American Society for Microbiology
Distinguished Lecturer (ASMDL) Program

Program Year 2019-2020
Lecture Topics and Descriptions

The ASMDL Roster includes two Waksman Foundation Lecturers, supported through funding from the Waksman Foundation for Microbiology, with research topics primarily focused in antibiotics, translational research and/or environmental microbiology. Waksman Foundation Lecturers are clearly denoted on the Roster.

Aaron A. Best, Ph.D. *(term: 7/1/18 through 6/30/20)*
Waksman Foundation Lecturer

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ASM MEMBERSHIP AFFILIATION

Primary Division	W	Microbiology Education
Secondary Division	R	Evolutionary and Genomic Microbiology

LECTURE TOPICS AND DESCRIPTIONS – Aaron A. Best, Ph.D.

Just Your Friendly, Neighborhood *E. coli*? Population Diversity of *Escherichia* Isolated from Fresh Water Sources

Escherichia coli is traditionally thought of as a commensal and pathogen of animals and as a primary model organism for the study of molecular biology, genetics and microbiology. It is also used as a fecal indicator bacterium in the monitoring of food and water quality. However, increasing evidence suggests that there are strains adapted to secondary environments outside of host organisms, including soil and water, raising the question of whether *E. coli* should continue to be used in routine water quality monitoring. This talk describes an ongoing research project conducted in the context of a course-based undergraduate research experience (CURE) to understand the types of *E. coli* isolated from fresh water sources and their genomic and phenotypic diversity.

Reaching Clarity: Monitoring a Hypereutrophic Watershed During Remediation

The Macatawa Watershed in West Michigan contains a drowned river mouth lake that drains into Lake Michigan. Extensive anthropological influence has resulted in hypereutrophy of Lake Macatawa characterized by extreme levels of sediment, nutrient loading of phosphorous and

nitrate, and levels of *E. coli* that exceed contact limits. This talk describes a partnership of Hope College with the local community to actively monitor remediation of the watershed for impact on physical and microbial levels. Weekly sampling of water at lake and stream sites is conducted by undergraduate research students in the context of a course-based undergraduate research experience (CURE) to establish baseline levels of sediment, phosphate, nitrate, *E. coli*, and 16S rRNA bacterial community profiles for long term comparison as remediation efforts continue.

What's in *Your* Water? Assessing Water Quality Around the World
The WHO estimates that, in 2015, 844 million people lacked access to an improved water supply, and that at least 2 billion people used a drinking water source that had fecal contamination. Annually, it is estimated that over 840,000 people die of diarrhea related to the use of contaminated water supplies, including over 300,000 children. These deaths are largely preventable with proper drinking water improvement and education. This talk describes a global survey of unimproved drinking water sources from over 20 countries using 0.1 micron point-of-use filters to collect water quality metrics, including profiles of 1) microbial populations based on 16S rRNA sequencing, 2) dissolved heavy metals, and 3) particulate geochemistry. Bacterial community profiles are analyzed for connections to chemical and particulate profiles, geographic location, drinking water source and other factors. In addition, the health impacts of introducing point-of-use water filters in all households of villages in relation to water quality metrics is described.

Taking the Research Plunge from Day 1: Authentic Research for First Year Undergraduates
Incorporation of authentic research experiences into undergraduate training has been shown to impact recruitment and retention of students into STEM fields. Over the past 20 years, efforts to include research in course-based experiences have increased, yielding many small-scale efforts at individual institutions and several examples of nation-wide programs that span many institutions. This talk describes Hope College's experience with the implementation of both local and national course-based undergraduate research experiences (CUREs), including the SEA-PHAGES program. The Day1 Watershed Research Community at Hope College (https://hope.edu/academics/day1/watershed.html) expands the concept of a CURE to include residential and academic support communities for students. The impacts of the programs on student careers, student learning, and student perceptions of themselves and science is being assessed and is described. Lessons learned from implementation and participation in a variety of CUREs will be described such that graduate students, post-doctoral students and faculty can envision implementation of these approaches at their own institutions.

BIOGRAPHICAL SKETCH – Aaron A. Best, Ph.D.

My first exposure to microbiology was during undergraduate training at William Jewell College (Liberty, MO), a small private liberal arts college (B.A. Biology, 1996). An undergraduate research experience led me to obtain a Ph.D. in Microbiology from the University of Illinois, Urbana-Champaign with Dr. Gary Olsen (2001) focused on evolution of transcription systems, followed by a post-doc with Dr. Carl Woese in molecular evolution. I pursued a career in academia that supported serious research and excellence in teaching, returning to a liberal arts environment where I am the Harrison C. and Mary L. Visscher Professor of Genetics at Hope College. I maintain an extramurally funded research program, incorporating undergraduates into all aspects of the research process; have combined research and teaching programs into a single

endeavor; have taught and participated at a programmatic level in HHMI's SEA-PHAGES for nine years; incorporated research projects into a microbiology laboratory course; and started a laboratory course for first-year students on the microbial ecology of our watershed. My research centers on comparative genomics of environmentally derived *Escherichia* populations, molecular ecology of fresh water systems, integration of large-scale datasets into genome-scale metabolic models of bacteria, and assessment of integrating research into teaching on student education.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Aaron A. Best, Ph.D.

The ASMDL program represents an opportunity for me to give back to the Society that profoundly influenced my professional development. I have established a highly active research program in the context of undergraduate training at a primarily undergraduate institution (PUI), and I believe that my expertise in combining research with intense teaching responsibilities can serve as a positive example for others considering careers in academic microbiology. It is well documented that less than 10% of Ph.D.'s will obtain tenure track positions at research intensive universities; it is imperative that examples of "alternative" career paths are made clear. My first ASM meeting was in Chicago during graduate school, and I have been attending the General Meeting/ASM Microbe since then. As I transitioned to a PUI, I began attending the ASM Conference for Undergraduate Educators (CUE), which has proven to be an invaluable resource. I had the privilege of co-organizing ASMCUE in 2007. My undergraduate research students have presented work at national ASM meetings; two have received ASM Undergraduate Research Fellowship (URF) awards. In 2014, I presented at an ASM General Meeting workshop, "Getting Started as a Microbiologist at a Primarily Undergraduate Institution," and I have presented invited talks at the General Meeting and the Michigan Branch meetings. During my time at Hope College, I have published 24 peer reviewed papers; 16 include over 100 undergraduate co-authors. ASM is vital to my professional development. I look forward to serving the Society by bringing the perspective of an active teacher/scholar at a PUI to the ASMDL program.

Stephen M. Beverley *(term: 7/1/18 through 6/30/20)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	AA	Free-Living, Symbiotic, & Parasitic Protists
Secondary Division	B	Microbial Pathogens

LECTURE TOPICS AND DESCRIPTIONS – Stephen M. Beverley

Role of RNA Viruses as Pathogenicity Factors in Protozoan Parasites
Many protozoans contain endogenous viruses; examples include *Leishmania*, *Trichomonas*, *Giardia*, and several apicomplexans including *Cryptosporidium*, *Babesia*, and *Toxoplasma*. Focusing mostly on *Leishmania*, we showed a few years ago that these actually contribute towards parasite virulence in animal models and probably in humans. As endobiont viruses, these in effect constitute the "virome within." Lecture topics would include the emerging parasite viromes including viral discovery, the structure and functional relationships of viruses within the parasite host, how these contribute to mammalian pathogenicity, and exploiting these viruses as therapeutic targets. *Leishmania* will be the central paradigm but studies of the other protozoal viruses will be incorporated depending on the specific lecture.

The Role of *Leishmania* Surface Glycoconjugates in Pathogenicity
Like many pathogens, *Leishmania* is covered with a dense glycocalyx that plays critical roles in survival through the parasite's infectious cycle. To probe the role of these we have employed forward and reverse genetic methods, steadily incorporating the most recent advances in genetic tools now including CRISPR/Cas9, which works with high efficiency. We are systematically dissecting the pathways for every surface glycoconjugate, starting from the synthesis of fundamental sugar or lipid building blocks on up, and using genetics to then link these to the consequences on parasite virulence. Unexpectedly, one of the new glycosyltransferases is localized to the parasite mitochondrion, where its activity and residence is essential. Previously, glycosylation was not thought to occur in mitochondria and this may represent an unexpected new direction for eukaryotes generally. This story and its role in metabolism is an intense area of investigation.

