migration. In 2018, she started her postdoctoral training in the Carruthers lab where her research mainly centers on the studying the differentiation process of *Toxoplasma gondii*.

When not in the lab, Dr. Wang enjoys spending time with her family, and likes traveling and playing sports.

In 1902, the U-M Department of Bacteriology is established. Novy is the Chair until 1935.

1902

An outbreak of rabies in Ann Arbor leads the Regents to create a Pasteur Institute within the Hygienic Laboratory.

1903

From 1902 to 1926, the Department is located in the West Medical Building (Dana Natural Resources)

Carl Zeiss microscope, built in Jena, Germany, in 1911 (M&I collection).

From 1902 to 1935, Novy is Chair of the Department of Bacteriology, and serves as Dean of the U-M Medical School from 1933 to 1935. Novy was an organic chemist who became interested in bacteria through his work with Vaughan. His dissertation was on the toxic products of the bacillus of hog cholera. Early in his career he attained an international reputation as an authority in the field of bacteriology, and as a great teacher and scientific investigator.

Novy publishes the first article from the Department on parasites: "Mosquito Trypanosomes," *Journal of Hygiene*, April 1906.

1906

WELCOME TO M&I: NEW STAFF!

Four staff members joined M&I to further support the Department's administration and communication activity. Welcome to M&I!

DANIEL MACEDO DE MELO JORGE, PH.D.

Joined M&I in August 2022

As a Research Lab Specialist Lead / BSL3 Facility Manager, Daniel Macedo de Melo Jorge supports different PIs with work in the BSL3/ABSL3. Based in the Wobus Lab, he is also involved with enteric virus work. Before moving to Ann Arbor, Macedo de Melo Jorge was working with respiratory viruses and arboviruses in Prof. Eurico Arruda's Lab at the Universidade de Sao Paulo in Brazil. In 2020, he started working with Sars-CoV-2 in cell culture and *in vivo* models in a BSL3/ABSL3. He received an Msc. and Ph.D. in Genetics from Universidade de Sao Paulo (Brazil) and B.s.c in Biological Sciences from Universidade Federal do Ceara (UFC), Brazil.

He enjoys spending time with his three sons as well as playing soccer in Fuller fields, cooking, and exploring the breweries here in Ann Arbor.

ELISABETH PAYMAL

Joined M&I in August 2022

As a Communication specialist, Elisabeth Paymal supports special communication projects, including the website migration, the development of an internal website, and the publication of the Annual Report/ Newsletter. She writes blog stories about our scientists, trainees, and the life of M&I. She holds a similar position in the Department of Computational Medicine and Bioinformatics, and serves as the lead person for the basic sciences communicators's community of practice of the U-M Medical School.

Paymal has been with the U-M for a long time in different roles, including as a communication specialist at the Center for RNA Biomedicine. She holds a Master's degree in psychology from Sorbonne University in Paris, and a BFA in graphic design from U-M.

She loves hiking, backpacking, and being out in nature!

M&I staff is essential to the life of the Department. Every day, they support our faculty, scientists, and students, helping to efficiently run the Department, fostering our community and representing our values.

EKATERINA BETHKE

Joined M&I in October 2022

As a Research Administrator Lead, Ekaterina Bethke works closely with M&I faculty primarily on post-award and financial management matters. This includes providing M&I faculty with monthly financial reports, creating *ad-hoc* financial projections upon request, processing and advising award changes requests, working with faculty on annual RPPRs, Final Progress Reports, FSRs/UG reports, initiating/monitoring/approving subcontract invoicing, submitting journal entry requests and processing PARs, reviewing and approving Concur expense reports and OPS purchase requests.

Prior to joining M&I, Bethke worked at the U-M Life Sciences Institute as a Research Administrator Intermediate, providing LSI faculty with both pre- and post-award grants management. She received her Master's in Business Administration from Eastern Michigan University in 2016 and became a certified research administrator in 2017.

Ekaterina enjoys traveling and attending art classes.

ANGELA KELLY

Joined M&I in October 2022

As M&I Administrative Specialist Associate Health, Angela Kelly is responsible for Staff and Student onboarding/offboarding, job postings, recruitment and offers. She is a DEI liaison for M&I Administrative Staff.

Prior to joining M&I, she worked at U-M Shared Services Center for over seven years where she held several positions: Human Resource Coordinator, Diversity Equity & Inclusion Planning Lead/ Committee Chair, Peoplepay Associate, and Statement of Activity Specialist.

Kelly holds a Bachelor's of Business Administration from Marygrove College, a Master's of Management (Human Resources) from Walsh College of Business, and a DEI in the Workplace Certificate from the University of South Florida.

She loves spending time with her family, especially attending the bi-yearly family reunions.

WELCOME TO M&I: NEW STAFF!

NATALIE DEEB

Joined M&I in January 2023

As a Program Manager, Graduate Studies & Student Services, Natalie Deeb is the student services and graduate studies representative for the M&I Department. Her job consists of a lot of functions, but the main goal is to make sure the students have a successful time in the program. This is means managing milestones, funding, courses, and anything in between.

Prior to joining M&I, Deeb was with the Texas Association for the Education of Young Children (TXAEYC) where she was the Outdoor Learning Specialist, and worked under an outdoor learning grant. She helped early childhood centers improve their outdoor spaces in partnership with landscape architects. The improvement in outdoor learning spaces leads to physical, cognitive, and social benefits for the children. Deeb hods a Bachelor's degree, Healthcare Administration and a Master's degree, Public Health both from the University of Toledo.

She really enjoys working out and recently joined a cross-fit gym with her sister!

JOHN FRANKLIN

Joined M&I January 1, 2023

As a Laboratory Assistant, John Franklin prepares solutions/medias and operates laboratory epquipment. He sets-up equipment and supplies for multiple teaching laboratories. He cleans labs, maintains equipment, and chemical and supply inventories. He also assists with decommission and moving of laboratories, and updates equipment list for the entire department. He creates layouts for common equipment space to calculate percentile used for space survey.

Prior to joining M&I, Franklin worked at RedViking as a Co-op student where he did part design and revision work. Franklin holds a Bachelor's degree in mechanical engineering from Kettering University with a minor in business.

Outside the lab, he enjoys canoeing, camping and hiking.

WELCOME TO M&I: POSTDOCTORAL FELLOWS!

Christophe-Sebastien Arnold, Carruthers Lab
Dulce Guillen-Matus, Balunas Lab
Surbhi Gupta, Mobley Lab
Jungmoo Huh, Balunas Lab
Hargobinder Kaur, Carruthers Lab
Nathaniel Lartey, King Lab
Allison Mason, Schloss Lab
Christian Michael, Kirschner Lab
Santosh Paudel, Mobley Lab
Estela Pereira, Spindler Lab
Shelby Rae (Kesterson) Clark, Telesnitsky Lab
Chaitra Shankar, Snitkin Lab
Biniam Tebeje, Joel Swanson Lab
Qinnan Yang, Martens Lab
Guolei Zhao, O'Meara Lab

Postdoctoral fellows Maral Budak, Pariksheet Nanda and Christian Michael from the Kirschner lab enjoy Tea@3.

1926

In 1926, the East Medical Bldg (now 1100 N. University Bldg) is built at a cost of $1.14 million.

It accommodates the departments of anatomy, bacteriology and physiology.

1929

Scottish bacteriologist Alexander Fleming identifies penicillin at St. Mary's Hospital in London.

Malcolm H. Soule

1935

From 1935 to 1951, Malcolm H. Soule is Chair of the Department of Bacteriology.

Reuben L. Kahn, professor of bacteriology and serology from 1928 to 1956, in his lab in 1938. Kahn is the first immunologist in the Department of Bacteriology, and is best known for developing the Kahn precipitation test for syphilis.

1942

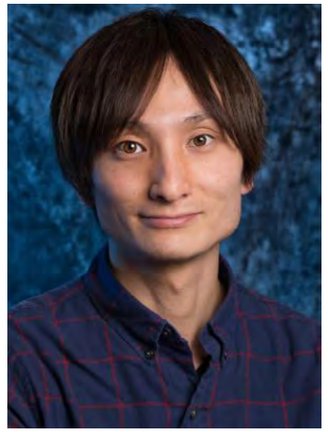
Jonas Salk is a research fellow in the U-M Department of Epidemiology.

WELCOME TO M&I: RESEARCH STAFF!

Luiza Castro, Spindler Lab
Rita Costa, Moore Lab
Tad Eichler, Mobley Lab
Daniel Jorge, BSL3/ABSL3 Manager
Christina Kiser, Mobley Lab
Shiuhyang Kuo, Mobley Lab
Ariel Lindholm, Wang Lab
Lisa Lojek, Snitkin Lab
Josh Perkins, Moore and Zhou Lab
Vijay Raaj, Shenoy Lab
Amber Siglin, Chang Lab
Jonathan Simon, ASV office, Spindler Lab

FACULTY PROMOTION

Congratulations to Tomoyuki Murakami on promotion to Research Assistant Professor!



In September 2023, Tomoyuki Murakami was promoted to Research Assistant Professor. In Dr. Ono's lab, he studies the roles of macropinocytosis in HIV-1 entry into primary CD4+ T cells and fibroblastic reticular cells in HIV-1 spread and latency.

Murakami has been interested in HIV-1 since high school, when he was shocked to learn that there was no cure for AIDS. He received his B.S. from Saitama University, Saitama, Japan, and his M.S. and Ph.D. from the University of Tokyo, Tokyo, Japan. His dissertation was on Vpr, one of the HIV-1 accessory proteins, which arrests the cell cycle at the G2 phase and induces apoptosis. By using live-cell imaging, he succeeded in observing Vpr-induced G2 arrest in living cells following apoptosis. From 2014–2019, Murakami was a Postdoctoral Fellow in the M&I Ono lab where he became a Research Investigator in 2019.

He is the lead author of many peer-reviewed articles including in *PNAS* and *Nature Communications.* He is also the organizer of the Virology Journal Club at the U-M Medical School, and mentors students in the Ono lab.

As a Research Assistant Professor, he will further his research on the roles of macropinocytosis in the HIV-1 life cycle.

Dr. Murakami poses with his cake at the celebration for his promotion.

"Our research to elucidate the pivotal role of macropinocytosis in HIV-1 infection through the collaboration with macropinocytosis specialists, Drs. Philip D King and Joel A Swanson, could uncover novel therapeutic avenues."

READ MORE

1945 — Ruth Lofgren and Soule publish an article in the *Journal of Bacteriology,* about *Spirochaeta Novyi,* a bacteria named after Novy.

