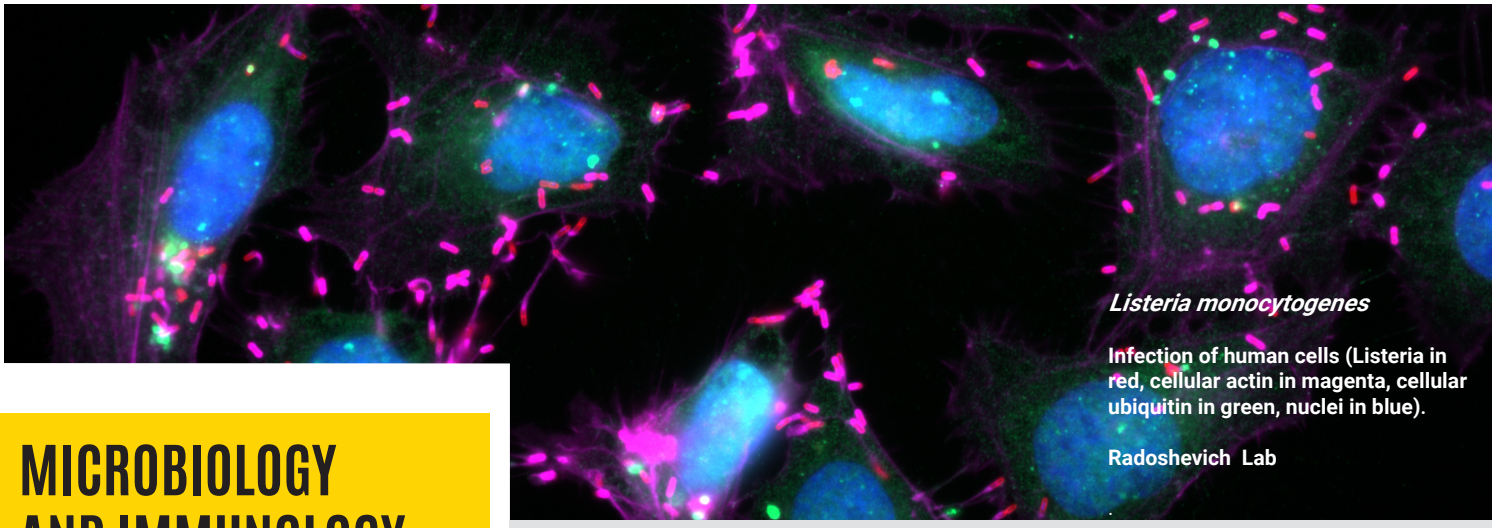

Listeria monocytogenes

Infection of human cells (Listeria in red, cellular actin in magenta, cellular ubiquitin in green, nuclei in blue).

Radoshevich Lab

MICROBIOLOGY AND IMMUNOLOGY NEWSLETTER

Spring 2021

PRIMARY FACULTY MEMBERS

Gail Bishop, PhD
Noah Butler, PhD
Craig Ellermeier, PhD
Hillel Haim, MD, PhD
Jon Houtman, PhD
Bradley Jones, PhD
Aloysius Klingelhutz, PhD
Dominique Limoli, PhD
Adam Mailloux, PhD
Balaji Manicassamy, PhD
Wendy Maury, PhD
Stanley Perlman, MD, PhD
Lilliana Radoshevich, PhD
Richard Roller, PhD
Patrick Schlievert, PhD
Steven Varga, PhD
Mary Weber, PhD
David Weiss, PhD
Mary Wilson, MD
Li Wu, PhD
Timothy Yahr, PhD

ASSOCIATES AND INSTRUCTORS

Marcia Cordts, PhD
Robert Faris, PhD
Theresa Ho, PhD
Linda Knudtson, PhD

SECONDARY FACULTY MEMBERS

Vladimir Badovinac, PhD
Damian Krysan, MD, PhD
Kevin Legge, PhD
Paul McCray, MD
Steven McElroy, MD
William Nauseef, MD
Patrick Sinn, PhD
Jack Stapleton, MD

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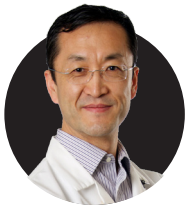
CARVER COLLEGE OF MEDICINE

medicine.uiowa.edu/microbiology/



Message from the Department

Li Wu, PhD, Professor, Chair and Department Executive Officer

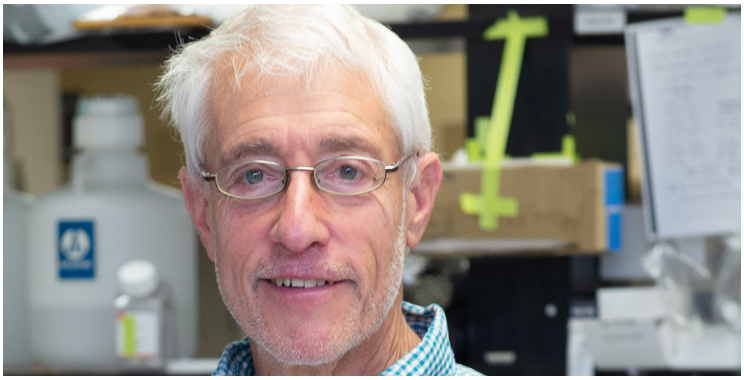
Spring is full of forethought and prospect, which is particularly true in 2021 during our continued combat against the COVID-19 pandemic.

When reflecting on 2020, we are immensely proud of the tremendous achievements of the Department. I express my sincere gratitude to the faculty, staff, and trainees in the Department for their dedication to teaching, research, service, and learning. We also appreciate the continuous support from the University and College leadership as well as our generous alumni and friends.

The Department has achieved remarkable success despite unprecedented challenges in 2020, including the worldwide COVID-19 pandemic, national racial justice initiatives, and the severe derecho in Iowa. In fiscal year (FY) 2020, we taught a total of 41 courses, 106 semester hours, and 2,652 contact hours for 1,793 students enrolled in undergraduate, graduate, medical, and health professional programs. In March 2020, our faculty and instructors rapidly adapted to the virtual or hybrid teaching model to ensure effective and safe learning for students. In FY2020, our primary faculty were highly successful in receiving research funding, with a total of $14.4M, including $11.9M from NIH grants and $2.5M from other external funding sources. The primary faculty have published 83 manuscripts in 2020, including highly innovative and impactful research articles in top journals, such as *Cell, Cell Reports, Nature, Nature Immunology, Journal of Clinical Investigation, and PNAS*. Furthermore, through our tireless service and devotion to basic science, Departmental faculty, staff, and trainees actively engage in and significantly contribute to the regional, national, and international research community.

With our team effort in the Department, we are confident that we will reach brighter prospects in 2021. I encourage you to read the newsletter to recognize the accomplishments of our students, staff, and faculty and enjoy the stories of our alumni and emeritus professors. We appreciate what you do for our Department!