Genomic and Genetic Perspectives on Parasite Virulence
With a consortium of investigators we now have genome sequences for many *Leishmania* species; comparative analyses and implications for virulence are a focus.

Widespread Aneuploidy in *Leishmania*
Cultured *Leishmania* parasites typically show aneuploidy at 1-10 chromosomes, a remarkable finding seen in several fungal species as well. These provide a mechanism and opportunities for selection and adaption, especially given the low frequency of genetic exchange and transcriptional regulation in *Leishmania*. Recent studies have raised the question of whether this phenomenon is seen in nature or is an adaptation to laboratory culture, which we are now addressing through direct examination of uncultured parasites by methods including single-cell sequencing.

BIOGRAPHICAL SKETCH – Stephen M. Beverley

Dr. Beverley's laboratory studies the biology of the protozoan parasite *Leishmania*, including virulence factors, host response and basic metabolic functions. His laboratory has focused on the development of genetic tools and their applications to diverse questions in *Leishmania* biology, more recently incorporating genomic and gene editing approaches. Recent foci include the study of the RNAi interference pathway as a tool and also the forces contributing to its loss during evolution in some *Leishmania* species. These studies have led his laboratory into the study of *Leishmania* RNA viruses and their role in parasite virulence. Translational interests include the identification of chemotherapeutic targets and live vaccination strategies. Dr. Beverley earned his Ph.D. in biochemistry from the University of California, Berkeley, and did postdoctoral research at Stanford University. In 1983 he moved to Harvard Medical School and went on to become Professor and Interim Chair of the Department of Biological Chemistry & Molecular Pharmacology. In 1997 he joined the faculty at Washington University School of Medicine in St. Louis as Head of the Department of Molecular Microbiology. He is a Burroughs-Welcome Scholar in Molecular Parasitology, a member of the US National Academy of Sciences, a member of the American Academy of Microbiology, a Fellow of the AAAS, and a Fellow of the American Society of Tropical Medicine and Hygiene. In 2017, Dr. Beverley received the Peter Raven Lifetime Achievement Award from the St. Louis Academy of Sciences.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Stephen M. Beverley

One of the goals of the ASMDL program is to encompass the diversity of the ASM, including unicellular eukaryotes including parasitic protozoa, as well as institutional and geographical strengths – both of which I have great enthusiasm for. I will bring to this program a perspective based not only on my own laboratory research, but also from having served as chair of a major microbiology department for more than 20 years. This includes perspective across a wide range of microbiology and other disciplines, design and implementation of teaching for undergraduates, MD and Ph.D. students, and career development for trainees and faculty. The ASMDL program provides an opportunity for increased interactions with trainees beyond that typically available in most conference or individual university seminars. Given the increasing and complex pressures they face, opportunities to talk with senior leaders (and vice versa) is perhaps more critical than ever.

Barbara A. Brown-Elliott, MS, MT(ASCP)SM *(term: 7/1/18 through 6/30/20)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	U	Mycobacteriology
Secondary Division	C	Clinical Microbiology

LECTURE TOPICS AND DESCRIPTIONS – Barbara A. Brown-Elliott, MS, MT(ASCP)SM

Nontuberculous Mycobacteria (NTM) and Recent Developments in the Mycobacteriology Laboratory

Mycobacteriology (the study of mycobacteria and the diseases they cause) has been greatly impacted by recent changes in the laboratory methods used for identification of NTM, including gene sequencing, and by the need for multiple gene targets for the identification of some species, especially among the rapidly growing mycobacteria. There are currently more than 160 known species of NTM, and the use of molecular methods and matrix assisted laser deionization time of flight (MALDI–TOF) has expedited the identification of these organisms in the clinical laboratory, in contrast to the classic, but now outdated, phenotypic and biochemical methods. This talk provides an introduction to NTM and the application of new technologies in their identification.

Nocardia: Update on Taxonomy and Laboratory Diagnosis, Including Molecular Methods and Antimicrobial Susceptibility Testing

The genus *Nocardia* has had a long and complex history, and an equally complex taxonomy that is rapidly changing with the addition of newly described species derived by gene sequencing and other molecular methods. There are currently approximately 100 recognized species of *Nocardia*. Because of the increasing number of species, biochemical identification methods are no longer adequate to allow discrimination among species, and have been replaced by molecular methodologies. This talk will provide an overview of the genus *Nocardia*, its relevance in human disease, and the methods currently used in laboratory diagnosis and susceptibility testing.

***Mycobacterium avium* Complex (MAC): Clinical Diagnosis, Laboratory Identification, and Antimicrobial Susceptibility Testing**

MAC is the most commonly encountered nontuberculous mycobacterial taxon worldwide. The complex is composed of at least eight known species with varying clinical significance. The organisms cause chronic pulmonary infections in otherwise healthy elderly or middle-aged individuals and also cause disseminated infections in HIV-infected individuals. This talk will focus on the diseases associated with MAC, and the types of tests conducted once a MAC specimen arrives in the clinical laboratory.

Animal Infections Caused by Rapidly Growing Mycobacteria and Other Aerobic Actinomycetes

Rapidly growing mycobacteria and other aerobic actinomycetes can cause a wide variety of infections in domestic animals including panniculitis, mastitis, and other important infections. The recognition of accurate species identification is important in the management of veterinary disease. This talk describes the types of diseases caused by these organisms in animals, and the methods used to identify the causative agent.

Challenges in Research and How Having the Right Team Can Help

The major challenge to effective research has been the limitation of funding for specific projects. Importantly, the selection of the right team and topics at the right time can also be instrumental to the success of the research.

BIOGRAPHICAL SKETCH – Barbara A. Brown-Elliott, MS, MT(ASCP)SM

Barbara Brown-Elliott is an Associate Professor of Microbiology at the University of Texas Health Science Center at Tyler where she is also supervisor of the CAP-accredited Mycobacteria/Nocardia Laboratory and Instructor of Microbiology in the Masters of Biotechnology program. Barbara received her B.Sc. from Houston Baptist University, and her M.Sc. from the University of Texas at Tyler, and is a registered medical technologist with a specialty in microbiology. Barbara has extensive expertise in the detection, identification, and antibiotic susceptibility testing of nontuberculous mycobacteria, and other aerobic actinomycetes, and has authored more than 185 scientific articles and chapters, and presented more than 125 research abstracts/posters in this field. Barbara has been on the editorial board of *Clinical Microbiology Reviews* and the *Journal of Clinical Microbiology*, and an advisor on two subcommittees of the Clinical and Laboratory Standards Institute, the Centers for Disease Control Laboratory Proficiency Testing Committee, and the American Thoracic Society Committee to revise guidelines for the diagnosis of nontuberculous mycobacteria. She is a 2009 recipient of the Gardner Middlebrook Award for significant contributions in the field of mycobacteriology, and the 2013 ASM Scherago-Rubin Award for excellence in clinical microbiology.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Barbara A. Brown-Elliott, MS, MT(ASCP)SM

I developed my interest in microbiology in high school, and since then, I have devoted my entire career to microbiology, including teaching microbiology to students, many of whom went on to become dedicated physicians and researchers. I am always honored to share my knowledge with the next generation of microbiologists and believe that the future of microbiology is bright. It is exciting to see the passion in young scientists as they hone their skills.

As a clinical microbiologist with over 30 years of experience, and as a supervisor of a national reference laboratory, I have seen many changes in the way bacteria are studied. The fundamentals of research and diagnostics in microbiology remain the same, however, including the importance of careful observation, patience (especially with mycobacteria!), and a willingness to learn. Even after decades of research, the bugs can still surprise me!

I have been an ASM member since 1978, and every year I look forward to attending ASM meetings which keep me abreast of new developments and allow me to continually interface with students, scientists, and physicians from around the world. I also enjoy discussing my research and have presented at many ASM workshops, poster sessions, and symposia. I am particularly enthusiastic about the opportunity that the ASM Distinguished Lecturer program provides for interacting with students and postdoctoral fellows. I will bring my unique perspectives and experience as a clinical microbiologist and researcher, and hopefully along the way, groom the next distinguished lecturer awardee.