1946 — Lofgren is the first woman to be appointed Assistant Professor in Bacteriology at the U-M.

1948 — The new World Health Organization, with 55 national signatories, launches campaigns for immunization of children against diphtheria, tetanus, whooping cough, measles, paralytic poliomyelitis (polio), and tuberculosis.

1950 — The U-M Medical School celebrates its centennial.

1951 — From 1951 to 1970, Walter J. Nungester is named Chair of the Department of Bacteriology.

Walter J. Nungester

1952 — Albert Wheeler is the first Black faculty member hired in the department.

1953 — James Watson and Francis Crick elucidate the double-helix structure of DNA, based on X-rays taken by Rosalind Franklin.

FACULTY AWARDS

M&I community members' achievements and commitment to research and education are recognized by many awards. These span from life-time achievement to junior research recognition and staff appreciation. Congratulations to all!!

Marcy Balunas was elected to lead Gordon Research Conferences.
A. Oveta Fuller received the 2022 Regents' Award for Distinguished Public Service. The American Society of Virology (ASV) created two named lectures; one of them is the "A. Oveta Fuller Lecture."
Katherine Gallagher was elected to the National Academy of Medicine.
Yvonne Huang was honored with 2023 MICHR Distinguished Clinical and Translational Research Mentor Award.
Denise Kirschner has a Wellcome LEAP grant worth $5M+ and was invited to expand it.
Nicole Koropatkin led a FASEB Summer Conference.
Adam Lauring was elected to American Society of Clinical Investigation (ASCI).
Eric Martens organized the Beneficial Microbes meeting and submitted two patents.
Bethany Moore was elected to lead a Gordon Research Conference.
Teresa O'Meara won the Thomas J. Walsh Young Investigator Award from the Medical Mycological Society of the Americas.
Mary O'Riordan was elected to lead a Gordon Research Conference.
Malini Raghavan was named Nancy Williams Walls Research Professor.
Patrick Schloss received the 2023 EBS Teaching Award.
Kathy Spindler was honored with the Wolfgang & Patricia Joklik Distinguished Service Award from the American Society for Virology.
Andrew Tai was elected to ASCI and as the Elisabeth Crosby Award winner by the Galens Medical Society for outstanding medical student teaching in basic sciences.
Alice Telesnitsky re-funded her U-54 grant (CRNA) for the third time. She is ranked #10 in NIH funding nationally for all Microbiology PIs.

Dr. Malini Raghavan was named the Nancy Williams Walls Research Professor

This professorship recognizes scientific excellence and supports the career of a woman scientist. Congratulations Dr. Raghavan!

The Department of M&I is pleased to announce that Malini Raghavan, Ph.D., is named the Nancy Williams Research Professor.

This new research professorship was made possible thanks to a gift from Dr. Nancy Williams Walls. Dr. Walls intended to support the career of women scientists in M&I, and this professorship is funded through financial growth of her initial gift.

We are very grateful to Dr. Walls for her generous support.

To help us choose the recipient, M&I chair Beth Moore convened a nomination committee with a panel of basic science chairs and Vern Carruthers (M&I). The committee also sought input from M&I Executive Committee.

"Dr. Raghavan is so richly deserving of this honor for so many reasons. She really is a world expert in the field of HLA class I biology. In addition to her research, I have always admired that she is someone who is passionate about training, whether that is in the classroom or the laboratory. She is also someone who steps up and gives of her time and talents in service to the university and she has done that on DEI issues, on Advisory Committee on Appointments, Promotions and Tenure, and especially as the Director of the Graduate Program in Immunology. She is passionate about these endeavors and we are all richer for it! I believe she embodies the ideals that Dr. Walls sought to support as a terrific female scientist and role model," said Beth Moore.

1955

April 12, 1955, at the U-M Rackham Auditorium, Dr. Thomas Francis announced the success of the two-year national field trials of the poliomyelitis vaccine developed by and named after former U-M research fellow Jonas Salk.

About 16,000 cases of poliomyelitis occurred each year in the U.S. in the 20th century compared with none in 2020.

1959

100th U-M Doctorate in Microbiology is granted.

Faculty, 1959. Front row: Johnson, Garrison, Rajam, Nungester; back row: Blumenthal, Merchant, Gerhardt, Kempe, Whitehouse and Wheeler

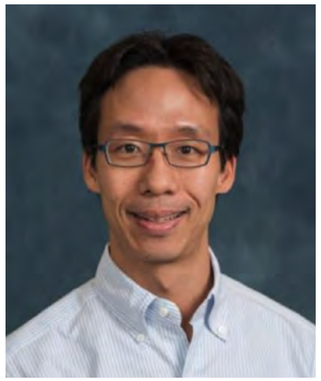
1963

The Department of Bacteriology is named Department of Microbiology.

Classroom ca. 1964 in East Medical Building

Faculty, 1966. Front row, Johnson, Whitehouse, Nungester (Chair), Olsen, Freter, Merchant, Juni; back row: Holmgren, Fearnehough, Harvie, Talmadge, Paradise, Haines, Garrison, and Wheeler

Andrew W. Tai, M.D., Ph.D., has been appointed Assistant Dean for Early Medical Education in the Medical School



We are pleased to share that Andrew W. Tai, M.D., Ph.D., has been appointed assistant dean for early medical education in the Medical School, effective July 17, 2023. He will oversee the pre-clinical medical student education program and work closely with the Office of Admissions and the Office of Health Equity and Inclusion to develop robust pre-matriculation and pathway programs for the Medical School.

Dr. Tai began teaching at the medical school as director of the pre-clinical gastroenterology curriculum in 2014. He has helped to guide the medical student pre-clinical curriculum through several major transformations, beginning with the transition from a two-year to a one-year pre-clinical curriculum, now called the Scientific Trunk. He has served as assistant director of the Scientific Trunk since 2018.

His teaching has been recognized by multiple awards for undergraduate and graduate medical education, including the Kaiser Permanente Award for Excellence in Teaching (the highest award for pre-clinical teaching in the Medical School), the Elizabeth Crosby Award for outstanding teaching of medical students in a basic science area, the Richard D. Judge Award for excellence in medical student teaching in Internal Medicine, and multiple Faculty Teaching Awards from the graduating gastroenterology fellows.

An associate professor of internal medicine/gastroenterology and microbiology and immunology, he has an active basic science research program focusing on the cell biology of RNA virus infection, originally hepatitis C virus and more recently dengue, Zika, and SARS-CoV-2. He is an elected member of the American Society for Clinical Investigation and a fellow of the American Association for the Study of Liver Diseases (AASLD).

Dr. Tai earned his undergraduate degree in biochemical sciences from Harvard College and his M.D. and Ph.D. degrees from Weill Cornell Medical College and the Tri-Institutional M.D.-Ph.D. program in New York. He completed an internal medicine residency at Brigham and Women's Hospital followed by a clinical and research fellowship in gastroenterology and hepatology at the Massachusetts General Hospital before joining the University of Michigan Medical School as faculty in 2009.

FACULTY SERVICE HIGHLIGHTS

M&I faculty members are highly engaged and dedicated to the success of M&I research and training. Thank you for what you all do to support and advance our community!

Vern Carruthers directs the Molecular Mechanisms of Microbial Pathogenesis Program at U-M, and is a co-director for the Biology of Parasitism laboratory course at the Marine Biology Laboratories in Woods Hole, MA.
Cheong-Hee Chang is on the Steering Committee for the African Studies Center and American Association of Immunologists Publication Committee.
Kathy Collins is Editor in Chief of *JCI Insight* and Director of the MSTP program.
Phil Hanna is MS Program Chair.
Mike Imperiale is Editor in Chief of *mSphere* and US representative to the Global Science Forum Expert Group on Research Norms, Standards, and Integrity at the Organization for Economic Cooperation and Development. He also completed a 5-year term as Associate Vice President for Research – Policy and Compliance.
Denise Kirschner is Co-Editor in Chief *J. Theoretical Biology* and Member of Burroughs Wellcome Fund's Pathogenesis Committee. She serves on External Advisory Boards for projects at U. California and Georgia Tech and co-Directs the Center for Systems Biology. She also chairs our Mentoring Committee and is past-president of the Society of Mathematical Biology.
Nicole Koropatkin is on the Advisory Board for FASEB, and has completed her term as PIBS Associate Director.
Yasmina Laouar is head and Chair of the faculty senate Committee on the Economic and Social Well-Being of the Faculty.
Adam Lauring chaired the 2022 Virology Search Committee and is an ASV Council member.
Eric Martens organized the Beneficial Microbes meeting and submitted two patents.
Beth Moore is Co-Chair of the EBS committee.
Beth Moore and **Kathy Spindler** serve on the ADVANCE advisory board.
Akira Ono is on the American Society for Virology (ASV) DEI committee.
Mary O'Riordan recently completed service as Associate Dean for Graduate and Postdoctoral Studies and is on the Van Andel Board of Directors. She is M&I Graduate Studies Chair.

Delna Garrison is the first woman faculty member to be promoted to Associate Professor.

1968

The Department of Microbiology moves to the Medical Sciences Building II.

1969

Medical Sciences Building II in 1969

From 1970 to 1982, Frederick C. Neidhardt is Chair of the Department of Microbiology.

1970

Frederick C. Neidhardt

Department of Microbiology, May 4, 1973

Mary O'Riordan, Maria Sandkvist, Kathy Spindler and **Christiane Wobus** have agreed to co-chair the faculty searches for 2023.
Malini Raghavan directs the Immunology Graduate Program at U-M.
Maria Sandkvist is permanent member NIH PCMB study section; **Christiane Wobus** ended as permanent member of NIH VIRA; **Beth Moore** chairs NIH LCMI and PFF.
Patrick Schloss chairs the ASM Journals Committee; serves on U-M STRIDE.
Kathy Spindler is the ASV Secretary-Treasurer and co-host of *This Week in Virology* podcast.
Chelsey Spriggs is an ASV Council member.
Michele Swanson serves on Michigan Medicine's Executive Committee, directs the Office of Postdoctoral Studies, co-hosts *This Week in Microbiology* podcast and is past president of the American Society for Microbiology.
Andrew Tai serves on the Michigan Center for Infectious Disease Threats for M&I.
Christiane Wobus is on the ASV Travel Award Committee and chairs U-M Institutional Biosafety Committee (IBC). **Phil Hanna, Adam Lauring, Akira Ono,** and **Andrew Tai** all serve on IBC.
Vince Young is Chair of the Council on Microbial Sciences for the American Society for Microbiology and also serves as a temporary voting member of the FDA. He is M&I Wellness Network Advocate.