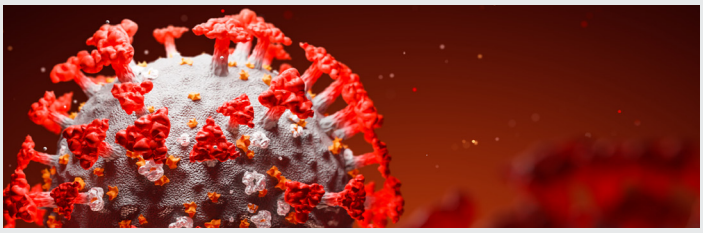
FACULTY SPOTLIGHT



Stanley Perlman, MD, PhD, has been appointed as the Mark Stinski Chair in Virology

Dr. Perlman joined the faculty at the University of Iowa thirty-eight years ago in 1983 and began his studies on coronaviruses shortly thereafter. He is now considered one of the world's leading coronavirus experts. When the COVID-19 pandemic started, he was immediately called upon by the research community and policymakers to provide advice on SARS-CoV-2, the virus that causes COVID-19. Because of his expertise, Dr. Perlman's lab hit the ground running and is now focused on studying SARS-CoV-2, exploring immune responses, potential treatments, and vaccines. Other studies from his lab have centered on immune responses to coronaviruses, including SARS-CoV-2. Dr. Perlman collaborates widely with many other investigators at the University of Iowa, as well as nationally and internationally. His research and insight have been critical in moving COVID-19 research forward as rapidly as possible, and he has quickly published numerous papers on coronaviruses in high-impact journals. His group has developed a mouse model for SARS-CoV-2 infection that has already proven useful for studies on treatments and pathogenesis, such as loss of the sense of smell upon infection (Zheng et al., *Nature*, 2021). Dr. Perlman has been invited to serve on many national advisory panels, including an FDA panel for approving COVID-19 vaccines.

The Mark Stinski Chair in Virology was established to honor and recognize research excellence in virology. The chair was named after former Microbiology faculty member Dr. Mark Stinski, who developed and patented a promoter from cytomegalovirus. The promoter continues to be used as a tool to express proteins that are important in the production of vaccines and therapeutics. Dr. Perlman's appointment as the Mark Stinski Chair in Virology could not be more timely, deserving, and appropriate.



Faculty Research Focus

Mary Weber, PhD, Assistant Professor

Mary Weber, PhD, Assistant Professor, joined our Department in 2017 after completing her postdoctoral studies at the National Institutes of Health (NIH) Rocky Mountain Laboratory in Montana. The Weber laboratory studies how obligate intracellular bacteria like *Chlamydia trachomatis* carve out their unique niche within a host cell. They are addressing the role of bacterial virulence factors in reprogramming the host to serve as a vessel for bacterial propagation. *Chlamydia trachomatis* is an obligate intracellular pathogen that is the leading cause of non-congenital blindness and the most prevalent sexually-transmitted bacterial infection in the world. Chlamydia is known to secrete two major classes of virulence factors through its type III secretion system: inclusion membrane proteins (Incs) which are inserted into the pathogen containing vacuole, and conventional secreted effectors that are secreted into the host cell where they can directly interact with host proteins and modulate their cellular function to benefit the bacterium. Dr. Weber was awarded two new five-year NIH R01 grants to study mechanisms used by each of these class of virulence factors. Her lab identified an essential bacterial factor called Inc protein CT229 that recruits numerous membrane trafficking proteins called Rab GTPases to the bacterial inclusion. This redirects host vesicle trafficking to the inclusion where chlamydia can harvest host nutrients including crucial lipid precursors and iron. Current work focuses on the mechanistic interaction between CT229, other Incs, and host proteins involved with vesicle fusion. Other studies are investigating how other bacterial type III secreted effector proteins aid in cellular invasion by triggering increased filopodia formation and engulfment of the bacterium by the host cell. These findings were recently published in *PLoS Pathogens* with a graduate student, Alix McCullough, and research scientist, Robert Faris, leading the study. The findings could lead to more specific treatments for Chlamydia infection. It is exciting that the Weber lab continues to push the boundaries of our understanding of host pathogen interactions and the intracellular lifestyle of Chlamydia!

Weber Lab Pictured (L-R) R. Faris, M. Weber, P. McCaslin, B. Steiert, S. Andersen, L. Bulman, I. Herring and A. McCullough

Faculty News

Klingelhutz inducted into the 2020 Wall of Scholarship

Aloysius J. Klingelhutz, PhD, was one of five Carver College of Medicine (CCOM) faculty honored for an impactful research article in the Wall of Scholarship Induction Ceremony in 2020. The article entitled "Both Rb/p16INK4a inactivation and telomerase are required to immortalize human epithelial cells" (*Nature* 396:84, 1998), was recognized for having been cited more than 1,000 times in subsequent published research articles through selected academic citation indices.

Varga selected as chair of NIH Virology B Study Section

Steven Varga, PhD, has been selected to serve as chair of the National Institutes of Health (NIH) Virology B Study Section for two years (2020-2022).

Schlievert recognized as an Impact Scholar by CCOM

Patrick Schlievert, PhD, is part of an inaugural group of 47 Impact Scholars—researchers who have made a major scientific impact over the course of their careers. Impact Scholars are selected based on the Hirsch index, also known as the H-index, which represents the number of research papers a faculty member has published, and the papers' impact as gauged by how many times they have been cited by other scientists and scholars in subsequent research articles.

Faculty Promotion

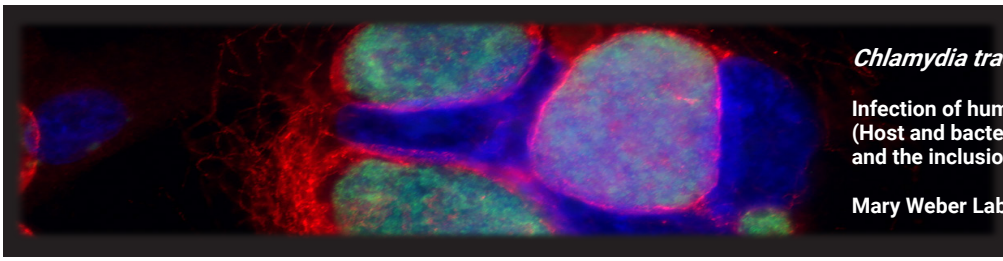
Congratulations to Craig Ellermeier, PhD, who was promoted to Professor with tenure effective July 1, 2020. Ellermeier joined the faculty in 2007. Dr. Ellermeier's lab works on how Gram-positive bacteria sense and respond to extracellular signals, with a particular focus on the opportunistic human pathogen *Clostridioides difficile*. Among many other responsibilities, Dr. Ellermeier directs and teaches Bacterial Physiology and Cell Biology class and also teaches Microbial Genetics.

Renewal of Senior Research Career Scientist Award

Gail Bishop, PhD, has received a renewal of her Senior Research Career Scientist Award from the Department of Veterans Affairs. This renewal supports Dr. Bishop's career award from October 2020 through September 2027.