Robert A. Burne *(term: 7/1/19 through 6/30/21)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	H	Genetics & Molecular Biology
Secondary Division	K	Microbial Physiology & Metabolism

LECTURE TOPICS AND DESCRIPTIONS – Robert A. Burne

Probiotic Mechanisms of Beneficial Oral Bacteria
Dental caries and periodontal diseases affect a large majority of humans and are driven by environmental inputs that effect compositional and behavioral changes in the oral microbiome. Overwhelmingly, research has focused on known or putative pathogens, with little effort devoted to understanding how organisms that are associated with health moderate the pathogenic potential of oral biofilms. Using combinations of high-throughput screening, phenotypic analyses, whole-genome sequencing, and functional genomics we are characterizing a collection of organisms to understand the molecular basis for how these bacteria may promote health and antagonize the establishment and persistence of oral pathogens. The work provides the foundation for the rational design of probiotic strategies to promote oral and systemic health.

Complexities of Intercellular Communication in Regulation of Genetic Competence and Stress Tolerance in *Streptococcus mutans*
Two quorum-sensing (QS) peptides of *Streptococcus mutans* regulate bacteriocin production, development of genetic competence, biofilm formation, programmed cell death and tolerance to a variety of stressors (e.g. acid, oxidative). Using microfluids and various *in vitro* models, we have studied the physiologic and molecular basis for differential responses to the QS signals, including stochasticity in sub-population responses and hyper- or hypo-responsiveness depending on a spectrum of environmental conditions. Unlike any other organism examined, there are at least 3 peptides encoded within known genes of *S. mutans* that are differentially expressed and act as primary regulatory effectors, along with small nucleotide alarmones, to create a complex decision network that integrates physiologic status of the cells with the commitment to activate regulons required for DNA uptake, stress tolerance and virulence.

Regulation of Carbohydrate Metabolism: Long-term Memory and Cheating Behaviors in Oral Streptococci
Oral streptococci rely almost entirely on their capacity to catabolize a wide range of carbohydrates to generate energy for growth. Because of the host diet and diurnal rhythms, oral microorganisms lead a feast-or-famine lifestyle and have thus evolved highly complex regulatory pathways to optimize the use of preferred and non-preferred carbohydrates. In certain pathogenic

isolates, bet-hedging and cheating behaviors, in which sub-populations of cells can acquire long-term memory induced by certain preferred carbohydrates that precludes the population from utilizing non-preferred sources, are now evident. Further, the expulsion of hexoses during catabolism of disaccharides allows populations to develop cheaters that bet-hedge and repress catabolic systems while utilizing hexoses released by a sub-population. This behavior likely evolved to optimize persistence and ecological dominance as humans transitioned from a hunter-gatherer lifestyle to a diet rich in many different carbohydrates.

BIOGRAPHICAL SKETCH – Robert A. Burne

Robert A. Burne earned his B.S. in Microbiology from the Pennsylvania State University and his Ph.D. in Microbiology and Immunology from the University of Rochester (UR). After a 3-year postdoctoral fellowship, he served on the faculty of UR's School of Medicine & Dentistry for 10 years. He is presently the Associate Dean for Research, a Distinguished Professor and Chair, and the Louis and Marge Atkins Endowed Professor at the University of Florida College of Dentistry. The overarching theme of Dr. Burne's research is to dissect the molecular mechanisms governing the ability of bacteria that colonize the human oral cavity to modulate gene expression in response to environmental inputs. He has published over 175 peer-reviewed articles on the genetics, physiology and ecology of oral biofilm bacteria, including works on novel probiotic mechanisms used by beneficial bacteria. Over 150 students, postdoctoral fellows, clinician-scientists and international fellows have received training in his laboratory. Among the recognitions he has received for his contributions are the International Association for Dental Research's Gies Award, Hatton Award and Distinguished Scientist Award. He is currently a Fellow and elected Member-at-Large of the American Association for the Advancement of Science.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Robert A. Burne

As a student, post-doc and junior faculty member in Rochester, it was a privilege to have two seasoned and dedicated mentors who selflessly committed their time, experience and knowledge to support and guide my career development. By the mid 90s, I had 5 PhD students and 1 postdoc under my supervision. I was the PI/PD of a T35 for minority professional students and wrote my 1st T32 in the late 90s. For the past 10 years I have been the PI/PD of the largest T training program at the University of Florida, which funds 3 dual-degree (DMD-PhD), 3 PhD and 5 postdoctoral fellows. My research program has been continually funded from NIH for the past 28 years, and I am presently PI on 3 R01s and co-PI on 1 R01. Since 2000, 18 postdocs have trained in the lab, with 5 still in training. Of the 13 who completed training, all remain in science and 11 are in faculty positions. I believe the ASMDL program will allow me to benefit students, postdocs and junior faculty at regional ASM meetings by sharing the knowledge and experience gained from a decades-long commitment to research and mentoring, while "giving back" to an organization in which I have held membership since the mid-80s. Presently, the ASMDL is lacking expertise in oral microbiology and the oral microbiome; ideal for studying bacterial behaviors and interactions. Inclusion of expertise in the ASMDL in the oral microbiome will enhance the breadth and scope of the program, while offering meeting attendees novel perspectives on concepts that are broadly applicable to environmental, pathogenic and applied microbiology.

Edward G. Dudley *(term: 7/1/19 through 6/30/21)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	P	Food Microbiology
Secondary Division	B	Microbial Pathogens

LECTURE TOPICS AND DESCRIPTIONS – Edward G. Dudley

Virulence Depends on the Company You Keep
As humans, our attitude and well-being can be impacted by those around us. Bacterial pathogens are not so different. One focus of Dr. Dudley's lab is whether the course of infection by the foodborne pathogen *E. coli* O157:H7 varies in response to specific strains of commensal *E. coli* colonizing the intestines. This research-focused talk reveals ways that the production of toxin by *E. coli* O157:H7 changes in response to its neighbors, and highlights research from other groups that demonstrates how the gut microbiota directly affects other essential traits including adherence. This talk provides a model for how disease susceptibility could be due, in part, to individual differences in the gut microbiota.

Whole Genome Sequencing: A Leap Forward for Food Safety Regulators, a Massive Concern to the Food Industry
The rise of genomic technologies has transformed how we investigate foodborne outbreaks. Dr. Dudley's lab leads the Pennsylvania consortium of a Food and Drug Administration effort called GenomeTrakr. The goals of this program include bringing whole genome sequencing to state public health laboratories for the purpose of defining routes of foodborne pathogen transmission in unprecedented detail. This talk will describe how foodborne outbreaks are investigated, the promises delivered by this new technology, and stories of foodborne outbreaks that may not have been solved before the genomics era. This talk will also describe unintended side effects of this powerful tool, specifically the apprehension it is creating among U.S. food producers.

The Relentless Evolution of *Escherichia coli*
This talk title is taken from a famous 2005 commentary by Dr. Roy Robbins-Browne. The lifestyle of *E. coli* spans from harmless commensal to devastating pathogens of humans and animals. The genomics age provided great insights into how this species evolves to cause gastrointestinal, urinary tract, and bloodborne diseases of mammals and birds. We have also learned that some isolates are "hybrids," possessing the traits of two or more *E. coli* pathogens,

and that new variants continue to emerge. Drawing from his experiences as Director of Penn State's *E. coli* Reference Center and involvement with international working groups interested in *E. coli* typing, Dr. Dudley uses this species as an example of how basic research and surveillance studies, with an emphasis on *E. coli* foodborne pathogens, continues changing the infectious disease field.

Make Mine Raw, Unprocessed, and Preservative-free Please
The field of microbial ecology teaches us that perturbing a system can alter community composition. These rules certainly apply to food safety. Several foodborne pathogens of great concern today were unknown 40 years ago, and our news seems filled with stories of widespread illnesses resulting from contaminated foods. These changes are partially the result of our improved detection and tracking methods. However, we should not discount the role played by consumer demands for "healthier" foods, less food processing, and preservative-free foods. This talk is tailored to a broader audience and suggests how changes in food culture and attitudes over the past century have impacted pathogen trends. It also argues that those who demand raw, unprocessed, and preservative-free foods, should educate themselves about why these "undesirable" methods were implemented in the first place by the food industry.