M&I faculty at departmental picnic, September 2023

FACULTY LOSS AND DEPARTURES

A. OVETA FULLER, PH.D.

In memoriam

The Department of Microbiology & Immunology and the Medical School's community acknowledge with profound sadness the death of A. Oveta Fuller, Ph.D., Associate Professor in the Department of Microbiology and Immunology at the Medical School. Professor Fuller died of lymphoma on November 18, 2022.

Dr. Fuller received her B.A. degree in Biology in 1977 and her Ph.D. in Microbiology and Immunology in 1983, from the University of North Carolina at Chapel Hill. She joined the University of Michigan Department of Microbiology and Immunology as an Assistant Professor in 1988 and was promoted to Associate Professor in 1995. Starting in 2005, Dr. Fuller was Science Advisor at the African Methodist Episcopal Church - Service and Development Agency (AME-SADA) for HIV and AIDS Prevention. Dr. Fuller was the Associate Director (2014-16) and Director, interim (2016-17) of the African Studies Center of the International Institute of the College of Literature, Science and Arts. She received many awards for her community engagement, including the Detroit-Windsor Metropolitan Council of Churches, 2017 "Trumpet Award" for Excellent Service in Community Engagement and was the Sarah Goddard Power Award Recipient 2022, Academic Women's Caucus, University of Michigan.

Dr. Fuller was a distinguished virologist who focused her work on herpesvirus entry and pathogenesis and translational research for HIV/AIDS elimination. She was dedicated to global health and health equity interventions to reduce infectious and chronic diseases. For almost two decades, she worked with church leaders in Botswana, South Africa and Zambia to develop and test a prevention model designated the "Trusted Messenger Intervention" (TMI). TMI engages with clergy and faith leaders who have substantial community access and influence to effectively address HIV/AIDS. This program profoundly improved the lives of the communities she served by limiting the spread of infectious disease through scientific education, implementation, and community engagement.

Dr. Fuller served on many advisory boards and committees at the University of Michigan, nationally and internationally, generously contributing her unwavering commitment to create a better world. A bioethics advocate, she was a Founding Member of the Bioethics Commission, Samuel Dewitt Proctor Conference, Inc. and Tuskegee University Center for Bioethics. In 2020, she was a Member of the

Department of M&I, Sept. 29, 1980. Front row: Bill Murphy, Garth Jones, Lathe Claflin, Fred Neidhardt, Mike Savageau, unknown; rear row: David Friedman, Wes Dunnick, Frank Whitehouse, Rolf Freter, unknown, Ethel Jackson, Bill Brockman, Al Wheeler

Vaccines and Related Biological Products Advisory Committee for the FDA. She was instrumental in the approval of the COVID-19 vaccines and continued her science education activity in local communities during the pandemic.

Dr. Fuller was a pioneer in so many ways. She was the first Black woman to receive tenure in Microbiology and Immunology and she never stopped advocating for opportunities for women and trainees, especially from diverse backgrounds. She touched the lives of so many through her classes, fieldwork, ministry and service. She was a unique and special faculty member that made our department and the world a better place and we will forever be in her debt.

As we mourn the loss of our beloved colleague, we extend our heartfelt condolences to her husband, Dr. Jerry Caldwell, her three children, and her many loving relatives and friends.

M&I hosted a Celebration of Life, February 18, 2023, in NCRC. The video recording of the event is available here.

Left to right: Oveta Fuller, Denise Kirschner, Malani Raghavan, Alice Telesnitsky, Michele Swanson and Cheong-Hee Chang.

A. Oveta Fuller Memorial Award Fund

This fund was created in memory of Dr. Fuller. Gifts to this fund will support the A. Oveta Fuller Award which will be given to a promising young scientist working in an area relevant to public health. The awardees will give a memorial lecture in Ann Arbor and receive a cash prize. This award will recognize people doing outstanding work aligned with Dr Fuller's values and also help support remarkable young scientists in this area.

Donate here

IRINA GRIGOROVA, PH.D.

Dr. Irina Grigorova is an immunologist who studies spatio-temporal dynamic regulation of T-dependent B cell immune response in health and disease.

The mammalian immune system has evolved to respond to a variety of infectious agents by integrating "danger signals" into distinct signaling outcomes and thus distinct dynamics of intercellular interactions. When the immune response is successful, disease eradication occurs. Grigorova's research interests are directed at understanding the quantitative principles that underlie this "signal processing" in an adaptive immune response, specifically in the T-dependent B cell response.

Her appointment ended March, 2023, as she returned to Russia for personal reasons.

MY-HANG (MAE) HUYNH, PH.D.

After more than 20 years of being a key member of the Carruthers lab, Dr. My-Hang (Mae) Huynh retired as an Associate Research Scientist in February 2023 to pursue her other passion as a skilled potter and potting instructor.

Dr. Huynh first joined the Carruthers lab in 2002 as a Postdoctoral Fellow at Johns Hopkins University. She moved with the group to U-M in 2006 coinciding with her promotion to Research Investigator. Dr. Huynh's research focused mainly on understanding aspects of how *Toxoplasma gondii* exits from infected cells before migrating to and invading a new target cell. She showed that this parasite critically depends on an adhesive protein complex (the MIC2-M2AP complex) for migration and adhesion, and that the complex is important for parasite virulence. Dr. Huynh also engineered a genetically tractable *Toxoplasma* strain that is widely used by the field to precisely manipulate parasite genes.

1983

Kary Mullis invents the polymerase chain reaction (PCR) that rapidly makes millions to billions of copies of a specific DNA sample, allowing scientists to take a very small sample of DNA and amplify it to a large enough amount to study in detail.

Department of M&I, late 1980's. Front row: Garth Jones, Rich Jove, Barry Eisenstein (Chair), Mike Savageau, Lathe Claflin; rear row: Frank Whitehouse, Steve Cooper, Mike Imperiale, Oveta Fuller, Rod Nairn, Elliot Juni, Don Clewell

Barry I. Eisenstein

1986

From 1986 to 1992, Barry I. Eisenstein is Chair of the Department of M&I.

Rolf G. Freter, a professor of microbiology from 1966 to 1996, and engineer Dick Coy design the Coy Anaerobic Chamber to conduct studies on the anaerobic specimens that lived in the intestine of mice.

Throughout her career Dr. Huynh has not only made key scientific contributions but also expertly trained dozens of new personnel in the Carruthers lab, was a model of efficiency at the bench, and kept others entertained with her dry sense of humor. We wish Dr. Huynh all the best with her second career in pottery!

Mae's retirement party!

Vern Carruthers and Mae Huynh

ALFREDO GUERRA, PH.D.

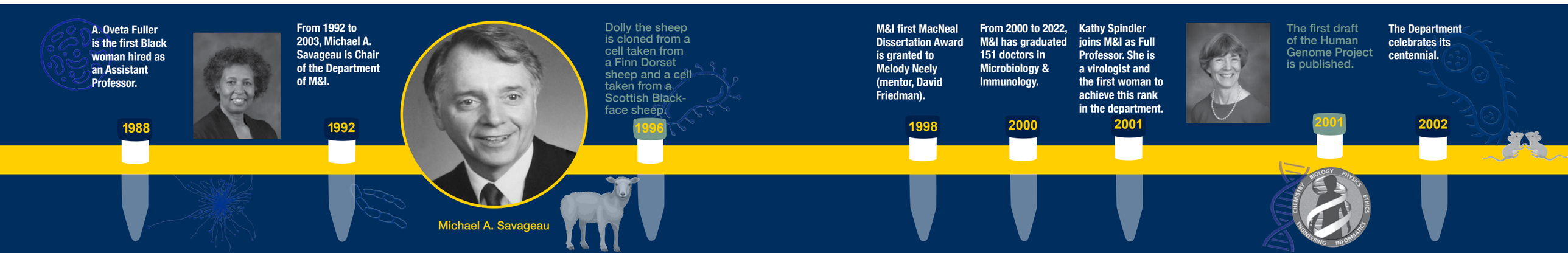
Dr. Alfredo Guerra, Research Investigator affiliated with the Carruthers lab, was recruited to Cayman Chemicals to help lead their protein core facility. Dr. Guerra joined the Carruthers lab as a Postdoctoral Fellow in 2017 to elucidate the structural and biochemical basis of membrane binding by a pore-forming protein that *Toxoplasma gondii* uses to escape from infected host cells after replicating therein. In parallel, Dr. Guerra also identified an aspect of how *Toxoplasma* stores iron within its lysosome-like internal organelle for safe keeping and utilization as a key cofactor for several metabolic pathways during infection. Dr. Guerra brought invaluable expertise in protein structure and biochemistry to the Carruthers lab, he helped to mentor several trainees in the group, and he helped lift the lab with his friendliness and wit. Cayman chemicals is fortunate to have recruited Dr. Guerra with his extensive knowledge and skills in protein biochemistry and his outgoing personality.

STAFF AWARDS AND KUDOS

Ekaterina Bethke, Elisabeth Paymal, Alan Phlipot and **Sheryl Smith** received "Making a Difference" awards.
Will Fitzsimmons received the 2023 EBS Research Staff Award.
Brenda Franklin has done a great job with all the renovation and move efforts.
Jona Kalaj passed her Certified Research Administrator exam.
Katie McBride and **Sheryl Smith** received AdMIration awards.
Melissa McGeorge has processed and/or assisted with processing 1200 orders in OPS in the past six months. This does not include the work she does with travel and expense reimbursements and hosting.
Britton Michmerhuizen (O'Riordan lab) will be starting medical school at Michigan State University College of Medicine in the fall.
Kim Rize received the Go Blue! award from her Med School CDA colleagues.
Cindy Shaw presented at the National Council of University Research Administrators annual conference.
Joe Walliga has been in M&I for 20 years.

Joe Walliga (Kirschner Lab) has been in M&I for 20 years!

Left to right: Beth Moore and Will Fitzsimmons hold the EBS award; Katie McBride and Sheryl Smith hold their AdMIration awards.

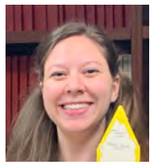


GRADUATE OR STUDENT AWARDS & HIGHLIGHTS

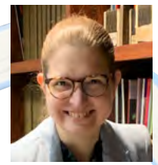
PHD DEFENSES

Aric Brown
(Mobley Lab)
"The Role of the ArcA Metabolic Regulator in Gram-Negative Bacteremia"

Austin Campbell
(Schmidt Lab)
"Metabolism of Dietary Fiber by Human Gut Microbes: Interspecies Interactions and the influence of Molecular Hydrogen"



Amanda Photenhauer
(Koropatkin Lab)
"Carbohydrate Binding Molecule 74 (CBM74) is a specialized resistant starch binding domain"



Megan Procario
(Imperiale Lab)
"Single Cell High Content Microscopy Analysis of BK Polyomavirus Infection"

TRAINEE AWARDS

Yolanda Rivera-Cuevas received the MacNeal Dissertation Award. It recognizes a doctorate thesis for its exceptional and innovative science as well as for its understandability to a non-expert audience.