New Faculty

Adam Mailloux, PhD, was hired as an Assistant Professor with a joint appointment in the Holden Comprehensive Cancer Center in 2020. Dr. Mailloux grew up and went to school in South Carolina. He performed postdoctoral studies in Tampa, Florida. Iowa is his first experience of an actual winter. The overarching goal of Dr. Mailloux's research is to create new T cell-based immunotherapies to treat cancer and to make current cell therapies smarter, stronger, faster, and more readily available to all who may benefit. His lab will focus on a suite of hypothesis-driven basic research projects that: 1) improve production methods and potency of effector lymphocyte products, 2) address challenges in the tumor microenvironment faced by adoptively transferred effector cells, and 3) develop and translate new immunotherapeutic approaches. Dr. Mailloux's laboratory utilizes a combination of conventional molecular and immunologic assays, as well as cutting edge technologies, to study the immune response against cancer. He plans to work with both pre-clinical models and primary human samples in a bench-to-bedside translational approach. A significant focus of his lab involves fluorescence-based approaches, such as high-parameter flow cytometry and multiplexed immunofluorescence (https://mailloux.lab.uiowa.edu/). Dr. Mailloux's lab is located in the Holden Comprehensive Cancer Center space in MERF. We welcome Dr. Mailloux to the Department!



Chlamydia trachomatis

Infection of human cervical keratinocytes
(Host and bacterail DNA is in blue, chlamydia bacteria are in green and the inclusion membrane protein IncE is red).

Mary Weber Lab

Three faculty were recognized by CCOM with distinguished College Awards

Dr. Rich Roller received the Collegiate Teaching Award. This award is to acknowledge members of the faculty whose activities and accomplishments demonstrate unusually significant and meritorious achievement in teaching during the academic year.

Dr. David Weiss received the Faculty Service Award. This award is to acknowledge a faculty member who has made a significant and sustained contribution to the College of Medicine in the area of service.

Dr. Tim Yahr received the John P. Long Teaching Award in the Basic Sciences. The award acknowledges outstanding teaching contributions by a basic sciences faculty member in the Carver College of Medicine. It is in honor of Dr. Long, who was dedicated to education, research, and service.

New Research Funding

Gail Bishop

Diabetes-Free, Inc

Intima Capital Laboratory Work

Gail Bishop

National Institutes of Health (R21)

Loss of TRAF3 in Aging B Lymphocytes

Hillel Haim

American Foundation for AIDS Research

Deep learning Methods to Personalize Antibody Therapeutics for Delaying Viral Rebound After Cessation of ART

Jon Houtman and Steven Varga

Holden Comprehensive Cancer Center, Mezhir Award Program

Connecting Immunological Changes to Patient Outcome in Pharmacological Ascorbate Clinical Trails

Aloysius Klingelhutz

National Institutes of Health - Iowa Superfund Research Program (P42 Project Lead)

Role of Airborne PCBs in Adipogenesis, Adipocyte Function, and Metabolic Disease

Aloysius Klingelhutz

National Institutes of Health-Environmental Health Research Center, University of Iowa (P30 Project Lead)

Effect of Environmental PFAS Compounds on Human Adipogenesis and Adipose Function

Dominique Limoli

National Institutes of Health/University of Iowa Center for Gene Therapy of Cystic Fibrosis (P30 Pilot Grant)

Identification of *E. Coli* Genes Necessary for Colonization of the Gastrointestinal tract in cystic fibrosis ferrets.

Balaji Manicassamy

National Institutes of Health/Georgia State University

Intersection Between Viral Translation and Innate Immunity in the Context of Filovirus Infection

Wendy Maury

National Institutes of Health (R21)

CD40 Regulation of Acute Virus Infection

Wendy Maury

BerGenBio ASA

Evaluation of the Anti-Viral Effects of Bemcentinib on Coronaviruses

Wendy Maury

Furst-McNess Company

In vitro Investigation into the Influence of Furst-McNess Nutritional Supplement Blend of Alpha Monoglycerides, Botanical and Essential Oil Against SARS-Coronavirus-2 in Cell Culture Models

Wendy Maury

Stine Seed Farm, Inc.

Identifying Bioactive Constituents in a Natural Blend with Anti-Viral Activity

Wendy Maury

US Department of Homeland Security/Iowa State University

Detection of Biothreats in Near Real Time with a Multiplexed Aptasensor

Stanley Perlman

AbbVie, Inc.

Studies to Establish the EC50 and CC50 Values for AbbVie Antiviral Drugs

Stanley Perlman

Eli Lilly & Company

Industry Research of COVID-19 Related Assays

Stanley Perlman

BioAge Labs, Inc.

Effect of DP-1 Inhibitor on Coronavirus Infection

Stanley Perlman

US Department of Defense Advanced Research Projects Agency/Autonomous Therapeutics, Inc.

A Rapid-Response Platform to Develop & Deliver TIPs (Therapeutic Interfering Particles) Against Respiratory Viral Threats, including MERS-CoV

Stanley Perlman

National Institutes of Health/New York Blood Center

Novel Nanobodies to Prevent and Treat SARS-CoV-2 and Other Pathogenic Human Coronaviruses

Lilliana Radoshevich

National Institutes of Health (R35)

Discovery of Novel Mechanisms of Action of Ubiquitin-Like Proteins in Cellular Stress Pathways

Richard Roller

National Institutes of Health (R21)

Mechanism and Regulation of Protein Kinase Functions in HSV Nuclear Egress

Richard Roller

National Institutes of Health (R21)

Characterization of the Herpes Simplex Virus Cytoplasmic Assembly Center in Neuronal Cells

Patrick Schlievert

National Institutes of Health/National Jewish Health (U01)

Atopic Dermatitis Research Network Leadership Center

Patrick Schlievert

National Institutes of Health/University of Rochester (U01)

Subaward: Biomarker Identification, Viral Susceptibility & Management in *S. aureus* Colonized AD Patients

Patrick Schlievert

National Institutes of Health (R21 MPI)

Modulation of Cutaneous Autoimmunity by *Staphylococcus aureus*

Steven Varga

National Institutes of Health (R21)

RSV-Induced Inflammation in the Brain

Mary Weber

National Institutes of Health (R01)

Functional Characterization of *Chlamydia trachomatis* Inclusion Membrane Proteins and their Role in Subversion of Host Vesicular Trafficking

Mary Weber

National Institutes of Health (R01)

The Role of Secreted Effector Proteins in *Chlamydia trachomatis* Invasion

Li Wu

National Institutes of Health (R01, transferred to UI)

SAMHD1-Mediated Regulation of HIV-1 Innate Immunity and Viral Gene Expression

Li Wu

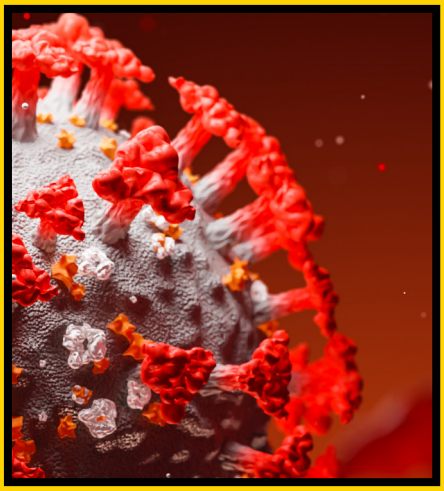
National Institutes of Health (R01, transferred to UI)