Don't Know What You Want to Do with Your Life? Join the Club
Dr. Dudley has given this talk to numerous groups including the student chapter of the International Association for Food Protection at their national meeting. The purpose is to dispel the myths that most established science professionals knew what direction their careers were headed when they were students, and that career paths typically follow a linear trajectory. It also includes his opinions of the top 10 things students should appreciate as they transition to the working world.

BIOGRAPHICAL SKETCH – Edward G. Dudley

Dr. Dudley has a B.S. in Microbiology from Penn State, and an M.S. in Food Science and Ph.D. in Bacteriology both from the University of Wisconsin-Madison. His training has spanned various areas of food microbiology, including the genetics and physiology of lactic acid bacteria, the mechanisms of virulence of *E. coli*, and the use of genomics to define routes of transmission during foodborne outbreaks. He is currently an Associate Professor of Food Science at Penn State, and also serves as the Director of Penn State's *E. coli* Reference Center. His group leads Pennsylvania's involvement in an FDA program called GenomeTrakr, the goals of which include assisting public health laboratories as they transition to using whole genome sequences in foodborne outbreak investigations. He is the current head of the Applied and Environmental Science track for the annual ASM Microbe meetings and serves as an Editor for the journal *Applied and Environmental Microbiology*.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Edward G. Dudley

As an undergraduate student, I was a Microbiology major focused on a research career in immunology and medical microbiology; however a chance meeting with a food microbiologist followed by a summer internship at the Kraft-General Foods Department of Biotechnology opened my eyes to the fascinating possibilities in the food microbiology discipline. After nearly

30 years, three degrees, and achieving tenure at a major university, I have not forgotten how a chance meeting can radically change a student's life. Through my undergraduate teaching responsibilities (a freshman seminar, and junior level required food microbiology courses) and graduate courses (microbial physiology of foodborne microorganisms, and introduction to food microbiology for food scientists), I have tried to bring to students the excitement I felt after realizing my true passion. More recently, I have used this energy to establish an undergraduate summer research program at Penn State, funded by the USDA. This program supported 16 students in 2018, and will support 13 in 2019, with the goal of introducing students from undergraduate-centric colleges and universities to food microbiology research. Notably, this program involves the University of Puerto Rico Aguadilla, and in Fall 2019 a student from that institution will join my lab to begin her Ph.D. As an ASMDL, I would like to communicate with students why microbiology is such a fascinating discipline, and to open their eyes to the wide number of career opportunities including those in the agricultural, engineering, and environmental disciplines.

Susan Forsburg *(term: 7/1/19 through 6/30/21)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	X	Molecular, Cellular & General Biology of Eukaryotes
Secondary Division	H	Genetics & Molecular Biology

LECTURE TOPICS AND DESCRIPTIONS – Susan Forsburg

How DNA Replication Stress Is Linked to Genome Instability
The proper response to replication stress is considered to be the first barrier to malignant transformation. Using a fission yeast model, we are investigating the mechanism by which the cell responds to global and local stresses. Yeast don't get cancer but we can study cancer in yeast.

Differentiation and Development in a Model System
On the order of 25% of human conceptions end in miscarriage, largely due to early meiotic defects including aberrant chromosome segregation. Fission yeast undergoes a streamlined meiosis allowing us to investigate the processes that ensure normal chromosome segregation and viable gametes.

Dissecting Fundamental Cell Biology with Yeast Genetics: A Primer
In an era of high-throughput sequencing, we still use classical and molecular genetics to dissect biological function. How, exactly, do we do that? From isolation of mutations to suppressor screens, the art and design of working in yeast and knowing what they look like.

BIOGRAPHICAL SKETCH – Susan Forsburg

Professor Forsburg holds an AB from UC Berkeley with a double major in Molecular Biology and English, and a Ph.D. from MIT in Biology. From 1989-1993, she was a postdoctoral fellow at the Imperial Cancer Research Fund at Oxford University, UK. She was on the faculty at the Salk Institute from 1993-2004, and from there she moved to University of Southern California.

Her experience in microbiology ranges from work on bacteriophage P2 late gene expression with Richard Calendar at UC Berkeley, to studying transcriptional regulation of cytochrome c in the budding yeast *S. cerevisiae* with Leonard Guarente at MIT, to cell cycle control in the fission yeast *Sc. pombe* with Sir Paul Nurse at Oxford. She is a tireless advocate for the use of *Sc. pombe* as a model organism for the study of eukaryotic cell biology.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Susan Forsburg

The ASMDL program offers a unique opportunity to meet and share with audiences around the country. As a yeast geneticist, I occupy a bridge between classic microbiology and eukaryotic cell biology, using fission yeast as a model system to study fundamental questions relevant to cancer and development, and I look forward to an opportunity to highlight eukaryotic microbiology! I bring to the program my own research, and my advocacy for the use of model organisms in biology. Importantly, I have a long-standing commitment to the career development of junior scientists, as seen in my awards as a mentor and my leadership in both graduate and undergraduate training and education. I have also worked for diversity and inclusiveness in science, and have been recognized for my work particularly in advocating for women (including the Roche Diagnostics Alice C Evans Award from ASM in 2011). I am also active in public policy issues as a current member of the public affairs advisory committee of the ASBMB and as the ASBMB representative to FASEB's policy committee, and I am enthusiastic about encouraging the involvement of young scientists in policy and science advocacy. I have been a member of ASM for many years, and was elected to the Academy in 2014. I am eager to share my experience and viewpoints broadly with the ASM community.

Bettina Fries *(term: 7/1/19 through 6/30/21)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	F	Medical Mycology
Secondary Division	B	Microbial Pathogens

LECTURE TOPICS AND DESCRIPTIONS – Bettina Fries

Replicative Aging in Pathogenic Fungi Results in Enhanced Resilience in the Host
A novel concept of how the aging of a pathogen leads to heterogeneity in a fungal population in the host. The speaker discusses why older fungal cells exhibit higher resistance to phagocytic uptake and killing as well as why aging leads to antifungal resistance.

Infections with Multidrug Resistant Enterobacteriaceae in the U.S.
The speaker will discuss the importance and epidemiology of multidrug resistant enterobacteriaceae in the clinical setting. She will also discuss challenges that need to be overcome to develop novel treatments.

Developing Monoclonal Antibodies for Treatment of Human Infections
The speaker will discuss the basic process and challenges of developing monoclonal antibodies to treat human disease.

The Development of Antibody-based Therapies for Resistant Bacterial Infections
The speaker will discuss the challenges of developing antibodies against bacteria, including drug resistant bacteria.

BIOGRAPHICAL SKETCH – Bettina Fries

Dr. Fries is Professor of Medicine and Molecular Genetics and Microbiology and chief of the Infectious Disease Division at Stony Brook University. She is an ASM member, a Fellow of the Infectious Disease Society of America, and served as a standing member on the NIH study section for AIDS-Associated Opportunistic Infections and Cancer. She has received continuous extramural grant support, including from the National Institutes of Health. The focus of her research is in two areas: the pathogenesis of chronic infection by the fungal pathogen, *Cryptococcus neoformans*; and the development of anti-infective antibodies. She has contributed new knowledge and advanced our understanding of the host response to chronic *C. neoformans* infection and the molecular mechanisms that allow the fungus to change based on the host response. She has also developed neutralizing antibodies against *Staphylococcal enterotoxin B* and *K* (SEB, SEK) and antibodies that bind the polysaccharide capsule of carbapenem resistant *Klebsiella* strains, including those with a hypermucoid capsule type. She has published over 85

original scientific manuscripts and review articles, along with several book chapters. She is actively engaged in teaching students, residents, and fellows and is a regularly invited meeting organizer and speaker at national and international conferences.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Bettina Fries

I am a physician scientist appointed in microbiology and medicine. I wrote papers, hold grants with experimental physicists, and have developed a passion for cross-disciplinary teaching. As a residency director, I founded a journal club that brought MD-Ph.D. students and residents together to discuss basic science papers that have impact on clinical outcomes. As a division chief I have integrated my Ph.D. students and postdoctoral fellows into ID grand rounds and ID journal club, where they learn about clinical challenges and teach progress in basic science. Together with the head of microbiology, I teach a translational pillar for medical students on basic science of urinary tract infections. I have developed and taught a 3-week intensive summer course on emerging infections for undergraduate students at the University of Freiburg. That course also included skype interviews with economists and lawyers working in Global Health. I have been an ASM member since 1999 and consistently attend ASM meetings. I helped organize the ASM sponsored 8th International Conference on Cryptococcosis in Amsterdam. I publish in ASM journals and serve as reviewer. I am an active member in the ASM community and serve as councilor of the Medical Mycology Society of the Americas. I chair their award committee that selects the best graduate student abstract. I also serve in multiple roles at the annual IDSA meetings and on their awards and research committees and I serve as the President of the New York ID Society.