The 2022 MacNeal Award was presented to Yolanda Rivera-Cuevas for her dissertation titled "*Toxoplasma gondii* exploits the host ESCRT machinery for the uptake of host cytosolic proteins," defended March 10, 2022. Her dissertation mentor was Professor Vern Carruthers.

On March 3, 2023, Dr. Rivera-Cuevas gave the 2022 MacNeal Award lecture in Ann Arbor. Her talk was titled "GBP1-driven innate immune defence against *Toxoplasma gondii*."

Organization of Microbiology and Immunology Students (OMIS)

President: Zach Powers
Vice President: Nicole Cady
PIBS Recruiting Chairs: Andrés Rivera Ruiz and Jess Li
Social Chairs: Faith Anderson and Karen Zeise
Student-Invited Speaker Coordinator: Adam Hafner
BGSG Student Representative: Junha Lee
Press Coordinator: Katie Winner
DEI Liaison: Joey Krampen

Beth Moore hoods Dr. Helen Warheit-Niemi at Spring commencement.

HIGHLIGHTS

Faith Anderson earned the Rackham Predoctoral Fellowship and a MCIDT conference travel grant.
Juliet Anku won 2nd place for the LaJean Chaffin Trainee Presentation Awards at the Medical Mycological Society of the Americas meeting. She also received travel awards from the Microbiology Society *Candida* and *Candidiasis* meeting.
Madison Fitzgerald won a Rackham Travel Grant to present posters at ASM Microbe 2022 and ASM Microbe 2023. Her second year of F31 funding started in March 2023 and she served as a UROP mentor to Chaitra Moolaveesala who was selected as a Beckman Scholar .
Adam Hafner received travel awards from ASV and Rackham for an oral presentation.
Gabby Huizinga was chosen to co-chair the Gordon Research Seminar in 2024 on Biology of Acute Respiratory Infection. She also earned a F31 this year and got the Immunology Graduate Program Miller fund award.
Zach Powers presented at two scientific communication and outreach events at our Museum of Natural History.
Megan Procario also earned a Pandemic Research Recovery (PRR) grant.
Andres Rivera Ruiz received travel awards from ASV and Rackham for a poster presentation
Mack Reynolds got an AHA Fellowship.
Darian Santana received travel awards from the Microbiology Society *Candida* and *Candidiasis* meeting. He also had an F31, completed his MS in Epidemiology and had an NIH abstract award for MMPC.
Austin Shannon and **Patrick Rimple** won the 2022 M&I TA Award.
Pha Thaprawat earned an F30.

From 2003 to 2004, Michael Imperiale serves as Interim Chair.

2003

Michael Imperiale

From 2004 to 2019, Harry L.T. Mobley is Chair of the Department of M&I.

2004

Harry L.T. Mobley

Under Mobley's leadership, M&I doubles the size of its primary faculty, from 13 to 27 members. M&I has more women primary faculty than men.

Department of Microbiology and Immunology faculty, ca. 2008

UNDERGRADUATE STUDENT SPOTLIGHTS

HALLE FREY'S PASSION FOR IMMUNOLOGY

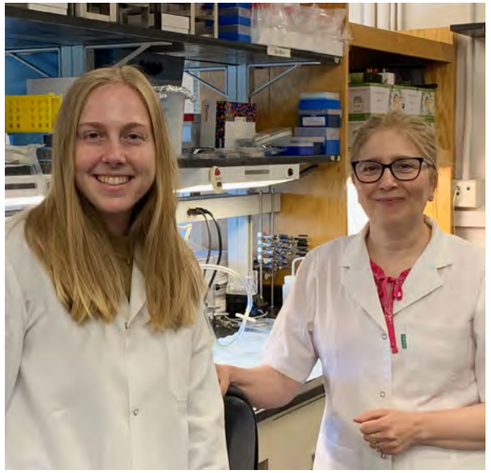
An undergraduate student in the Laouar lab

Halle Frey has an immense passion for immunology. She is fascinated by innate immune cells, the ones that respond almost immediately to infection –as opposed to adaptive immune cells. The complexity of the immune system is such that she thinks that there will always be more questions to be answered. And to discover one thing about the immune system, however small it might be, would make her really happy!

"Ever since I was younger, I thought it was so interesting that there were these invisible microscopic processes that allow life to happen, and we don't even know what's going on!" said Frey.

She is currently focusing on cellular plasticity —when one cell can modify its phenotype to become similar or identical to another cell— which challenges the definition of a cell itself. In particular, when a natural killer (NK) cell that is very effective at fighting a tumor enters the immunosuppressive tumor microenvironment, it transforms into an ILC1-like cell that cannot attack them. However, NK cells and ILC1s look very similar on the surface, and to further understand the plasticity mechanism, it is necessary to first find biological markers that allow scientists to distinguish between the two types of cells. This is what Frey is exploring in Dr. Yasmina Laouar's lab. She has identified one such marker that is reliable in different organs and conditions in the mouse and she is already preparing a publication of these results.

READ MORE



Left, Halle Frey; right: Yasmina Laouar

UNDERGRADUATE KUDOS

Sarah Babka (O'Meara lab) was named a Stamps Scholars Program award winner. **Norah Judge,** a UROP student (O'Riordan lab) won a poster award at the Spring Research Symposium for her work on Type-I IFN induction during MRSA infection.

MEET VICKY WANG!

An undergraduate student in the A. Ono lab

Vicky Wang studies hard and is not afraid of exploring broadly while being efficient and down to earth. In Spring 2023, she graduated with a BS in Microbiology with a minor in Statistics and a minor in General Health, all this achieved in just three years. And during these three years, she worked in Dr. Akira Ono's lab.

Growing up in Ann Arbor, it all started with a class from the "Career and Technical Education" program offered at Pioneer High School. Through this program, Wang received a broad exposure to various career paths in medicine and biomedical research. Among several activities, she became CPR certified, learned about the anatomy of the body and basic hospital surgeries, did visit Michigan Medicine's IT Services, and eventually shadowed a registered nurse at the U-M Rogel Cancer Center. These experiences directed her toward a path in research in biomedicine.

Once she was accepted into the University of Michigan (U-M), she investigated HIV research opportunities and contacted Dr. Ono. Their first exchanges were through emails in which Dr. Ono asked Wang to read scientific papers, and let him know what she thought of them. She followed through with these "assignments," and eventually joined Ono's lab. There, she learned different microbiology techniques as applied to viruses (tissue culture, plasmids as vectors to study genes of interest, fluorescence microscopy, Western blot test to detect HIV antibodies, etc.). She particularly enjoyed working with protein identification to assess their involvement in HIV infectivity.

"I was very surprised to get results each time I'd do an experiment! It's amazing how much you learn with these techniques," she said.

She is very grateful to Dr. Ono for her training in his lab, and to Dr. Tomoyuki Murakami, Research Assistant Professor, for his guidance and supervision during these three years.

"Vicky was such an insatiable student, very dependable and high caliber, with a strong drive to grasp new concepts and to test new approaches. These were all visible qualities already during our early exchanges about what she understood from the paper I sent to her when she had yet to start her freshman year! We're going to miss her so much!" said Akira Ono, Ph.D.

READ MORE

Vicky Wang with fellow University of Michigan students on a backpacking trip at Pictured Rocks National Lakeshore in Michigan Upper Peninsula.

The Department NIH funding increases from ranking 35th in 2004 into the top 10 in 2019.

Front row: Denise Kirschner (Full Professor in 2008), Malini Raghavan (Full Professor in 2010), Michele Swanson (Full Professor in 2008). Back row: A. Oveta Fuller (Associate Professor in 1995), Alice Telesnitsky (Full Professor in 2010), and Cheong-Hee Chang (Full Professor in 2007)

2011 — **M&I launches the MS Program in Microbiology and Immunology.**

2015 — **M&I is named a historical site by the American Society for Microbiology.**

From 2019 to 2021, Bethany Moore is Interim Chair of the Department of M&I.

Bethany Moore

2019 — **SARS-CoV-2 virus causes the COVID-19 pandemic, killing millions of people around the globe.**

2019

PROGRAM IN BIOMEDICAL SCIENCES (PIBS)

The Program in Biomedical Sciences (PIBS) is designed to offer students maximum flexibility during the first year of graduate studies. PIBS students receive full funding and benefits, and can immediately begin training in one program or take a course of study compatible with several programs while completing research rotations. This program is great for students who want to explore and discover their scientific passion!

In 2022–23, four students joined M&I: Hannah Carter, Olivia Harlow, Katy Krupinsky, and Jackson Rapala.

M&I PIBS dinner

U-M Immunology Graduate Program Recruiting Event. Left to right: Malini Raghavan, Durga Singer, Ashley Pearson, Michal Olszewski, Venkat Keshamouni, Shannon Carty, Chang Kim, Mike Green, Beth Moore and Francisco Gomez-Rivera

POSTDOCTORAL FELLOWS NEWS & HIGHLIGHTS

Postdoctoral Association Representatives

Timi Adediran
Cameron Roberts

Timi Adediran earned an F32.
Haley Brown and **Fenglei Li** received a PRR grant.
Maral Burdak earned a grant from the Center for Data-Driven Drug Development and Treatment Assessment (DATA) and was chosen as a Discussion Leader for a GRC in July.
Caity Holmes has organized the *Klebsiella* Seminar Series for three years. In 2022–23, they had >380 registrations. M&I paid for the virtual poster session which had 11 posters, a job networking area, and lots of attendees. Holmes also earned the Kevin J. Thompson Sepsis Research travel award and was awarded a prestigious K99/R00.

Postdoctoral Fellows at M&I Departmental Picnic, September 2023

Emergency use of the first mRNA vaccine for SARS-CoV-2 is approved by the FDA.

Bethany Moore is named Chair of the Department of M&I. She is the first woman in the Department in this role.

M&I Blue Ridge NIH Ranking: #10.

M&I received over $18 million in NIH grants in 2022.

M&I has 30 primary faculty, 18 joint faculty, and 13 research track faculty.

2020 **2021** **2022**

Marcy Balunas with new Bruker timsTOF mass spectrometer that supports metabolomics research.