Mechanisms of HIV-1 RNA Methylation in Regulating Viral Replication

Li Wu

National Institutes of Health/Holden Comprehensive Cancer Center (P30 Supplement)

The Role of SAMHD1 in Lymphoma and HIV-1 Infection of Aging Populations



CCOM Carver Trust COVID-19 Pilot Grants

Gail Bishop and Wendy Maury
Mechanisms of CD40-Mediated Early Protection from SARS-CoV-2 Infection

Jon Houtman and Jack Stapleton
Investigating the Dysregulation of TCR Signaling and CD4 T Cell Differentiation by SARS-CoV-2 S Protein Trimer

Al Klingelhutz and Wendy Maury
The Role of Visceral Fat in SARS-CoV-2 Infection

Balaji Manicassamy
Viral Cell Tropism in the Pathogenesis of SARS-CoV-2

Lilliana Radoshevich
The Role of ISGylation in SARS-CoV-2 Infection

We sincerely appreciate the generous support of the Roy J. Carver Charitable Trust.

Select Publications

Gail Bishop

Gao M, Bai H, Jethava Y, Wu Y, Zhu Y, Yang Y, Xia J, Cao H, Franqui-Machin R, Nadiminti K, Thomas GS, Salama ME, Altevogt P, **Bishop GA**, Tomasson M, Janz S, Shi J, Chen L, Frech I, Tricot G, Zhan F. Identification and Characterization of Tumor-Initiating Cells in Multiple Myeloma. *J Natl Cancer Inst.* 2020 May 1;112(5):507-515.

PMID:31406992

Arkee T, **Bishop GA**. TRAF family molecules in T cells: Multiple receptors and functions. *J Leukoc Biol.* 2020 June;107(6):907-915.

PMID:31749173

Noah Butler

Rogers KJ, Shtanko O, Vijay R, Mallinger LN, Joyner CJ, Galinksi MR, **Butler NS**, Maury WJ. Acute Plasmodium infection promotes interferon-gamma dependent resistance to Ebola virus infection. *Cell Rep.* 2020 March 24;30(12):4041-4051.e4.

PMID:32209467

Rogers KJ, Shtanko O, Stunz LL, Mallinger LN, Arkee T, Schmidt ME, Bohan D, Brunton B, White JM, Varga SM, **Butler NS**, Bishop GA, Maury W. Frontline Science: CD40 signaling restricts RNA virus replication in MΦs, leading to rapid innate immune control of acute virus infection. *J Leukoc Biol.* 2021 Feb; 109(2):309-325.

PMID:32441445

Vijay R, Guthmiller JJ, Sturtz AJ, Surette FA, Rogers KJ, Sompallae RR, Li F, Pope RL, Chan J-A, de Labastida Rivera F, Andrew D, Webb L, Maury WJ, Xue H-H, Engwerda CR, McCarthy JS, Boyle MJ, **Butler NS**. Infection-induced plasmablasts are a nutrient sink that impairs humoral immunity to malaria. *Nat Immunol.* 2020 July;21(7):790-801.

PMID:32424361

Craig Ellermeier

Kaus GM, Snyder LF, Müh U, Flores MJ, Popham DL, **Ellermeier CD**. Lysozyme Resistance in *Clostridioides difficile* Is Dependent on Two Peptidoglycan Deacetylases. *J Bacteriol.* 2020 October 22;202(22):e00421-20.

PMID:32868404

Hillel Haim

Han C, Johnson J, Dong R, Kandula R, Kort A, Wong M, Yang T, Breheny PJ, Brown GD, **Haim H**. Key Positions of HIV-1 Env and Signatures of Vaccine Efficacy Show Gradual Reduction of Population Founder Effects at the Clade and Regional Levels. *mBio.* 2020 Jun 9;11(3):e00126-20.

PMID: 32518179

Johnson J, Flores MG, Rosa J, Han C, Salvi AM, DeMali KA, Jagnow JR, Sparks A, **Haim H**. The High Content of Fructose in Human Semen Competitively Inhibits Broad and Potent Antivirals That Target High-Mannose Glycans. *J Virol.* 2020 Apr 16;94(9):e01749-19.

PMID: 32102878

Salimi H, Johnson J, Flores MG, Zhang MS, O'Malley Y, Houtman JC, Schlievert PM, **Haim H**. The lipid membrane of HIV-1 stabilizes the viral envelope glycoproteins and modulates their sensitivity to antibody neutralization. *J Biol Chem.* 2020 Jan 10;295(2):348-362.

PMID: 31757809

Jon Houtman

Tremblay MM, Ollinger T, **Houtman JCD**. The membrane proximal proline-rich region and correct order of C-terminal tyrosines on the adaptor protein LAT are required for TCR-mediated signaling and downstream functions. *Cell Signal.* 2020 December 1;76:109790.

PMID:32979494

Bradley Jones

Martini AM, Moricz BS, Ripperger AK, Tran PM, Sharp ME, Forsythe AN, Kulhankova K, Salgado-Pabón W, **Jones BD**. Association of Novel *Streptococcus sanguinis* Virulence Factors With Pathogenesis in a Native Valve Infective Endocarditis Model. *Front Microbiol.* 2020 Jan 31;11:10.

PMID: 32082276

Aloysius Klingelhutz

Gourronc FA, Markan KR, Kulhankova K, Zhu Z, Sheehy R, Quelle DE, Zingman LV, Kurago ZB, Ankrum JA, **Klingelhutz AJ**. Pdgfrα-Cre mediated knockout of the aryl hydrocarbon receptor protects mice from high-fat diet induced obesity and hepatic steatosis. *PLoS One.* 2020 July 30;15(7):e0236741.

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Schlievert PM, Gourronc FA, Leung DY, **Klingelhutz AJ**. Human Keratinocyte Response to Superantigens. *mSphere.* 2020 October 7;5(5):e00803-20.

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El-Hattab MY, Nagumo Y, Gourronc FA, **Klingelhutz AJ**, Ankrum JA, Sander EA. Human Adipocyte Conditioned Medium Promotes In Vitro Fibroblast Conversion to Myofibroblasts. *Sci Rep.* 2020 June 24;10(1):10286.

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Dominique Limoli

Yarrington KD, Sánchez Peña A, **Limoli DH**. Kinetic Visualization of Single-Cell Interspecies Bacterial Interactions. *J Vis Exp.* 2020 Aug 5;(162).

PMID: 32831301

Limoli D. mSphere of Influence: a Community To Study Communities. *mSphere.* 2020 Feb 5;5(1):e00047-20.

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Dominique Limoli

Price CE, Brown DG, **Limoli DH**, Phelan VV, O'Toole GA. Exogenous Alginate Protects *Staphylococcus aureus* from Killing by *Pseudomonas aeruginosa*. *J Bacteriol*. 2020 Mar 26;202(8):e00559-19.