Jeffrey Gralnick *(term: 7/1/19 through 6/30/21)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	K	Microbial Physiology & Metabolism
Secondary Division	Q	Environmental & General Applied Microbiology

LECTURE TOPICS AND DESCRIPTIONS – Jeffrey Gralnick

Electromicrobiology: How Bacteria Make Electricity and How Bacteria Eat Electricity
The microbial world is truly a wondrous place where metabolic innovation has driven an incredible amount of diversity. Where energy in chemical reactions can be captured, life finds a way. Dissimilatory metal reducing bacteria grow by using metals like iron or manganese as an electron acceptor for respiration. Neutrophilic iron oxidizing bacteria run a similar reaction, but in reverse. We can replace the iron used by these bacteria in the lab using poised electrodes. In this lecture topic I will discuss the best understood model microbe used to generate electricity (*Shewanella oneidensis*) and discuss recent advances on our studies of a model microbe that consumes electricity (*Mariprofundus ferroxidans*).

How to Train Electric Bacteria
Some bacteria have the ability to interface with electrodes that can act either as an electron sink or as an electron donor for metabolism. However, our ability to rapidly understand and engineer them is hampered by our lack of genetic tools. Here I will describe implementation of oligonucleotide-based genetic engineering and CRISPR/Cas9 counter-selection to rapidly alter gene sequences in the electricity producing bacterium *Shewanella oneidensis.* Unlike *S. oneidensis* which is metabolically versatile, some bacteria in the environment know only how to live one way. *Mariprofundus ferroxidans* is an obligate chemolithoautotroph, using energy conserved by the formation of rust to grow while fixing carbon dioxide. I will discuss the genetic system we have developed for *M. ferroxidans* and how we are "domesticating" this bacterium to enhance growth under laboratory conditions.

Leveraging Synthetic Biology to Understand Environmental Bacteria
Synthetic Biology is traditionally applied to model systems such as *Escherichia coli* and *Saccharomyces cerevisiae* where new capabilities are added via introduction of new genes and pathways. Addition of new capabilities into environmental bacteria can be beneficial for learning about their metabolism and physiology and could be used to help domesticate some of the uncultured majority. Here I will describe how the introduction of proteorhodopsin helped us better understand metabolic energy flow in *Shewanella* and discuss our efforts to domesticate the bacterium *Mariprofundus*, an obligate iron-oxidizing chemolithoautotroph. *Mariprofundus* is the

founding member of the zetaproteobacteria and produces a twisted iron oxide stalk as a necessary byproduct of its metabolism (it's SO cool!).

Engineering Interspecies Electron Transfer
In our now aerobic world we often take for granted how easy it is to dispose of electrons from metabolic processes through the reduction of oxygen gas. However, for about the first billion or so years of life on our planet, oxygen gas was essentially absent from our atmosphere and oceans, yet microbial life thrived. Even today, anaerobic environments exist in sediments, the subsurface, in animal guts, in stratified lakes and oceans and industrial fermentations. In these anaerobic ecosystems disposal of electrons is difficult and some organisms distribute this bourdon between partners. Here I will describe our efforts to synthetically construct a microbial co-culture system to explore molecular mechanisms of interspecies electron transfer using *Shewanella* and Geobacter.

BIOGRAPHICAL SKETCH – Jeffrey Gralnick

Jeffrey Gralnick is a Professor of Plant and Microbial Biology, a member of the BioTechnology Institute and the current Director of the Microbial and Plant Genomics Institute at the University of Minnesota. The Gralnick Lab works at the intersection of environmental microbiology and synthetic biology, with a particular focus on bacteria that can eat (oxidize) or breathe (reduce) iron. Iron can be replaced by electrodes in these systems where the bacteria either consume or produce electrical current. The Lab uses classic and modern genetic techniques to understand the physiology and metabolism of these bacteria and engineer them for a variety of applications in bioenergy, biocatalysis and bioremediation. The lab has published over 50 papers in the area of microbial extracellular electron transfer, with nearly half published in ASM journals. Gralnick's former students have gone on to diverse positions in industry (both start-ups and major corporations), academia, teaching institutions and craft brewing.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Jeffrey Gralnick

It is an honor to be selected for the American Society for Microbiology Distinguished Lecturer Program. I take pride in delivering entertaining and educational seminars targeted for broad audiences where I minimize jargon, carefully explain experiments and encourage questions along the way. I recall participating in a Branch meeting held at Mankato State University several years ago and had the privilege and honor of picking up Stan Maloy at MSP airport, then driving him (and a van full of students from both my lab and Daniel Bond's lab) to Mankato, MN where Stan would be presenting as a participant in the ASMDL program. I first got to know Stan at a Midwest Microbial Physiology meeting when I was a graduate student. The drive to Mankato chatting with Stan reminded me of how important it is for senior faculty to interact with students and postdocs (and junior faculty!!). There are many pathways to success (and happiness) and the more young scientists can learn about these pathways from established scientists, the better equipped they will be to find their own way. Sharing experiences from my scientific journey, and the journeys of my students, with students and postdocs at ASM Branch meetings is something that I would be excited to do. While I cannot match Stan Maloy's ability to engage, entertain and educate (very few can), I can promise to bring his level of enthusiasm for microbiology!

Brian Hammer *(term: 7/1/18 through 6/30/20)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	H	Genetics & Molecular Biology
Secondary Division	N	Microbial Ecology

LECTURE TOPICS AND DESCRIPTIONS – Brian Hammer

Control of Bacterial Biofilms by Quorum Sensing Small RNAs
Vibrio cholerae quorum sensing sRNAs, or Qrrs, utilize distinct post-transcriptional mechanisms to negatively regulate several mRNAs and also positively regulate other mRNA targets by direct base-pairing interactions. The target genes under control of the Qrrs participate in controlling biofilms and other behaviors important in the environment and in a human host. The Hammer lab has ongoing investigations of the role of *V. cholerae* quorum sensing and biofilm formation in bacterial communities.

Natural Transformation in *Vibrio cholerae*
The Hammer lab participated in identifying components of a regulatory network that coordinates expression of a competence apparatus and Type VI Secretion System in patient-derived *Vibrio cholerae* strains. Currently, the lab is determining the mechanisms of action of newly discovered toxins and signaling systems that coordinate the T6SS weapon in recently sequenced strains isolated from environmental sources. We are also defining how horizontal exchange of Type VI genes between strains by natural transformation alters microbial fitness and cell-cell dynamics in ecological communities.

Type VI Secretion Alters the Organization of Bacterial Communities
Aquatic pathogen *Vibrio cholerae* and other bacteria compete by injecting lethal toxins into neighboring bacterial or eukaryotic cells with a Type VI Secretion System. The lab's recent work shows that Type VI-mediated aggression between bacteria in densely packed biofilms precipitates spatial reorganization of the community, which can favor the evolution of cooperation. In the intestinal tract of a fish host, Type VI-induced enhancement of gut peristalsis by *V. cholerae* can trigger the host to expel resident commensal competitors. This talk focuses on current efforts to uncover mechanisms by which contact-dependent bacteria-bacterial and bacterial-host interactions redefine microbial community composition.

Carving Out Your Niche (in Microbiology)
This talk is designed to facilitate frank discussions with students and postdocs about striving for a successful scientific career that balances their goals and values. Tips and strategies are covered that come from the experiences of the speaker, colleagues, and other associates.