Department of Microbiology and Immunology retreat, October 2022

Amanpreet Kaur won a travel award for an oral presentation at AAI.
Nathaniel Lartey was named a Histochemical Society Merit awardee for 2023.
Emily Maggioncalda earned an F32.
Praveen Manivannan recently got a $500 travel award from the American Society for Virology (ASV) for his 2023 talk.
Christian Michael has been organizing movie nights!
Einar Olafsson received an International Postdoctoral Fellowship from the Swedish Medical Research Council.
Helen Rich received a travel award and gave an oral talk at an American Association of Immunologists meeting in 2023.
Cameron Roberts earned an outstanding and fundable score on his F32 application.
Guolei Zhao was supported by the IMM T32 grant.

Madison Fitzgerald, Faith Anderson, Gabby Entrup, Olivia Harlow, Jackson Rapala, Nicole Cady and Jenn Baker at PIBS recruiting dinner with Gary Huffnagle in background.

POSTDOCTORAL FELLOW GEOFF SEVERIN (MOBLEY LAB) RECEIVED THE COLLETT AWARD.

Dr. Collett (B.S.'73, Ph.D.'77) established this fund to provide on-going support of postdoctoral trainees in microbiology, virology, or immunology in the Department of M&I. The annual recipient fellow will be conducting novel research that is deemed high-risk/high-reward.

Severin's project topic:
The proliferation of antibiotic resistant bacteria is a global health concern and is primarily driven by the spread of resistance genes encoded on plasmids. Plasmids are a type of DNA that bacteria exchange with one another and can contain >1,000 genes. To accelerate our understanding of how plasmids aid bacteria and illuminate ways to combat bacterial infections we are developing a molecular tool that can destroy plasmids in the laboratory.

Geoff Severin and Christina Kiser (Mobley Lab Technician) who is an indispensible contributor to this project.

ALUMNI

THE HERITAGE LECTURE

The Heritage lecture is given annually by an outstanding scientist who trained in the Department of Microbiology and Immunology (as a student or postdoc) and who has moved on to a highly successful career elsewhere. The intention of this lectureship is to give the current generation of Microbiology and Immunology trainees (and faculty) an opportunity to meet and interact with former trainees who have carved successful career paths, and to allow the invitees a chance to reconnect with the department.

The 2022–2023 Heritage Lecture was delivered by Erin Garcia, Ph.D., University of Kentucky

"The focus of my lab is to understand the molecular mechanisms that govern antagonistic and cooperative interactions between Burkholderia species in the context of infectious disease." — Erin Garcia, Ph.D.

Erin Garcia, Ph.D., came to Microbiology and Immunology from Central Michigan University where she earned a 4.0 GPA supported by a Centralis Gold scholarship. Here, she was an outstanding student and developed into a creative bench scientist. Erin received her doctorate under Professor Harry Mobley's direction in September 2009. Her research topic focused on "Iron acquisition by *Escherichia coli*: ChuA and Hma heme receptors as virulence determinants and vaccine targets." She identified protein antigens from uropathogenic *E. coli* that elicited an immune response during experimental infections in the well accepted murine model of ascending urinary tract infection.

Erin completed a long-term project on which the transcriptome was determined for *E. coli* strains collected directly from the urine of women attending a clinic for symptoms of cystitis. She presented this work at the 2010 ASM and her poster was mobbed even though it was presented on the last day of the conference. Indeed, there are only a handful of published papers on global gene expression of bacterial pathogens in humans. This work, published in November 2010 in *PLoS Pathogens,* was the first assessment of global gene expression any pathogenic *E. coli* pathotype during a

Newly renovated space (6703 Med Sci II) welcomes M&I's two newest Assistant Professors, Anukul Shenoy and Yifan Wang.

2023

https://medicine.umich.edu/dept/microbiology-immunology

Harry Mobley and Erin Garcia

human infection. Overall, Erin published nine peer-reviewed articles from her work in the Mobley lab, five as first author.

"Erin was a terrific lab citizen and helped others along the way. She was tenacious in her own work but always had time to lend a hand. In my letter of recommendation for her current position at the University of Kentucky, I stated, 'She will succeed as a tenure track faculty and researcher. I guarantee this.' I was right." — Harry Mobley, Ph.D.

Balancing work & play!

Top right: Administrative staff office spring cleaning, March 23. Bottom left: Administrative team at foot golf outing, August 2023. Bottom right: Cornhole game at departmental picnic, September 2023

RESEARCH

555 publications!

M&I published 306 papers in 2022 plus an additional 249 papers as of August 9, 2023. Following are highlights from the different labs.

From Marcy Balunas Lab

Trachymyrmex septentrionalis ants promote fungus garden hygiene using Trichoderma-derived metabolite cues, Kathleen E. Kyle, Sara P. Puckett, Andrés Mauricio Caraballo-Rodríguez, José Rivera-Chávez, Robert M. Samples, Cody E. Earp, Huzefa A. Raja, Cedric J. Pearce, Madeleine Ernst, Justin J. J. van der Hooft, Madison E. Adams, Nicholas H. Oberlies, Pieter C. Dorrestein, Jonathan L. Klassen, and **Marcy J. Balunas,** *PNAS,* June 15, 2023, 120 (25) e2219373120, https://doi.org/10.1073/pnas.2219373120

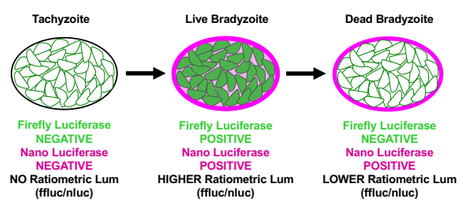
Marcy Balunas Lab

An extended defense response may exist in any relationship where one partner benefits from defending a mutualistic partner. Such a response is observed in the fungus-growing ant symbiosis, where ants must identify and remove pathogens of their symbiotic fungus gardens.

From Vern Carruthers Lab

A High-Throughput Amenable Dual Luciferase System for Measuring *Toxoplasma gondii* Bradyzoite Viability after Drug Treatment. Smith D, Lunghi M, Olafsson EB, Hatton O, Di Cristina M, **Carruthers VB.** *Anal Chem.* 2023 Jan 17;95(2):668-676. doi: 10.1021/acs.analchem.2c02174. Epub 2022 Dec 22.PMID: 36548400

This study reports the development of a first-of-its-kind assay that measures the viability of cultured chronic stage (bradyzoite) Toxoplasma gondii. *Chronic* T. gondii *infection can reactivate in people with weak immunity, causing severe disease in some cases. This new assay can be used to screen drugs for efficacy against the chronic stage of infection, thereby potentially identifying a treatment that could eliminate the infection in at-risk individuals.*



From Phil King Lab

Zho S*, Mekbib KY*, van der Ent MA*, Allington G, Prendergast A, Chau JE, Smith H, Shohfi J, Ocken J, Duran D, Furey CG, Le HT, Duy PQ, Reeves BC, Zhang J, Nelson-Williams C, Chen D, Li B, Nottoli T, Bai S, Rolle M, Zeng X, Dong W, Fu PY, Wang YC, Mane S, Piwowarczyk P, Fehnel KP, See AP, Iskandar BJ, Aagaard-Kienitz B, Kundishora AJ, DeSpenza T, Greenberg ABW, Kidanemariam SM, Hale AT, Johnston JM, Jackson EM, Storm PB, Lang SS, Butler WE, Carter BS, Chapman P, Stapleton CJ, Patel AB, Rodesch G, Smajda S, Berenstein A, Barak T, Erson-Omay EZ, Zhao H, Moreno-De-Luca A, Proctor MR, Smith ER, Orbach DB, Alper SL, Nicoli S, Boggon TJ, Lifton RP, Gunel M, **King PD**,** Jin SC**, Kahle KT**. Mutation of key signaling regulators of cerebrovascular development in vein of Galen malformations. *Nature Communications.* 2023. Accepted for publication.
*Equal contribution, **Equal contribution and co-corresponding author

Phil King Lab

The causes of Vein of Galen Malformations, the most common and serious type of arteriovenous malformation in pediatric patients, were identified using combined human genetic, bioinformatic, and mouse developmental genetic approaches.

From Denise Kirschner Lab

Concomitant immunity to *M. tuberculosis* infection, Louis R. Joslyn, JoAnne L. Flynn, **Denise E. Kirschner,** and Jennifer J. Linderman, *Scientific Reports,* (Dec 2022) 12:20731, DOI: 10.1038/s41598-022-24516-8, PMID: 36456599, PMCID: 9713124

Denise Kirschner Lab

In this work the Kirschner group predicted a first time ever upper bound on the lifespan of resident memory T cells in the human lung of 2-3 years. Additionally simulating reinfection scenarios and comparing with data from non-human primate studies, they predicted that the durability of a concomitant immune response against Mycobacterium tuberculosis *is intrinsically tied to levels of tissue resident memory T cells during primary infection.*

From Harry Mobley Lab

Conserved metabolic regulator ArcA responds to oxygen availability, iron limitation, and cell envelope perturbations during bacteremia. Aric N. Brown, Mark T. Anderson, Sara N. Smith, Michael A. Bachman, **Harry L. T. Mobley,** *mBio,* Sep 2023. DOI: https://doi.org/10.1128/mbio.01448-23

Harry Mobley Lab

Two-component anoxic redox control system (ArcAB) was identified as a fitness factor for multiple Gram-negative bacterial species in a model of bloodstream infection. ArcA, a global transcription factor, mediates the metabolic switch from aerobic respiration to fermentation during infection.

From Akira Ono Lab

The Ono Lab, from left to right, Akira Ono, Rajat Mudgal, Vicky Wang, Dishari Thornhill, Chris Sumner, Ricardo de Souza Cardoso, and Tomoyuki Murakami.

A Glu-Glu-Tyr Sequence in the Cytoplasmic Tail of the M2 Protein Renders Influenza A Virus Susceptible to Restriction of the Hemagglutinin-M2 Association in Primary Human Macrophages. Bedi S, Mudgal R, Haag A, **Ono A.** *J Virol.* 2022 Sep 28;96(18):e0071622. doi: 10.1128/jvi.00716-22. Epub 2022 Sep 13. PMID: 36098511

This work was primarily conducted by a previous MacNeal award recipient Sukhmani Bedi as a part of her thesis research. This work identified a specific amino acid sequence within influenza A virus M2 protein targeted by macrophage-specific antiviral mechanism and thereby molecularly defined a weakness of this virus during progeny virus production process. This is likely to help us identify the macrophage factor that restricts influenza assembly.