PMID: 31792010

Adam Mailloux

Garg SK, Ott MJ, Mostofa A GM, Chen Z, Chen YA, Kroeger J, Cao B, **Mailloux AW**, Agrawal A, Schaible BJ, Sarnaik A, Weber JS, Berglund AE, Mulé JJ, Markowitz J. Multi-Dimensional Flow Cytometry Analyses Reveal a Dichotomous Role for Nitric Oxide in Melanoma Patients Receiving Immunotherapy. *Front Immunol*. 2020 February 25;11:164.

PMID:32161584

Hesterberg RS, Beatty MS, Han Y, Fernandez MR, Akuffo AA, Goodheart WE, Yang C, Chang S, Colin CM, Alontaga AY, McDaniel JM, **Mailloux AW**, Billington J MR, Yue L, Russell S, Gillies RJ, Yun SY, Ayaz M, Lawrence NJ, Lawrence HR, Yu XZ, Fu J, Darville LN, Koomen JM, Ren X, Messina J, Jiang K, Garrett TJ, Rajadhyaksha AM, Cleveland JL, Epling-Burnette PK. Cereblon harnesses Myc-dependent bioenergetics and activity of CD8+ T lymphocytes. *Blood*. 2020 August 13;136(7):857-870.

PMID:32403132

Balaji Manicassamy

Vogel OA, Han J, Liang CY, Manicassamy S, Perez JT, **Manicassamy B**. The p150 Isoform of ADAR1 Blocks Sustained RLR signaling and Apoptosis during Influenza Virus Infection. *PLoS Pathog*. 2020 Sep 8;16(9):e1008842.

PMID: 32898178

Hussein AF A, Cheng H, Tundup S, Antanasijevic A, Varhegyi E, Perez J, AbdulRahman EM, Elenany MG, Helal S, Caffrey M, Peet N, **Manicassamy B**, Rong L. Identification of entry inhibitors with 4-aminopiperidine scaffold targeting group 1 influenza A virus. *Antiviral Res*. 2020 May 1;177:104782.

PMID:32222293

Balaji Manicassamy

Kandasamy M, Furlong K, Perez JT, Manicassamy S, **Manicassamy B**. Suppression of Cytotoxic T Cell Functions and Decreased Levels of Tissue-Resident Memory T Cells during H5N1 Infection. *J Virol*. 2020 Apr 16;94(9):e00057-20.

PMID: 32075925

Wendy Maury

Rogers KJ, Shtanko O, Vijay R, Mallinger LN, Joyner CJ, Galinski MR, Butler NS, **Maury WJ**. Acute Plasmodium infection promotes interferon-gamma-dependent resistance to Ebola virus infection. *Cell Rep*. 2020 March 24;30(12):4041-4051.

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Rogers KJ, Jones-Burrage S, **Maury WJ**, Mukhopadhyay S. TF protein of Sindbis virus antagonizes host type I interferon responses in a palmitoylation-dependent manner. *Virology*. 2020 March;542:63-70

PMID:32056669

Rogers KJ, Shtanko O, Stunz LL, Mallinger LN, Arkee T, Schmidt ME, Bohan D, Brunton B, White JM, Varga SM, Butler NS, Bishop GA, **Maury WJ**. Frontline Science: CD40 signaling restricts RNA virus replication in MΦs, leading to rapid innate immune control of acute virus infection. *J Leukoc Biol*. 2020 2021 Feb; 109(2):309-325.

PMID:32441445

Stanley Perlman

Sun J, Zhuang Z, Zheng J, Li K, Wong RL-Y, Liu D, Huang J, He J, Zhu A, Zhao J, Li X, Xi Y, Chen R, Alshukairi AN, Chen Z, Zhang Z, Chen C, Huang X, Li F, Lai X, Chen D, Wen L, Zhuo J, Zhang Y, Wang Y, Huang S, Dai J, Shi Y, Zheng K, Leidinger MR, Chen J, Li Y, Zhong N, Meyerholz DK, McCray, Jr PB, **Perlman S**, Zhao J. Generation of a Broadly Useful Model for COVID-19 Pathogenesis, Vaccination, and Treatment. *Cell*. 2020 August 6;182(3):734-743.e5.

PMID:32643603

Stanley Perlman

Pan R, Zhang Q, Anthony SM, Zhou Y, Zou X, Cassell M, **Perlman S**. Oligodendrocytes that survive acute coronavirus infection induce prolonged inflammatory responses in the CNS. *Proc Natl Acad Sci U S A*. 2020 July 7;117(27):15902-15910.

PMID:32571951

Zheng J, Wong LR, Li K, Verma AK, Ortiz M, Wohlford-Lenane C, Leidinger MR, Knudson CM, Meyerholz DK, McCray PB Jr, **Perlman S**. COVID-19 treatments and pathogenesis including anosmia in K18-hACE2 mice. *Nature*. 2021 Jan;589(7843):603-607.

PMID:33166988

Lilliana Radoshevich

Kespohl M, Bredow C, Klingel K, Voß M, Paeschke A, Zickler M, Poller W, Kaya Z, Eckstein J, Fechner H, Spranger J, Fähling M, Wirth EK, **Radoshevich L**, Thery F, Impens F, Berndt N, Knobeloch KP, Beling A. Protein modification with ISG15 blocks coxsackievirus pathology by antiviral and metabolic reprogramming. *Sci Adv*. 2020 March 11;6(11):eaay1109.

PMID:32195343

Richard Roller

White S, Kawano H, Harata NC, **Roller RJ**. Herpes Simplex Virus Organizes Cytoplasmic Membranes To Form a Viral Assembly Center in Neuronal Cells. *J Virol*. 2020 Sep 15;94(19):e00900-20.

PMID: 32699089

Patrick Schlievert

Schlievert PM. Effect of non-absorbent intravaginal menstrual/contraceptive products on *Staphylococcus aureus* and production of the superantigen TSST-1. *Eur J Clin Microbiol Infect Dis*. 2020 January;39(1):31-38.

PMID:31853743

Patrick Schlievert

Tiwari N, López-Redondo M, Miguel-Romero L, Kulhankova K, Cahill MP, Tran PM, Kinney KJ, Kilgore SH, Al-Tameemi H, Herfst CA, Tuffs SW, Kirby JR, Boyd JM, McCormick JK, Salgado-Pabón W, Marina A, **Schlievert PM**, Fuentes EJ. The SrrAB two-component system regulates *Staphylococcus aureus* pathogenicity through redox sensitive cysteines. *Proc Natl Acad Sci U S A*. 2020 May 19;117(20):10989-10999.

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Schlievert PM, Gourronc FA, Leung DY M, Klingelhutz AJ. Human Keratinocyte Response to Superantigens. *mSphere*. 2020 October 7;5(5):e00803-20.