BIOGRAPHICAL SKETCH – Brian Hammer

Dr. Hammer's research interests focus on understanding mechanisms bacteria use to cooperate and compete in niches they occupy. His lab has identified components of regulatory networks in *Vibrio cholerae* that control the production of numerous factors, including secreted enzymes, biofilm matrix material, a molecular harpoon for toxifying neighboring cells, and an apparatus to take up foreign DNA. The lab's current work aims to identify novel genes and regulatory connections of these networks, characterize the behaviors they control, and determine the contribution of these activities to the fitness and adaptability of this waterborne microbe in host and ecological settings. Dr. Hammer has been awarded several National Science Foundation grants including a prestigious early investigator CAREER award. He collaborates in several cross-disciplinary studies funded by the Gordon and Betty Moore Foundation, Simon's Foundation, and the US-Israel Binational Science Foundation. Dr. Hammer has received multiple awards for teaching excellence, has authored 35 articles, is faculty advisor to his campus ASM Student Chapter, serves on the editorial board for the *Journal of Bacteriology*, and is an *ad hoc* reviewer for many ASM journals, including *Applied and Environmental Microbiology*, *Infection and Immunity*, and *mBio*.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Brian Hammer

I enjoy the challenge and excitement of engaging students and postdocs in conversations – about my lab's research, about microbiology, and about being a research scientist. After earning my BS in Biology, my career path included several years as a lab technician, an aquatic ecology MS, and a medical microbiology Ph.D., prior to my postdoc. At Georgia Tech I run my research program and also teach courses spanning an introductory level "Biology of Sex and Death" course for non-majors to my upper level "Molecular Microbiology" course. In 2011 I received the Undergraduate Faculty of the Year award and in 2014 a Junior Faculty Teaching Excellence award from our campus Center for Teaching and Learning. In the spring of 2016 I presented an invited TEDx talk on microbial cooperation and conflict. I currently serve on the *Journal of Bacteriology* editorial board and as faculty advisor for my campus ASM Student Chapter. I present my research at ASM's Microbe and Branch meetings, and I make it a point to bring postdocs, graduate students, undergraduates, and high school students to these events. Since 2008 I have mentored 17 undergraduates, 10 MS and 6 Ph.D. students, and 2 postdocs. My passion for training young researchers stems from the mentoring I received from my own advisors, extraordinary scientists and communicators. As an ASMDL I will relish the opportunity to serve as a model for students and postdocs discovering their unique career paths.

Dr. Bert Jacobs *(term: 7/1/19 through 6/30/21)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	S	DNA Viruses
Secondary Division	D	Microbe-Host Interactions

LECTURE TOPICS AND DESCRIPTIONS – Dr. Bert Jacobs

The Amazing, Death-Defying….Poxviruses
Poxviruses are among the most interferon-resistant viruses that have been characterized. The vaccinia virus E3L gene is essential for interferon-resistance. One of the main functions of E3L encoded proteins is to bind to and sequester the viral pathogen-associated molecular pattern (PAMP), A-form dsRNA. However, most poxvirus E3L–like genes encode a second nucleic acid binding domain, capable of recognizing Z-form nucleic acid. Our recent data demonstrates that this Z-NA binding domain of E3 proteins is essential for interferon-resistance, by inhibiting pre-mature program necroptotic cell death. This research provides insight into how cells sense virus-infection, and how viruses have evolved to evade sensing by the host.

Ancient Medicine/Modern Science: Re-discovery of Herbal Antivirals
Native Americans were reported in the mid-19th century to have an herbal cure for smallpox. We have gone back to characterize the herbal extract reported to cure smallpox. We have shown that this extract inhibits replication of vaccinia virus, monkeypox virus and variola virus, the causative agent of smallpox, and have begun to characterize the mode of action of this anti-viral extract. We have shown that this extract has antiviral activity against several unrelated DNA viruses, and may have efficacy both in humans and in animal models for treatment of viral diseases. These type of extracts may be a source of potential antiviral compounds.

BIOGRAPHICAL SKETCH – Dr. Bert Jacobs

Dr. Jacobs is Professor of Virology and former Director of the School of Life Sciences, and a member of the Biodesign Center for Immunotherapy, Vaccines and Virotherapy at Arizona State University. The main interest of Dr. Jacobs' lab is poxvirus:host interactions; in particular, evasion of the innate immune interferon defenses by poxviruses. Disabling of the immune evasion genes in vaccinia virus has allowed the generation of highly attenuated strains of vaccinia virus as improved vaccine vectors for diseases such as HIV, as well as viruses to

potentially treat cancer. Dr. Jacobs was awarded the Governor's Innovator of the Year Award in Academia for the work in vaccine development.

Dr. Jacobs received his Ph.D. in Biochemistry from the University of California, Berkeley and did post-doctoral research at the University of California, Santa Barbara, before taking a faculty position at Arizona State University. He has been a member of the NIH Virology Study Section, and has served on numerous biodefense-related study sections. He has been an active collaborator with Russian scientists at VECTOR, home of the Russian smallpox repository. Dr. Jacobs serves as Chair of the Arizona State University Institutional Biosafety Committee.

Dr. Jacobs' teaching interests include HIV prevention education to lay audiences. In this regard, he teaches a highly regarded interdisciplinary HIV class at Arizona State University and spends several weeks each year in Africa teaching HIV prevention. Dr. Jacobs serves on the Board of Directors of two non-profit organizations dealing with public health: Aunt Rita's Foundation and HEAL, International.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Dr. Bert Jacobs

As a faculty member in the Arizona State University (ASU) microbiology program, I run an active research program, trying to understand how mammalian hosts protect themselves from poxvirus infection, and how poxviruses have evolved to evade host innate immunity. As such we have identified a novel dual nucleic acid binding protein that allows vaccinia virus to evade sensing by the host innate immune interferon system. The thrust and parry that this system provides is an entertaining example of co-evolution between pathogens and hosts. One of the things I am most proud of about our research is how it is grounded in basic research, but has implications for benefiting humanity. My other passion is teaching. I truly enjoy seeing students and faculty get the message of my research. I have an open lecturing style, hoping to encourage discussion. Through my HIV prevention teaching I have developed novel methods for teaching complex material to people who may not be experts in the field. I hope to bring this sensitivity to having every member of an audience understand my presentation to the ASM Distinguished Lecturer program. Having served as Director of the School of life Sciences at ASU, my commitment to student learning has broadened and deepened. That being said, serving as Director has limited the amount of time I have been able to devote to teaching. Having stepped down as Director, effective January 2019, I look forward to using more of my time for teaching, including serving as an ASM Distinguished Lecturer.

Barbara I. Kazmierczak, MD, Ph.D. *(term: 7/1/18 through 6/30/20)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	D	Microbe-Host Interactions
Secondary Division	B	Microbial Pathogens

LECTURE TOPICS AND DESCRIPTIONS – Barbara I. Kazmierczak, MD, Ph.D.

Bacterial Cheating: Why Phenotypic Heterogeneity Improves Pathogen Fitness in the Host
Many Gram-negative pathogens cannot establish infections when Type 3 secretion systems are mutated. Type 3 secretion system (T3SS) expression is often bistable, however, resulting in a population of T3SS-ON and -OFF bacteria. Murine infection models demonstrate that "cheating" by T3SS-OFF bacteria can improve pathogen fitness during acute infection, and might favor persistence.

Should I Stay or Should I Go? Decision Points in *Pseudomonas aeruginosa* Biofilm Formation
Bacterial transitions between planktonic and surface-associated growth underlie the remarkable ability of *P. aeruginosa* to cause disease in plants, insects, rodents and humans. Although c-di-GMP plays an important role in the development of bacterial biofilms, recent evidence suggests that cAMP is an earlier signal that triggers irreversible surface attachment and virulence in *P. aeruginosa*.

A Physicist's View of Bacterial Motility: Applying Single Particle Tracking to *P. aeruginosa* Motility
The single polar *P. aeruginosa* flagellum has a complicated regulatory apparatus compared to *E. coli* or *Salmonella*: two chemotaxis clusters, two motor-stators, and over two dozen chemoreceptors. Single particle tracking algorithms allow us to characterize how the *P. aeruginosa* flagellum moves these bacteria through 3D space, and to speculate how the unique behavior of this flagellum might allow *P. aeruginosa* to navigate through freshwater and sputum with ease.