From Malini Raghavan Lab

Endo-lysosomal assembly variations among human leukocyte antigen class I (HLA class I) allotypes. Eli Olson, Theadora Ceccarelli, **Malini Raghavan,** (2023) *eLife* 12:e79144. https://doi.org/10.7554/eLife.79144

Major histocompatibility complex class I (MHC class I) molecules facilitate subcellular immune surveillance by presenting peptides on the cell surface. Peptides are generally processed in the cytosol, transported into the endoplasmic reticulum (ER), and assembled with MHC class I heavy and light chains. However, as many pathogens reside within multiple subcellular organelles, peptide sampling across non-cytosolic compartments is also important. This study shows that human MHC class I polymorphisms, well known to affect ER assembly modes, also influence assembly within endosomal compartments of cells.

Malani Raghavan Lab

From Pat Schloss Lab

Pat Schloss Lab

Diluted Fecal Community Transplant Restores *Clostridioides difficile* Colonization Resistance to Antibiotic-Perturbed Murine Communities. Lesniak NA, Tomkovich S, Henry A, Taylor A, Colovas J, Bishop L, McBride K, **Schloss PD.** *mBio.* 2022 Aug 30;13(4):e0136422. doi: 10.1128/mbio.01364-22. Epub 2022 Aug 1.PMID: 35913161

We modified the structure of the murine gut microbiota using one of three different antibiotics and found that different dilutions of feces from healthy mice allowed the mice to clear a Clostridioides difficile *infection. This is part of a long line of work in the lab showing that* C. difficile *is able to exploit different niches in the murine gut and that different fractions of the healthy community can fill those niches to exclude* C. difficile.

From Evan Snitkin Lab

CDC Prevention Epicenter Program. Threshold-free genomic cluster detection to track transmission pathways in health-care settings: a genomic epidemiology analysis. Hawken SE, Yelin RD, Lolans K, Pirani A, Weinstein RA, Lin MY, Hayden MK, **Snitkin ES;** *Lancet Microbe.* 2022 Sep;3(9):e652-e662. doi: 10.1016/S2666-5247(22)00115-X. Epub 2022 Jul 5. PMID: 35803292; PMCID: PMC9869340.

In this paper we developed a method to integrate genomic and epidemiological data to track the spread of infections in healthcare settings. We went on to apply this approach to understand how carbapenem-resistant Klebsiella pneumoniae spread among patients in a long-term acute care hospital, despite the implementation of targeted infection prevention strategies to stop it.

Evan Snitkin Lab

OTHER PUBLICATION HIGHLIGHTS

BoGH13ASus from Bacteroides ovatus represents a novel α-amylase used for Bacteroides starch breakdown in the human gut. Brown HA, DeVeaux AL, Juliano BR, Photenhauer AL, Boulinguiez M, Bornschein RE, Wawrzak Z, Ruotolo BT, Terrapon N, **Koropatkin NM.** *Cell Mol Life Sci.* 2023 Jul 28;80(8):232. doi: 10.1007/s00018-023-04812-w.PMID: 37500984

Klebsiella pneumoniae causes bacteremia using factors that mediate tissue-specific fitness and resistance to oxidative stress. Holmes CL, Wilcox AE, Forsyth V, Smith SN, Moricz BS, Unverdorben LV, Mason S, Wu W, Zhao L, Mobley HLT, **Bachman MA.***PLoS Pathog.* 2023 Jul 18;19(7):e1011233. doi: 10.1371/journal.ppat.1011233. eCollection 2023 Jul.PMID: 37463183

NEW GRANTS

Denise Kirschner - Wellcome LEAP grant "Tissue Time Machine for TB Immunology"

Nicole Koropatkin - R21 "Bacteroides use a novel N-acyltransferase for lipoprotein synthesis and survival"

Beth Moore - T32 "Research Training in Experimental Immunology"

Mary O'Riordan - R21 "Engagement of the macrophage integrated stress response in *Salmonella* infection"

Alice Telesnitsky - U54 - "Center for Structural Biology of HIV RNA"

Nicole Koropatkin Lab

BoGH13ASus from Bacteroides ovatus represents a novel α-amylase used for Bacteroides starch breakdown in the human gut. Brown HA, DeVeaux AL, Juliano BR, Photenhauer AL, Boulinguiez M, Bornschein RE, Wawrzak Z, Ruotolo BT, Terrapon N, **Koropatkin NM.** *Cell Mol Life Sci.* 2023 Jul 28;80(8):232. doi: 10.1007/s00018-023-04812-w.PMID: 37500984

Multiple ParA/MinD ATPases coordinate the positioning of disparate cargos in a bacterial cell. Pulianmackal LT, Limcaoco JM, Ravi K, Yang S, Zhang J, Tran MK, Ghalmi M, O'Meara MJ, **Vecchiarelli AG** (2023). *Nature Communications.* 14(1):3255. doi: 10.1038/s41467-023-39019-x.

ARF6 is a host factor for SARS-CoV-2 infection in vitro. Mirabelli C, Bragazzi Cunha J, Wotring JW, Sherman EJ, El Saghir J, Harder J, Kretzler M, Sexton JZ, Emmer BT, **Wobus CE.***J Gen Virol.* 2023 Jun;104(6):001868. doi: 10.1099/jgv.0.001868.PMID: 37342971

Optimizing tuberculosis treatment efficacy: Comparing the standard regimen with Moxifloxacin-containing regimens. Budak M, Cicchese JM, Maiello P, Borish HJ, White AG, Chishti HB, Tomko J, Frye LJ, Fillmore D, Kracinovsky K, Sakal J, Scanga CA, Lin PL, Dartois V, Linderman JJ, Flynn JL, **Kirschner DE.***PLoS Comput Biol.* 2023 Jun 15;19(6):e1010823. doi: 10.1371/journal.pcbi.1010823. eCollection 2023 Jun.PMID: 37319311

Gut Microbiome Composition in Lynch Syndrome With and Without History of Colorectal Neoplasia and Non-Lynch Controls. Rifkin SB, Sze MA, Tuck K, Koeppe E, Stoffel EM, **Schloss PD.** *J Gastrointest Cancer.* 2023 Jun 13. doi: 10.1007/s12029-023-00925-4. Online ahead of print. PMID: 37310549

Candida albicans selection for human commensalism results in substantial within-host diversity without decreasing fitness for invasive disease. Anderson FM, Visser ND, Amses KR, Hodgins-Davis A, Weber AM, Metzner KM, McFadden MJ, Mills RE, O'Meara MJ, James TY, **O'Meara TR.** *PLoS Biol.* 2023 May 19;21(5):e3001822. doi: 10.1371/journal.pbio.3001822. eCollection 2023 May. PMID: 37205709 \\

Teresa O'Meara Lab

The Fungal Microbiome of the Upper Airway Is Associated With Future Loss of Asthma Control and Exacerbation Among Children With Asthma. Yuan H, Liu Z, Dong J, Bacharier LB, Jackson D, Mauger D, Boushey H, Castro M, Durack J, Huang YJ, Lemanske RF Jr, Storch GA, Weinstock GM, Wylie K, Covar R, Fitzpatrick AM, Phipatanakul W, Robison RG, Beigelman A, **Zhou Y.** *Chest.* 2023 Mar 30:S0012-3692(23)00462-2. doi: 10.1016/j.chest.2023.03.034. Online ahead of print. PMID: 37003356

Cullin 3-Mediated Regulation of Intracellular Iron Homeostasis Promotes Thymic Invariant NKT Cell Maturation. Yarosz EL, Kumar A, Singer JD, **Chang CH.** *Immunohorizons.* 2023 Mar 1;7(3):235-242. doi: 10.4049/immunohorizons.2300002.PMID: 36951874

Regulation of Virus Replication by BK Polyomavirus Small T Antigen. Zou W, **Imperiale MJ.** *J Virol.* 2023 Mar 30;97(3):e0007723. doi: 10.1128/jvi.00077-23. Epub 2023 Mar 14.PMID: 36916919

A Critical Analysis of the Evidence for the SARS-CoV-2 Origin Hypotheses. Alwine JC, Casadevall A, Enquist LW, Goodrum FD, **Imperiale MJ.***mBio.* 2023 Apr 25;14(2):e0058323. doi: 10.1128/mbio.00583-23. Epub 2023 Mar 28.PMID: 36897098

Mike Imperiale Lab

Cardiolipin coordinates inflammatory metabolic reprogramming through regulation of Complex II disassembly and degradation. Reynolds MB, Hong HS, Michmerhuizen BC, Lawrence AE, Zhang L, Knight JS, Lyssiotis CA, Abuaita BH, **O'Riordan MX**.*Sci Adv.* 2023 Feb 3;9(5):eade8701. doi: 10.1126/sciadv.ade8701. Epub 2023 Feb 3.PMID: 36735777

Age-associated adipose tissue inflammation promotes monocyte chemotaxis and enhances atherosclerosis. Song J, Farris D, Ariza P, Moorjani S, Varghese M, Blin M, Chen J, Tyrrell D, Zhang M, Singer K, Salmon M, **Goldstein DR.***Aging Cell.* 2023 Feb;22(2):e13783. doi: 10.1111/acel.13783. Epub 2023 Jan 23.PMID: 36683460

The *Klebsiella pneumoniae* ter Operon Enhances Stress Tolerance. Mason S, Vornhagen J, Smith SN, Mike LA, Mobley HLT, **Bachman MA.** *Infect Immun.* 2023 Feb 16;91(2):e0055922. doi: 10.1128/iai.00559-22. Epub 2023 Jan 18.PMID: 36651775

Rapid transmission and tight bottlenecks constrain the evolution of highly transmissible SARS-CoV-2 variants. Bendall EE, Callear AP, Getz A, Goforth K, Edwards D, Monto AS, Martin ET, **Lauring AS.** *Nat Commun.* 2023 Jan 17;14(1):272. doi: 10.1038/s41467-023-36001-5.PMID: 36650162

Airway microbiota and immune mediator relationships differ in obesity and asthma. Kozik AJ, Begley LA, Lugogo N, Baptist A, Erb-Downward J, Opron K, **Huang YJ.** *J Allergy Clin Immunol.* 2023 Apr;151(4):931-942. doi: 10.1016/j.jaci.2022.11.024. Epub 2022 Dec 23.PMID: 36572355

A High-Throughput Amenable Dual Luciferase System for Measuring Toxoplasma gondii Bradyzoite Viability after Drug Treatment. Smith D, Lunghi M, Olafsson EB, Hatton O, Di Cristina M, **Carruthers VB**. *Anal Chem.* 2023 Jan 17;95(2):668-676. doi: 10.1021/acs.analchem.2c02174. Epub 2022 Dec 22.PMID: 36548400