PMID:33028686

Steven Varga

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Angela Pack, PhD, Recognized by the Journal *Cell* for Her Scientific Achievements

Angela Pack, PhD (Postdoctoral Research Fellow, Butler Lab), was recently named to a list of 1,000 Inspiring Black Scientists in American by the journal *Cell*. She was also featured in the University of Iowa Health Care publication, The Loop, where she talks about her research, the value of mentorship, and the importance of diversity in science

https://medcom.uiowa.edu/theloop/news/angela-pack-on-molecular-warfare-mentorship-and-diversity

Graduate Students 2020/2021
Pictured (L-R)

Laurel Woods
University of Central Arkansas

Cinthia Hudachek
Iowa State University

Brianne Zbylicki
University of Portland

Paige Richards
Rowan University

Kevin Bollinger
University of Michigan

Alix McCullough
University of Iowa

(not pictured)
Anthony Rojas-Chávez
Colorado College

GRADUATE/POSTDOCTORAL TRAINEE NEWS

The COVID-19 pandemic has certainly made it a trying time to be a graduate student or postdoc. Trainees in the department have had to deal with many challenges including lab shutdowns and restrictions, taking classes online, giving presentations via Zoom, TA'ing remotely or with masks in-person, and, in some cases, retooling projects to focus on SARS-CoV-2 research. Despite all this, the students forged ahead to make progress. Many trainees published papers, received awards, and passed comprehensive exams. Incredibly, four graduate students were able to successfully defend their theses in the Department in 2020.

Congratulations, graduate students and postdocs, on making it through a challenging year!

Recent Graduate Thesis Defenses

Ryan Callahan, MS

Radoshevich Lab

Gabriela Kaus, PhD

Ellermeier Lab

Kyle Kinney, PhD

Salgado-Pabón Lab

Anthony Martini, PhD

Jones Lab

The Department would like to congratulate our students who defended their theses and graduated in 2020!

Graduate Student Fellowships and Awards


Paige Richards and Laurel Woods
First-year Microbiology graduate students Paige Richards and Laurel Woods received the CCOM Dean's Award for Biomedical Graduate Studies. Both were participants in the Summer Research Experience for Undergraduates in Microbiology in 2019.

Shiloh Lueschow
Shiloh Lueschow (McElroy lab) was awarded best student presentation at the Midwest Society for Pediatric Research Scientific Meeting.

Kody Waldstein
Immunology graduate student Kody Waldstein (Varga lab) was chosen as a finalist for the Three Minute Thesis competition for his thesis entitled, "Mutations and Viruses: Small Changes with Deadly Results."

TRAINING PROGRAM NEWS

Interdisciplinary Immunology Postdoctoral Training Program

Principal Investigators: Noah Butler, PhD, and Li Wu, PhD

The training program is supported by a T32 training grant from NIH/National Institute of Allergy and Infectious Diseases and has been funded since 1984. The goal is to produce outstanding independent investigators in immunology who will make meaningful contributions to immunological sciences through academic, biotechnology, public policy, or other relevant careers.

2020-2021 Trainees

- Lisa Drewry, PhD (Harty Lab)
- Emma Hornick, PhD (Bishop Lab)
- Brian Juber, MD (McElroy Lab)
- Breanna Scorza, PhD (Petersen Lab)
- Zeb Zacharias, PhD (Legge Lab)

Training in Molecular Virology, Viral Pathogenesis and Viral Vectors

Principal Investigator: Stanley Perlman, MD, PhD
Co-Investigator: Wendy Maury, PhD

The training program is supported by a T32 training grant from NIH/National Institute of Allergy and Infectious Diseases and has been funded since 1998. The purpose of this training program is to train young scientists to be productive members of the virology research community.

The competitive renewal received a perfect score and funding will continue through May 2026.

Training in Mechanisms of Parasitism

Principal Investigators: Mary Wilson, MD, Patrick Schlievert, PhD, and Noah Butler, PhD

The training program is supported by a T32 training grant from NIH/National Institute of Allergy and Infectious Diseases and has been funded since 1996. The program unites scientists working on different microbial systems and methods, but addressing similar questions about “Parasitism”, i.e. the pathogenesis of microbial diseases.

2020-2021 Trainees

- Dana Bohan (Maury Lab)
- Jordan Johnson (Butler Lab)
- Andrew Jezewski, PhD (Krysan Lab)
- Ellen Kiser (Wilson Lab)
- Bridget Moricz (Jones Lab)
- Angela Pack, PhD (Butler Lab)
- Anthony Pannullo (Ellermeier Lab)
- Lok-Yin Roy Wong, PhD (Perlman Lab)

Research Experience for Undergraduates in Microbiology

Principal Investigators: David Weiss, PhD, and Aloysius Klingelhutz, PhD

The Research Experience for Undergraduates (REU) in Microbiology has been primarily supported by the National Science Foundation since 1994. The goal is to foster the careers of the next generation of microbiologists. The REU provides an intensive 10-week summer research experience for bright and ambitious undergraduates who are considering a PhD in microbiology and have limited access to research opportunities at their home institutions.

Due to the COVID-19 pandemic, the summer program for 2020 was canceled. Conditions permitting, co-directors David Weiss and Al Klingelhutz are looking forward to hosting the program again in Summer 2021.

UNDERGRADUATE STUDENT NEWS

Undergraduate Research

The pandemic has posed many challenges for undergraduate research. With lab shutdowns, many projects were forced to go online. Other projects were put on hold. Social distancing practices and mask-wearing allowed undergrads to return back to labs. Research continues to be an important part of our undergraduate program and we look forward to more "normalized" activities in the future.

Iowa Center for Research Undergraduates (ICRU)

Students Shalini Birari, Linhai (Peter) Cheng, and Sreelekha Kundu participated in this virtual event highlighting student researchers in Spring 2020.

Honors in Microbiology Distinction

In 2020, the Department was proud to celebrate 5 outstanding undergraduates who achieved Honors in Microbiology. This distinction requires a high overall grade point average and extensive undergraduate research culminating in the production of a written thesis and an oral presentation of their work.

Barbara Badovinac (Radoshevich Lab) "Determining the role of ISGylation of Rab7a during cellular stress responses"

Moe Badreddine (Yahr Lab) "A rhlI 5' UTR-Derived sRNA Regulates RhlR-Dependent Quorum Sensing in *Pseudomonas aeruginosa*"

Alix McCullough (Weber Lab) "The *C. trachomatis* T3SS Effector Protein TmeA Binds N-WASP to Facilitate Host Cell Invasion"

Patrick Schwartzhoff (Butler Lab) "The effects of NLRP3 activation and hemozoin presence on anti-Plasmodium immunity"

Alexandria (Alex) Sturtz (Butler Lab) "Immunotherapeutic modulation of anti-malarial immunity"

Microbiology Undergraduate Student Association (MUSA) Program Update

by Alex Dobrila (MUSA President)

MUSA is an active student-led organization devoted to nurturing undergraduate interest in microbiology and providing opportunities for students to learn from and interact with faculty and graduate students involved in research.

In March 2020, MUSA had to shift its monthly meetings to a virtual setting due to the COVID-19 pandemic, and their plans to attend the annual ASM MICROBE Conference were unfortunately canceled. Despite the challenges posed by this global pandemic, MUSA managed to successfully hold an entirely virtual merchandise sale and continued to provide undergraduate students with information about professional development and microbiology research. Additionally, MUSA assisted with virtual community outreach events such as Kids GO STEM. They also worked with Dr. Theresa Ho to create and staff smaller virtual outreach activities with elementary school children in the Iowa City area.