The Cost of Virulence: Innate Immune Recognition of the Type 3 Secretion System
Bacterial virulence factors allow bacteria to infect a host – and yet they often trigger innate immune responses that lead to pathogen clearance. The opportunistic pathogen *P. aeruginosa* illustrates how this host-pathogen arms race plays out during acute pulmonary infection.

Gut Microbiome Acquisition and Maturation in Infants with Cystic Fibrosis
The genetic disease Cystic Fibrosis is marked by systemic and local inflammation which arises soon after birth. Our longitudinal study of infants with Cystic Fibrosis and healthy controls illustrates how this mucosal disease results in a dysbiotic and pro-inflammatory gut microbiome that fails to properly mature. Ongoing experiments to translate these findings to murine models will be described, and are likely to result in interesting discussions of what we can (and can't learn) from germ-free mice.

BIOGRAPHICAL SKETCH – Barbara I. Kazmierczak, MD, Ph.D.

Dr. Kazmierczak is a physician-scientist interested in how opportunistic bacterial pathogens cause disease in human hosts. Her work on *Pseudomonas aeruginosa* examines how fundamental features of *Pseudomonas* biology – flagellar and pilus mediated motility, expression of Type 3 secretion, biofilm mediated colonization – are regulated and deployed during host infection. Using single cell tracking and analysis, she is elucidating how phenotypic variation within bacterial populations, rather than mean behavior, influences pathogen-host interactions. Dr. Kazmierczak's lab also focuses on host-bacterial interactions that occur when infants establish their gut microbiome, and how this process is altered in newborns with Cystic Fibrosis. Her team's findings suggest that infants with Cystic Fibrosis fail to remodel their microbiome in early life, resulting in a dysbiotic and pro-inflammatory consortium not seen in healthy children. These findings are being translated to murine Cystic Fibrosis models to identify mechanisms of microbiome remodeling that might be targeted therapeutically.

Dr. Kazmierczak's work at the interface between microbiology and innate immunity has been recognized by awards from the Donaghue Foundation, Burroughs Wellcome Fund, and American Society for Clinical Investigation. She is a strong advocate for increasing access to graduate training in the life sciences and microbiology through her mentorship of high school and undergraduate students and her leadership of Yale's MD-Ph.D. and BioMed SURF programs.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Barbara I. Kazmierczak, MD, Ph.D.

I've been a microbiologist all of my scientific life. The study of bacteria led to the discovery of transformation and transduction; elegant papers using bacteria described the operon and transcriptional regulation; restriction enzymes paved the way for genetic engineering. These elegant scientific stories hooked me on microbiology. Luckily for me, the field continues to remain exciting and relevant. I am glad to be part of the ASMDL program so that I can transmit my enthusiasm and passion for this field to a broad and diverse audience of students.

The lectures I've proposed focus on microbial pathogenesis, a field that integrates microbiology with cell biology and immunology. The topics illustrate the wide range of approaches used to answer questions in this field, emphasizing the collaborative and interdisciplinary aspects of science. I'd like to convey that we continue to learn new things about bacterial behavior that remain relevant to understanding ourselves in health and disease, and our world – and that these advances come about both from new technologies that allow us to see and analyze millions of

individual bacterial behaviors simultaneously, and from new applications of analytic models borrowed from physics, evolutionary biology…even economics.

Communicating the value and relevance of science is central to my professional life. I teach students and postdocs and clinical fellows – but I also teach my patients on the hospital Infectious Disease service, the high school students who join our lab each summer, and the parents and families of the undergraduate students that we bring to Yale for our immersive summer research program. This, I hope, has made me clear and straightforward in how I present scientific questions and data. For many students at the Branch meetings, I might be a bit different than their professors: a (youngish) woman, a physician, a director of an MD-Ph.D. program at a research-intensive institution – and yet someone whose core identity still revolves around pulling out agar plates from an incubator, or looking through a microscope at swimming bacteria. I hope I have the chance to tell them about my good fortune.

Linda Kenney *(term: 7/1/18 through 6/30/20)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	H	Genetics & Molecular Biology
Secondary Division	M	Bacteriophage

LECTURE TOPICS AND DESCRIPTIONS – Linda Kenney

Peeking at a Pathogen in Action: Super-resolution Imaging of *Salmonella* Infection
Part of our current research is focused on high intensity imaging of *Salmonella* Typhi and Typhimurium infections *in vivo*. This work has allowed us to follow key processes during the infection process from a perspective not seen before.

Insights from Studying Individual Cells: A New View of pH Regulation in Bacteria
Unlike eukaryotes, bacteria undergo large changes in osmolality and cytoplasmic pH. It has been described that during acid stress, bacteria internal pH promptly acidifies, followed by recovery. Using pH imaging in single living cells, we showed that following acid stress, bacteria maintain an acidic cytoplasm and the osmotic stress transcription factor OmpR is required for acidification. The results indicate that activation of this response is distinct from previous mechanisms proposed for OmpR regulation. Preventing intracellular acidification of *Salmonella* renders it avirulent, suggesting that acid stress pathways represent a potential therapeutic target. These results emphasize the value of single cell analysis over studies of population averages.

How Do Bacteria Decide Between a Virulent vs Dormant Lifestyle: Watching Biofilms Form *in vivo*
After infection, *Salmonella* undertakes a complex journey through the host, transiting from the gut through lymphoid tissue and macrophages into the liver and spleen. To see how *Salmonella* decides between different outcomes during the infection process, we have used high intensity imaging of *Salmonella* Typhi and Typhimurium infections in the heterologous hosts *C. elegans* and zebrafish. These imaging techniques allow us to examine the process of biofilm formation *in vivo*.

Sometimes Your Enemy Is a Friend: *Salmonella* Pathogenesis vs Tumor Regression
Salmonella can cause very serious illness and death of an infected host. However, *Salmonella* is also very effective at targeting tumor cells and promoting regression of tumors in an infected host. We are examining the mechanisms of tumor targeting by *Salmonella* using microfluidic spheroid models, with the goal of developing strains that can serve as tumor antigen delivery devices.

BIOGRAPHICAL SKETCH – Linda Kenney

Linda Kenney is currently a Professor in the Department of Microbiology & Immunology at the University of Illinois, Chicago, and a principal investigator at the Mechanobiology Institute at the National University of Singapore. She obtained a BS in Biology at the University of Iowa, followed by a Ph.D. in Physiology and Biophysics at the University of Pennsylvania. After completing her Ph.D., she conducted postdoctoral work in biophysics at Yale University followed by three years as a Research Associate in bacterial genetics at Princeton University. She took a position in the Department of Molecular Microbiology & Immunology at Oregon Health Science University, where she progressed through the academic ranks to tenure, then moved to the University of Illinois, Chicago in 2003. In addition to her scientific research that has focused on *E. coli* and *Salmonella*, Linda has played an active role in science on editorial boards of highly regarded journals, on federal study sections, and with active membership in the Biophysical Society and the American Society for Microbiology. She has served on editorial boards of ASM journals, on the ASM Press Books Committee, and on the ASM International Fellowship Awards Committee. She has served as Chair of the International Microbiology Education Committee, as Group IV representative and as a Councilor-at-large, and has organized many sessions for ASM meetings. Her research is currently funded by two NIH grants. Linda's current research is focused on high intensity imaging of *Salmonella* Typhi and Typhimurium infections in the heterologous hosts *C. elegans* and zebrafish; characterization of the invasive phenotype of a drug-resistant *Salmonella* strain that causes high mortality in HIV patients; and examining the mechanisms of tumor targeting by *Salmonella* using microfluidic spheroid models, with the goal of developing strains that can serve as tumor antigen delivery devices.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Linda Kenney

As an ASM Distinguished Lecturer I look forward to sharing my scientific experiences and engaging with budding young scientists. I have a unique point of view as a result of my broad background in both biophysics and microbiology. I am not afraid of challenging the status quo and as a result, our work has challenged existing paradigms in three main areas: two-component signaling and how sensor kinases sense their environment; how *E. coli* and *Salmonella* sense and respond to acid and osmotic stress; and how *Salmonella* maintains the carrier state. Our recent focus on super-resolution imaging of *Salmonella* infections *in vivo* transmits the excitement of research with profound imagery. The message I can convey is to be critical and follow your results rather than being confined by existing paradigms. I have extensive international experience and our work is interdisciplinary. I often travel throughout Asia to recruit graduate students and give talks. I have also had the pleasure of teaching short courses in Mexico and Chile and sponsored ASM international fellows in my laboratory. I am especially interested in mentoring young women scientists and towards this aim, I organized a Women in Science group in the Mechanobiology Institute (https://mbi.nus.edu.sg/education/outreach/mbi-women-in-science/). We organized biannual symposia of women scientists in Singapore, held numerous outreach events and sponsored many inspirational talks by women scientists. Finally, I have an extensive service record in both the Biophysical Society and ASM.