The Gut Microbiome Modulates Body Temperature Both in Sepsis and Health. Bongers KS, Chanderraj R, Woods RJ, McDonald RA, Adame MD, Falkowski NR, Brown CA, Baker JM, Winner KM, Fergle DJ, Hinkle KJ, Standke AK, Vendrov KC, Young VB, Stringer KA, Sjoding MW, **Dickson RP.** *Am J Respir Crit Care Med.* 2023 Apr 15;207(8):1030-1041. doi: 10.1164/rccm.202201-0161OC.PMID: 36378114

Age-induced prostaglandin E2 impairs mitochondrial fitness and increases mortality to influenza infection. Chen J, Deng JC, Zemans RL, Bahmed K, Kosmider B, Zhang M, Peters-Golden M, **Goldstein DR.** *Nat Commun.* 2022 Nov 9;13(1):6759. doi: 10.1038/s41467-022-34593-y.PMID: 36351902

NKT cells adopt a glutamine-addicted phenotype to regulate their homeostasis and function. Kumar A, Yarosz EL, Andren A, Zhang L, Lyssiotis CA, **Chang CH.** *Cell Rep.* 2022 Oct 25;41(4):111516. doi: 10.1016/j.celrep.2022.111516.PMID: 36288696

Myeloid- and Epithelial-derived Heparin-Binding Epidermal Growth Factor-like Growth Factor Promotes Pulmonary Fibrosis. Hult EM, Gurczynski SJ, O'Dwyer DN, Zemans RL, Rasky A, Wang Y, Murray S, Crawford HC, **Moore BB.** *Am J Respir Cell Mol Biol.* 2022 Dec;67(6):641-653. doi: 10.1165/rcmb.2022-0174OC.PMID: 36036796

Beth Moore Lab, summer 2023

Intestinal Inflammation Reversibly Alters the Microbiota to Drive Susceptibility to *Clostridioides difficile* Colonization in a Mouse Model of Colitis. Barron MR, Sovacool KL, Abernathy-Close L, Vendrov KC, Standke AK, Bergin IL, Schloss PD, **Young VB.** *mBio*. 2022 Aug 30;13(4):e0190422. doi: 10.1128/mbio.01904-22. Epub 2022 Jul 28.PMID: 35900107

Vince Young Lab

Strain Variation in *Clostridioides difficile* Cytotoxicity Associated with Genomic Variation at Both Pathogenic and Nonpathogenic Loci. Saund K, Pirani A, Lacy DB, Hanna PC, **Snitkin E.***mSphere.* 2022 Jun 29;7(3):e0017422. doi: 10.1128/msphere.00174-22. Epub 2022 May 9.PMID: 35766503

Single-cell Transcriptomics Reveals Dynamic Role of Smooth Muscle Cells and Enrichment of Immune Cell Subsets in Human Abdominal Aortic Aneurysms. Davis FM, Tsoi LC, Ma F, Wasikowski R, Moore BB, Kunkel SL, Gudjonsson JE, **Gallagher KA.** *Ann Surg.* 2022 Sep 1;276(3):511-521. doi: 10.1097/SLA.0000000000005551. Epub 2022 Jun 28.PMID: 35762613

Toxoplasma gondii excretion of glycolytic products is associated with acidification of the parasitophorous vacuole during parasite egress. Huynh MH, **Carruthers VB.** *PLoS Pathog.* 2022 May 5;18(5):e1010139. doi: 10.1371/journal.ppat.1010139. eCollection 2022 May.PMID: 35512005

M&I Holiday Party
December 2, 2022

OUTREACH AND DIVERSITY, EQUITY & INCLUSION

M&I values diversity, equity and inclusion (DEI). Here are highlights of what we did in support of these values.

M&I DEI REPRESENTATIVES

Research Faculty
Ajay Kumar
Melanie Pearson

Research Staff
Stephanie Himpsl

Administrative Staff
Jona Ariona
Angela Kelly
Sheryl Smith

Postdoctoral Fellows
Timi Adediran
Cameron Roberts

Ph.D. Students
Jaime Fuentes
Joseph Krampen
Andres Rivera Ruiz

Master's Students
Lindy Paffel

Renewal of the Rackham Faculty Allies Diversity Grant for 2023–2024
(Lead: Yasmina Laouar and Akira Ono)
The Faculty Allies Diversity Grant provides Faculty Allies with funds to organize and host activities, events, and programming that promote diversity, equity, and inclusion among graduate students within their departments. The purpose of this financial support is to improve DEI at the program level in meaningful ways.

M&I had its **First Student Ambassador Initiative** *(funded by the Rackham Faculty Allies Diversity grant).* The participants were Yasmina Laouar, Akira Ono, Beth Moore, and student Ashley Mello from the Program in Immunology. In March 2023, the group met with UM-Flint students to talk about what it is like to be a graduate student and what is needed to start down that path.

M&I DEI Career and Diversity Speaker Series *(funded by Rackham Faculty Allies for Diversity grant)* Every year, this series invites two microbiology/immunology-related speakers in each of two categories listed below. Since this series is intended to provide role models and career perspectives to students in a manner that best fits students' needs, the speakers have been selected by the student-run Career & Diversity Panel for the past six years. The 2022–2023 speakers were:

Category 1: Successful academic PIs in the Microbiology/Immunology fields who have under-represented minority backgrounds.


Prof. Samuel Campos, University of Arizona, (left), and **Prof. Irene Garcia Newton,** Indiana University (right)

Category 2: Scientists who obtained a Ph.D. i n Microbiology/Immunology fields and are successful in pursuing non-academic career paths.


Dr. Robert DeSalle, author and curator; ANHM, (left), and **Dr. Kaitlyn Flynn,** data tech industry; Sage Bionetworks, (right)

The student-run Career & Diversity Panel for selection and hosting of the 2022–23 speakers was led by Pha Thaprawat. The panel members were: Madison Fitzgerald, Jaime Fuentes, Yuan Li, Amanda Photenhauer, Pha Thaprawat, and Katie Winner.

The student panel led by Jaime Fuentes has already selected speakers for the coming 2023–2024 year. The panel members were Isabel Amaya, Madison Fitzgerald, Jaime Fuentes, Yuan Li, Amanda Photenhauer, Pha Thaprawat, and Katie Winner.

First Year Mentoring Program *(funded by Rackham Faculty Allies for Diversity grant).* This is a peer-to-peer mentoring program for first-year Ph.D. students to help with many decision-making challenges during the time of transition (e.g., courses, rotation labs, etc.). One M&I Ph.D. student (2nd or 3rd year) is assigned as primary mentor to each first-year PIBS student whose first choice is likely M&I. In addition, we have a pool of backup mentors in case there is a topic or concern that the primary mentor cannot address. We support a lunch meeting for each mentor-mentee pair/trio (or "pods") upon arrival of the first-year student to Ann Arbor. We also support additional meetings as needed during the first year. Topics of discussion in later meetings include how to choose the lab for their thesis research and how to prepare for PhD candidacy exams. This program has been organized by Zach Powers, the current OMIS president.

International Women day special lecture

M&I hosted Dr. Donna Ginther as a guest speaker for the International Women Day lecture (March 2022).

Donna Ginther is the Roy A. Roberts & Regents Distinguished Professor of Economics and Director of the Institute for Policy & Social Research at the University of Kansas and a Research Associate at the National Bureau of Economic Research.

PIBS recruiting dinner, January 2022. Left to right: Akira Ono, Maria Sandkvist, Marcy Balunas, Mary O'Riordan, Christiane Wobus and Anukul Shenoy

M&I First Student Ambassador Initiative

Q&A with Ashley Mello, a student in the Program in Immunology and in Kyoung Eun Lee's lab who participated in this initiative. Mello studies how hypoxia regulates tumor immune microenvironments through the crosstalk between tumor cells, fibroblasts, and immune cells. Mello participated in this initiative and shares her experience with it:

"What interests me the most in DEI is being able to increase the engagement and recruitment of students from backgrounds underrepresented in STEM, such as myself, and being able to relate to younger students through my own experiences in navigating STEM-focused higher education.

I decided to participate in this event because it was similar to an initiative I proposed for IMM's Student Ally DEI grant in which current graduate students participate in outreach aimed at undergraduate students with the goal of exposing them to all that graduate school has to offer and to serve as mentors to them.

As far as advice, I shared what my journey as a graduate student has been like so far, and things I wished I had done differently along the way from undergrad to now. For example, one thing I told the students was that if they were even considering graduate school, they should start looking for ways to get research experience as early as possible. I also told them about all of the different resources the Immunology program and U-M, in general, have to ensure their retention and success upon entering graduate school.

Something that surprised me the most in meeting with the students is that many of them already knew exactly what they wanted to do after graduating, and graduate school was in fact the plan for some of them. As such, they were preparing accordingly by doing internships and volunteering in labs on campus.

I'd definitely do it again!"

M&I First Student Ambassador Initiative. Left to right: Akira Ono, Yasmina Laouar, Beth Moore, and Ashley Mello

RESEARCH STAFF DEI ACTIVITY

1. Slack channel update.
A Slack workspace for M&I research staff is now active. The space is for research staff to easily connect with one another, share pertinent information regarding work-related issues. Various channels including professional development, DEI, reagent requests, among others are within the workspace.

2. Career development policy announced. The M&I faculty have agreed that trainees and professional staff should be eligible for at minimum 1 hour per week of professional development time or 4 h per month. There are a number of online resources that have been shared with staff on the research staff SLACK channel and UMMS will provide tuition reimbursement according to SPG rules.

3. Career development resources shared; tuition reimbursement and free online classes. In response to professional development requests the following resources are available and have been shared with research staff: 1) SPG for UM tuition support program 2) Tuition reimbursement for non-UM courses 3) Michigan Online, access to +4000 Coursera learning opportunities 4) UM Personal Development Courses and Resources 5) LinkedIn Learning 6) Organizational Learning 7) Microlearning Opportunities 8) Mentoring and Networking Opportunities. These links can readily be found on the Slack channel under professional development.

ADMINISTRATIVE STAFF DEI ACTIVITY

- Deaf Awareness Month Trivia
- Administered the annual DEI survey
- Attended "How to become a DEI advocate in the workplace"
- M&I food drive for Maize & Blue Cupboard
- Added ADA language to workshops and seminars
- Participated in the DEI symposium
- Brown Bag series

SROP STUDENTS IN M&I

The Department of Microbiology and Immunology (M&I) supports diversity and inclusion in many ways, and one of them is by participating regularly in the Summer Research Opportunities Program (SROP). With SROP (pronounced S-ROP), the University of Michigan (U-M) offers academic exposure and mentorship to underrepresented students from various backgrounds across the U.S..