2020–2021 Stinski Undergraduate Research Fellowship

Shelby Andersen (Weber lab)) and Lindsey Grady (Maury lab) were each awarded the Stinski Undergraduate Research Fellowship for 2020-2021. The fellowship supports undergraduates in pursuit of research in the field of microbiology. The fellowship provides an annual stipend and full tuition support for the 2020-2021 academic school year.

OUTREACH AND STEM

Departmental Outreach

by Theresa Ho, PhD

Microbiologists have suddenly found our knowledge of tiny parasites useful during a pandemic when talking to friends and families about health and safety. This summer, a dozen graduate students (spear-headed by fourth-year Microbiology graduate student Kelsie Nauta) were highly motivated to do something constructive to help educate our community. Over several weeks of Zoom meetings, these students developed content and materials for fun and engaging STEM outreach activities for school-age kids. We worked together with counterpart graduate student groups from Neuroscience and Biology as well as microbiologists at Iowa State University to provide STEM-focused activities to relieve the monotony of the pandemic.

Together with medical students and undergraduates, many members of the Department of Microbiology and Immunology have engaged, educated, and supported dozens of young people in our community who have often been marginalized because of race, socio-economic status, or gender.

Outreach has come in many different guises this year. We have interacted with kids at picnic shelters and in parking lots and large empty warehouse spaces while drowning in face masks and shields. We have taught from small, rectangular boxes, Zoom-ing into kids' classrooms and homes fighting through internet connection issues. Often, we lead an activity like "Build Your Own Virus" while talking about the shapes, anatomy, and variety of viruses. Sometimes we talk about what inspired us to become microbiologists. Mostly, we play with the kids and distract them from the stress of the pandemic world. Not every kid who participated will become a microbiologist. Not every kid will remember the difference between DNA and RNA. But for a few moments, these kids have the attention and support of some normal, dare I say cool, human beings who happen to be scientists.

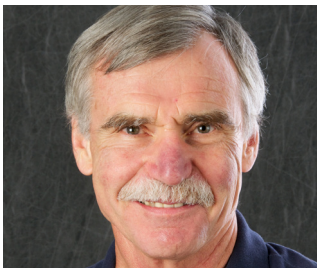
Many of these families we have reached out to with our STEM activities are skeptical and fearful of immunizations. In many cases, language and misinformation are significant barriers to understanding and accepting the science behind this pandemic. We hope to coordinate discussions between these families and knowledgeable microbiologist volunteers from our Department in the coming weeks. We hope to provide a safe and comfortable place for us to explain the value and importance of vaccinations in a way that does not demean or patronize those who are apprehensive. We hope that we microbiologists might be a little light in that darkness.

We are always on the lookout for more outreach opportunities and more volunteers. We have worked with local non-profit organizations, including United Action for Youth, Dream City, the Multicultural Development Center of Iowa, Open Heartland, Neighborhood Centers of Johnson County, the City of Iowa City, the University of Iowa Healthcare Outreach program, and teachers from the Iowa City Community School District. If you are looking for a way to use your love of science to educate and support kids and families in our community, contact Dr. Ho by email: theresa-ho@uiowa.edu.

Undergraduate student involved in STEM Outreach

by Floyd Evans

I am a third-year undergraduate majoring in Microbiology. In 2020, I participated in outreach with kids in a 3rd grade class at Lincoln Elementary. In the beginning, we introduced ourselves and talked about why we liked science/microbiology and how we became interested in it. Dr. Ho then discussed why viruses are important, the impact of microbes on humanity, and careers that microbiologists have. This bridged into the topic of SARS-CoV-2 and its structure. During the first time in January, we led six kids through a craft of making cardboard coronaviruses with pipe cleaner nucleic acids. In that period, we discussed different fascinating topics about viruses and microbiology. The kids also asked questions and shared their own insights into microbiology, which contributed to a fun conversation. During the second time, there were eight students. Another undergraduate student, Elise Femino, and I entered a breakout room to demonstrate and lead microbiology conversations between ourselves with four students. We constructed viruses until the school district's internet connection failed! Doing outreach online certainly has its challenges!



EMERITUS FOCUS

From Microscopes to Telescopes: Retired HIV Researcher Now Studies the Night Sky

C. Martin (Marty) Stoltzfus, PhD, Professor Emeritus, Microbiology and Immunology

Marty Stolzfus, PhD, grew up in Manson, Iowa. One of his claims to fame, among many, was that he was selected All-State in high school football. After high school, he went to the University of Colorado, earning a BA degree in Chemistry in 1966. He then went to graduate school at the University of Wisconsin-Madison, where he earned his PhD in Biochemistry in 1971. His thesis work with the renowned virologist, Roland Reuckert, focused on characterizing the structure of a picornavirus. He then went on to do a postdoc at the Roche Institute for Molecular Biology, where he worked on reovirus transcription with Aaron Shatkin. He became an Assistant Professor at Vanderbilt in 1973, where he initiated his studies on the exciting new field of retroviruses.

After getting tenure at Vanderbilt, Marty was recruited to the University of Iowa in 1979 as an Associate Professor. At Iowa, he focused his studies on Rous Sarcoma Virus (RSV), an important model virus for understanding malignant transformation of cells. A number of seminal papers from Marty's lab were concerned with regulation of RSV mRNA splicing. These studies poised his lab for work on HIV, the causative infectious agent of AIDS. His lab's studies were critical for understanding gene regulation via mRNA splicing of HIV genes. During Marty's tenure at the University of Iowa, he taught virology and molecular biology to undergraduate, graduate, and professional students. He trained scores of students and postdocs, many of whom went on to successful careers in research, medicine, and other professions.

Marty is a member of the Cedar Amateur Astronomers. In his spare time, he views and photographs planets, stars, galaxies, star clusters, and nebulae with his telescope that he keeps in a shed with a retractable roof outside of Iowa City, away from light pollution. He also regularly schedules time on publicly available robotic telescopes, where he remotely takes pictures of the skies. (Marty has a website where some of his images can be seen: https://www.flickr.com/photos/marty-stoltz011840.) Marty and his wife, Char, went on numerous adventures around the world to view total solar eclipses.

Marty currently lives in Iowa City with Char and enjoys spending time with his son, daughter, and granddaughter.

The grand design galaxy Messier 51 (M51) in the constellation Canes Venatici at the end of the Big Dipper's handle. M51 is actually two galaxies, M51a and M51b, with M51a being the larger one and M51b being the smaller companion located near the lower spiral arm of M51a. M51a is 76,000 light years in size, slightly smaller than our own Milky Way galaxy. M51 is 30 million light years away. This photo was taken remotely by Marty Stoltzfus on July16, 2020, using the robotic iTelescope T21 at Mayhill, NM.

Department of Microbiology and Immunology Emeritus Faculty

Lee-Ann Allen, PhD
Michael Apicella, MD
John Butler, PhD
Steven Clegg, PhD
Michael Feiss, PhD
Charles Cox, PhD
Louis Hoffman, ScD
William Johnson, PhD
Linda McCarter, PhD
George Stauffer, PhD
Donald Stahly, PhD
Mark Stinski, PhD
Marty Stoltzfus, PhD

Linda McCarter

by Patrick Schlievert, PhD

Linda McCarter, PhD, retired in June 2020.

Linda McCarter received her Bachelor's degree from the University of Hawaii at Manoa. She received her PhD at the University of California, Davis. Prior to coming to the University of Iowa, Linda was a faculty member at the University of Wisconsin-Madison, and the Scripps Research Institute in La Jolla, California. She was a faculty member at the University of Iowa for nearly 25 years before becoming an emeritus professor. Linda's research explored cell-cell signaling among Gram-negative rod-shaped bacteria, most prominently studying molecular mechanisms of surface motility of *Vibrio parahaemolyticus*; this microbe is notorious for causing serious diarrheal diseases, usually associated with shellfish. While the ability of *Vibrio parahaemolyticus* to move towards and away from external stimuli is incredibly complex, Linda and her trainees made great advances in our scientific understanding of this important bacterial process. Linda trained many undergraduate students, graduate students, and postdoctoral associates in the Department. Linda and her mentees published manuscripts in high-profile journals, including *Molecular Microbiology, Journal of Bacteriology, PLoS Pathogens, and Proceedings of the National Academy of Sciences.* Linda is well-known also for her teaching activities, most notably her teaching of undergraduates in laboratory courses. She received multiple awards for her teaching and mentoring of students. She has a quiet voice and demeanor and superb microbiology knowledge that engendered confidence in her advice and decision-making. Linda served with distinction on many PhD graduate student examination committees and chaired many. She was also co-director of the Summer REU Program. Linda was a great asset to the Department, the Carver College of Medicine, and the University as a whole. She will be missed!

Dr. Stinski Receives Distinguished Alumni Award

Mark Stinski, PhD, was the recipient of the University of Iowa Distinguished Alumni Award. Dr. Stinski devoted his career to the study of human cytomegalovirus (HCMV), a virus that can cause birth defects and life-threatening infections in the immunosuppressed. His laboratory discovered and patented a powerful transcriptional promoter of CMV that has been used extensively by research laboratories and pharmaceutical companies to facilitate high expression of proteins. The CMV promoter patent has generated more than $160 million for the University of Iowa allowing recruitment and retention of faculty members, establishment of endowed chairs, and support of research across campus.

Dr. Stinski was elected as Fellow of the American Academy of Microbiology and the American Association for Advancement of Science. He also received the Alexander Von Humbolt Award from Germany. As a faculty member in the Department of Microbiology, he greatly valued teaching and mentorship and has trained numerous mentees who have become leaders in biomedical research at academic universities and biotech companies. Congratulations, Dr. Stinski, on this well-deserved award!

In Memoriam | Dr. Jose Rodriguez

Emeritus faculty member, Jose Enrique Rodriguez, PhD, passed away in November 2020, after his brave fight against pancreatic cancer. Dr. Rodriguez was a dedicated professor, thoughtful colleague, caring advisor, and exacting researcher in virology. Dr. Rodriguez retired in 1999.

https://www.legacy.com/obituaries/press-citizen/obituary.aspx?n=jos-enrique-rodr-guez&pid=197098667

ALUMNI FOCUS

Ed Mocarski, PhD (Class of '79)

Ed Mocarski, PhD, 1979, traveled a long way from Belleville, NJ, to pursue graduate work with Dr. Mark Stinski at the University of Iowa. This move was prompted by a suggestion from the Chair of Microbiology at Rutgers College, Dr. Wayne Umbreit (a colleague of J. Roger Porter of Iowa), to "go pursue a new herpesvirus" with Dr. Stinski. His thesis, focusing on the cytomegalovirus (CMV) persistent infection, initiated a passion for herpesviruses that he continues to nurture to this day. At Iowa, he met his wife of 41 years, Christine Martens, who also received a PhD from the Department. While at Iowa, Dr. Mocarski was introduced to Dr. Bernard Roizman, an expert on Herpes Simplex Virus (HSV), who was visiting from the University of Chicago to give a seminar. Dr. Roizman offered Dr. Mocarski a postdoctoral position and he immediately accepted. After his postdoc, he was hired on the faculty of Stanford University (1983-2006), where he continued studies on both HSV and CMV. Following in Dr. Stinski's footsteps, he become a leading expert in CMV research. Dr. Mocarski is also recognized as one of the most broadly knowledgeable experts on all herpesviruses. At Stanford, Dr. Mocarski served as Professor and Chair of the Department of Microbiology and Immunology (1994-1999) and Associate Dean of Research (2000-2001). He became Emeritus Professor as he was recruited to Emory University (2006-present) to become the Robert W. Woodruff Professor of Microbiology and Immunology in the Emory Vaccine Center. He also served as Distinguished Fellow at MedImmune, LLC (2009-2011). Due to his outstanding scientific contributions, Dr. Mocarski serves as a member of the American Academy of Microbiology and has become recognized as a top world expert in both virology and immunology. His research has focused on herpesvirus replication and persistence, viral evasion of host defense, and viral pathogenesis. His most recent interests have been the host defense potential of programmed cell death, where he has discovered novel pathways and signaling mechanisms mediated by herpesvirus-encoded cell death suppressors. While maintaining a well-funded lab, he has published over 200 research articles in leading scientific journals, has contributed to virology textbooks, and has co-edited the reference book, "Human Herpesviruses: Biology, Therapy and Immunoprophylaxis". Dr. Mocarski's passion for herpesviruses, much of which started from his graduate experience at the University of Iowa, has been passed on to over 70 graduate and postdoctoral trainees during his long and productive career.

Alumni, Reconnect with Us!

Please let us know any status updates, career achievements or other news!

Email us at:
microbiology-alumni@uiowa.edu

McKaylee Robertson, MPH, PhD

As a trained epidemiologist, alumnus McKaylee Robertson, MPH, PhD, is doing her part to understand, treat, and stop the spread of viruses. Dr. Robertson earned her BS degree in Microbiology with Honors (Klingelhutz lab) from the University of Iowa in 2008 and her Masters in Public Health, specializing in Epidemiology, from the University of Iowa College of Public Health in 2010. Upon graduating, McKaylee started a fellowship with the Centers for Disease Control and Prevention at the New York City Department of Health, where she used population-based surveillance data sources for characterizing and monitoring the HIV epidemic, with the goal of improving health services for people living with HIV. McKaylee then went on to work at the CDC in Atlanta, Georgia, where she continued her work studying HIV clinical outcomes. She completed her PhD in Epidemiology at the City University of New York Graduate School of Public Health and Health Policy in 2019, where she has worked as a research scientist studying the effectiveness of HIV care coordination. With the pandemic, her group started a national study, the CHASING COVID cohort, to understand the spread and impact of SARS-CoV-2 on individuals and communities in the USA. McKaylee recently took an epidemiologist position with Pfizer, where she works in safety surveillance research. Dr. Robertson speaks highly of her time at the University of Iowa and emphasizes how important her Microbiology BS degree has been in understanding infectious diseases and directing her career decisions.

We wish her success in her new position at Pfizer.

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