Andrea Laboy Figueroa and Natalia Matias at The Rock

"This Program prepares underrepresented students for graduate studies. Our students come from all over the country and from very different walks of life. They receive the mentoring and experience that allow them to succeed in academia," said Richard Nunn, SROP program manager. In addition to doing research in labs with a scientist mentor, SROP undergraduate students receive coaching to write applications and CVs, select their graduate schools, practice interviews, and navigate academia. There is a pairing of the students with a more senior graduate student, and many former "SROP graduates" offer to give back to the program by helping out with the newcomers. With SROP, the students also create friendships that last well after their summer on campus. "And in the process, they all have fun, grow their network, and expand their experience of the world," said Nunn.

Andrea Laboy Figueroa is one such students, a senior student at the University of Puerto Rico - Humacao. In summer 2023, Andrea was training in the Balunas lab with Dr. Kojo Acquah, a postdoctoral fellow, and with Katie McBride, a microbiology staff member, studying the biological and chemical interactions between a beneficial bacterium and a fungal pathogen that develops in bee hives.

The goal for this research is to find the bacterial metabolites that can inhibit the fungal pathogens. Andrea learned the fundamentals of growing and extracting cultures, and how to use bioassays and mass spectrometry. She was particularly interested in cross-disciplinary collaborations and was extremely enthusiastic about her experience at U-M with many opportunities to explore science and meet new people while having fun. “Her plan for the future is to apply to U-M Program in Biomedical Sciences (PIBS) to someday become a college professor.

"SROP is a fantastic program to connect with many different people and various ways of thinking about research."
—Andrea Laboy Figueroa

Her friend Natalia Matias is at U-M for a second time with SROP. “I love this program so much, I wanted to come again to increase my opportunities.” A senior at the University of Puerto Rico - Humacao, she studies *Klebsiella,* a bacterium that normally lives inside human intestines and can become infectious under certain conditions. With SROP, last year, she studied immunology in the O’Riordan lab, and, this summer, she learned more about microbiology in the Bachman lab. She searched for genetic factors that make certain strains of *Klebsiella* more likely to infect a patient. She is planning on applying to PIBS to study Microbiology.

Natalia is also very grateful for all the help she has received from SROP and U-M on her journey to graduate school. “I didn’t expect such a welcoming environment and so much genuine care about students and their success in graduate school,” she said.

“In a way, my summers in the M&I labs are very similar to a PhD rotation, and I’m confident that I’m well prepared for graduate school,” said Natalia Matias.

Marcy Balunas

Dr. Balunas is very appreciative of the resources offered by SROP, a program coordinated by Rackham Graduate School. The Program was created about 40 years ago and has gone through several iterations. It has greatly grown over the last three years with more financial support and under the dynamic leadership of Richard Nunn.

DAVID MUELLER, A HIGH SCHOOL TEACHER, REKINDLES HIS PASSION FOR SCIENCE IN THE CARRUTHERS LAB

David Mueller had a busy summer. He moved from Wisconsin where he had taught High School Chemistry and Computer Science for five years, to start teaching 9th grade Biology, Anatomy and Physiology, and Physical Science at Lutheran Westland, in Westland Michigan. And while making this move, he decided to rekindle his passion for science with an internship in M&I.

Mueller had some exposure to microbiology and lab work during his undergraduate studies at the University of Wisconsin - LaCrosse where he received his degree in Biology Education and minor in Chemistry Education in 2018. His favorite class in high school was Anatomy and Physiology, and he thought he would go into Athletic Training or Physical Therapy. But pretty early in college, while taking a General Biology course, he realized he liked molecular biology even more. His General Biology professor worked in a microbiology research lab for a local hospital, and Mueller began working in the lab with her after his sophomore year. He really loved it and ended up working in that lab part-time for about 3.5 years as a student.

Here is what Mueller says about his experience interning in the Carruthers lab.

What motivated you to spend your summer in Vern’s Lab? How did you choose his lab?
Around 2021, I started listening to a podcast called This Week in Microbiology, which is co-hosted by professor Michele Swanson. This made me realize how much I missed working in research, and I began looking for opportunities to get back into a research lab during my summers. When I got the offer to come to Michigan and found out how close I would be to the U-M, I decided to reach out to Michele to see if she knew of any one in M&I that might take a school teacher for summer help. She directed me to the websites of several colleagues so I could read about their research.

I reached out to Vern first for a couple reasons. First, I thought it was really unique to see a microbiology lab studying a eukaryotic pathogen. Second, his website included both information about his lab's research as well as his training philosophy. I got the impression that he really cared about mentoring and developing quality scientists. Third, I think it really helped that “Carruthers” came pretty early in the alphabetical order, so while there are a lot of labs doing interesting research, his was one of the first I found.

What was most surprising to you in Vern’s lab?
I came to Vern's lab knowing almost nothing about *Toxoplasma gondii* and my goals for the summer were to learn as much about toxo as I could, trying to be a productive lab member and not being a hindrance to the other members’ projects.

The thing that surprised me the most, was how helpful and welcoming everyone in the lab was to me. Vern would regularly take time out of his day to explain *Toxo*'s structures and invasion strategies or lab techniques to me individually. I can also remember clearly one of my first days in the lab. I was meeting with Matt O'Meara from the Department of Computational Medicine and Bioinformatics (DCMB), about the project I would be working on. At the end of the meeting he said to me: "We’re all really excited to have you working here this summer." It felt really great to know that, even with my lack of experience, these researchers solving really complex problems were still excited to have me be a part of the team. I don’t think we realize often enough how big of an impact just expressing our gratitude to one another or telling someone we're excited to work with them has on making someone feel welcome.

What was/were your favorite moment(s) in the lab?
My project this summer was testing several potential inhibitors in an enzyme assay. One of the best moments was when I was able to successfully run the assay independently for the first time. I got it on my second try. It turns out remembering to add the enzyme to an enzyme assay makes a pretty big difference!

“I don't think we realize often enough how big of an impact just expressing our gratitude to one another or telling someone we're excited to work with them has on making someone feel welcome.”

Some of my other favorite times in the lab were getting to talk with the PhD candidates and postdocs about their ideas and experiments. It was really fun to hear the questions they were thinking about and how they might find the answer.

“David is highly inquisitive and loves to learn. I greatly enjoyed our discussions because inevitably we would get to a point where the answers to his questions were not known yet. It was a great reminder of how many more discoveries are yet to be made!” said Vern Carruthers.

READ MORE

Sarah Babka, Faith Anderson and Katie Metzner (O’Meara lab)

Pedro Soares Porto and Daniel Macedo de Melo Jorge (Wobus lab)

PHILANTHROPY

Dr. Mary Woodworth generously continues to make donations toward the establishment of an endowed chair for the department. M&I faculty visited Dr. Woodworth on July 11th, 2022.

Left to right: Mike Imperiale, Beth Moore, Mary Woodworth and Michele Swanson

Dr. Marc Collett (left) and Dr. Geoff Severin (right)

Dr. Marc Collett Endowed Fellowship for Discovery Fund
This generous award provides stipend and research support to one outstanding postdoctoral fellow each year who is engaged in high-risk, high-reward research. This fellowship is intended to help launch the career of the postdoctoral fellow. Dr. Collett received both his BS and PhD degrees from U-M.

We are pleased to announce that **Dr. Geoff Severin** is the first recipient of this award in M&I (see page 32).

GIVE HERE

M&I is pleased to host the **KJ Thompson Sepsis Research fund** which is used to provide travel awards to postdoctoral fellows working to understand the pathogenesis of sepsis, a bloodstream infection that sadly took the life of Mr. Thompson, the partner of our faculty colleague Michele Swanson.

This year, the award supported the travel of Dr. Caity Holmes to present sepsis research from the Bachman lab at a national meeting.

GIVE HERE

Harry Mobley with initial Mobley lecturer Dr. James Kaper from University of Maryland. Dr. Kaper is the sixth person from the left, between Natalie Mobley and Dr. Mobley.

We are fundraising for a lectureship in hoonor of **Harry Mobley.** These funds will be used to support an annual lectureship named for Dr. Mobley, which will honor his contributions to the field of bacteriology and related disciplines.

GIVE HERE

We are also fundraising to establish an award for an early career scientist working in global health, infectious disease or health disparities, to honor **Dr. Oveta Fuller's** legacy (read more on page 21).

GIVE HERE

Thank you for your support of M&I!

We split off a $1M Research Endowed Chair from the **Dr. Nancy Williams Walls Professorship** which was awarded to Malini Raghavan (read more on page 17).

The gift that Dr. Nancy Williams Walls made to the M&I department was lucky enough to grow in value and allow the recent creation of a new research professorship. This professorship has the same intentions as the original donation, to support the career of women scientists in M&I.

Celebrating the 2022 holiday season with some microbiology humor, from the Kirschner lab!

Why did the bacteria cross the microscope? —To get to the other slide.

I have a joke about immunity but you probably herd it.

Hey, when is turbeculosis day? Duno, it's TBD.

Why aren't students allowed in the TA lounge? It's for staph only.

What do hipster biologists wear? Skinny genes

Terrible line to get a date: "I wish I was adenine. Then I could be paired with U."

Why did the biologist break up with the physicist? They had no chemistry.

Did you just mutate into a stop codon? You're talking nonsense!

Why was the potato sad? It had tuber culosis.

I had an appointment with some microbiologists today, but I couldn't find them.

What do biologists post on Instagram? Cellfies.

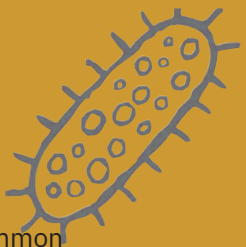
Moore lab door decoration

Wobus lab was the winner of the Door Decoration Contest, along with the clever AI-generated poem about norovirus at Christmas!

Department of Microbiology & Immunology
University of Michigan Medical School
1150 West Medical Center Drive
5641 Medical Science II
Ann Arbor, Michigan 48109-5620

Phone: (734) 763-3531

https://medicine.umich.edu/dept/microbiology-immunology



Cover image
by Melanie Pearson

Proteus mirabilis, a common agent of catheter-associated urinary tract infection, is famed for its ability to swarm over agar surfaces in a characteristic bullseye pattern. In this image, a guaA mutant displays a strikingly altered pattern of swarming motility. *P. mirabilis* mutants with altered swarming motility are often also impaired in virulence, as is the case for this mutation in GMP synthase, which renders the organism auxotrophic for guanosine. Purine biosynthesis was one of several key fitness factors identified using an ordered library screen on agar made from homogenized mouse organs or human urine (that is, “organ agar”).