Dr. Joel E. Kostka *(term: 7/1/18 through 6/30/20)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	N	Microbial Ecology
Secondary Division	Q	Environmental and General Applied Microbiology

LECTURE TOPICS AND DESCRIPTIONS – Dr. Joel E. Kostka

A Moveable Feast: The Response of Benthic Microbes to the Deepwater Horizon Oil Well Blowout in the Gulf of Mexico

In this talk, I begin with the ecosystem services provided by the Gulf of Mexico to the United States, emphasizing the vastness of this "small" ocean basin and its huge ecological diversity. I describe the science of the Deepwater Horizon oil spill and response to the disaster, with photos and video describing the scale of the disaster. The second half of the talk is a case study of our ongoing research (2010 to present) on how microbes impact the fate of oil contamination on beaches of the Gulf coast. We observed a bloom of successive microbial populations that degrade oil, we isolated new hydrocarbon-degrading bacteria, and we observe major impacts of oil on the microbial nitrogen cycle.

The *Sphagnum* Phytobiome: A Team of Ecosystem Engineers in Resource Limited Peatlands

Peatlands store approximately one-third of all global soil carbon and are climatically sensitive. This talk focuses on the microbiome of peat moss plants, *Sphagnum spp*., which often dominate primary production in northern peatlands. *Sphagnum* phytobiomes (microbiome + plant host + surrounding environment) are ecosystem engineers that play a major role in the carbon and nitrogen cycles of climatically sensitive northern ecosystems. Our ongoing research employs cutting-edge approaches (metatranscriptomics, Chip-SIP) to investigate the metabolically active microbial populations that mediate nitrogen fixation and methanotrophy. While nitrogen-fixing microbiome members are dominated by cyanobacteria of the Nostocales, multiple lines of evidence indicate that members of the Rhizobiales play a key role in coupling nitrogen fixation to methanotrophy, and biogeochemical field data show that N fixation comprises a major N source for nutrient-poor peatlands.

Can Peat Beat the Heat?: Stability of the Peatland Carbon Bank to Deep Warming

In this talk, I explore the response of large belowground carbon stores, greenhouse gas emissions, and heterotrophic microbial communities in peatlands to climate change drivers, warming and CO_2 enrichment. As part of the SPRUCE (http://mnspruce.ornl.gov) experiment

sponsored by the U.S. Department of Energy, peat up to 2 m deep is experimentally warmed up to 9^{o}C above ambient in a whole ecosystem climate manipulation conducted in northern Minnesota. Although CH_4 emissions were found to increase exponentially with deep heating, the response was due solely to the warming effect on surface peat. No changes with warming were seen in microbial communities nor did geochemical analyses provide evidence of enhanced peat carbon degradation suggesting that deep peat is stable under increasing temperatures. Since air heating and CO_2 enrichment began in 2015, changes with warming have been observed in plant as well as microbial communities.

New Pathways of Organic Matter Decomposition Limit Methane Emission from Wetland Soils

In freshwater wetlands such as peatlands, soils become anoxic at the surface and the majority of organic matter is decomposed through microbial consortia that are believed to primarily terminate in methanogenesis or methane (CH_4) production. In peat from high latitude *Sphagnum*-dominated peatlands that are critical to the global carbon cycle, state-of-the-art environmental metabolomics measurements revealed new pathways for organic matter degradation in peatlands, whereby electrons are deposited to the organic matter itself rather than to CH_4. This mechanism has also been observed to reduce CH_4 production in the cow rumen. An examination of past research on animal hosts suggests many parallels between the chemical and microbiological hydrogenation of organic matter between peatlands and the rumen. Because CH_4 has a sustained flux warming potential about 45 times higher than that of CO_2, mechanisms that alter CH_4 production ratios during peat mineralization have important implications for environmental change.

Biogeography of Benthic Microbial Communities in the Gulf of Mexico

The seafloor of the deep ocean is among the largest and most understudied of habitats on Earth. Here I present the largest dataset on benthic marine microbial communities ever assembled. The primary objectives in this study were to characterize biogeographic patterns in microbial populations in Gulf of Mexico sediments, and use these results to constrain impacts of petroleum hydrocarbons from the Deepwater Horizon (DWH) oil spill to microbial communities. Benthic microbial communities show remarkably consistent patterns across large (km) spatial and temporal scales, with biogeographic patterns primarily related to sediment depth (likely a proxy for oxygen concentration) and water depth (likely a proxy for carbon content). The statistical power of this dataset and our observed patterns in microbial community composition have enabled the construction of a model detailing the distributions of microbial populations in deep oceans sediments across the Gulf of Mexico. Results from this study show localized impacts to the DWH disaster and rebound by 2012 to an indistinguishable state from the unimpacted seafloor.

BIOGRAPHICAL SKETCH – Dr. Joel E. Kostka

Dr. Joel E. Kostka is Professor and Associate Chair for Research in the School of Biological Sciences as well as the School of Earth and Atmospheric Sciences at the Georgia Institute of Technology. He is internationally recognized for his research in environmental microbiology which focuses on characterizing the role of microorganisms in ecosystem functioning, especially in the context of bioremediation and climate change. Dr. Kostka is extensively published with over 110 peer-reviewed publications. He has served on numerous national and international review panels and expert committees on energy, bioremediation, and environmental microbiology. In 2013, Dr. Kostka was honored as a Georgia Power Professor of Excellence, and

he is currently a co-PI of the C-IMAGE3 consortium funded by the Gulf of Mexico Research Initiative to study the environmental consequences of petroleum hydrocarbon release on living marine resources and ecosystem health. In 2011, he coauthored the report, "Microbes and Oil Spills: Frequently Asked Questions," published by the American Academy of Microbiology. In 2016, he participated in the ASM-AGU Colloquium on "Interactions Between Climate Change & Microbial Ecosystems." From 2009-2013, Dr. Kostka was Chair of ASM's Division N, Microbial Ecology, and he served as editor of *Applied and Environmental Microbiology* from 2011-2017.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Dr. Joel E. Kostka

I was first introduced to ASM by attending a Branch meeting in Gatlinburg, Tennessee, while I was a Masters student. There I met and interacted with D.C. White, for whom the D.C. White Research and Mentoring Award is named. D.C. graciously answered my questions and made me feel like I belonged as a microbiologist. My experience at the Branch meeting was largely responsible for my decision to enter the field of environmental microbiology. I want to participate in the ASM Distinguished Lecturer Program so that I can give back the support and encouragement that I received at many ASM meetings to current students and postdocs. I have a passion for supporting ASM, having served as Division Chair and as Editor for *Applied and Environmental Microbiology*. I bring over 20 years of experience in the mentoring of students and postdoctoral researchers as well as giving plenary talks. In August 2017, I was elected Chair of the Gordon Conference in Applied and Environmental Microbiology in part based on the presentation of an invited talk as well as interactions with students/ postdocs at the conference. In September 2017, I was one of 6 scientists to speak at the 25th Anniversary of the Max Planck Institute for Marine Microbiology in Bremen, Germany, a premier institution in my field. I teach introductory microbiology and microbial ecology, and I very much believe that it is my professional mission to excite students about the myriad of ways that microbes benefit society, thereby catalyzing their entrance into the field.

Dr. Cheryl A. Nickerson *(term: 7/1/18 through 6/30/20)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	B	Microbial Pathogens
Secondary Division	D	Microbe-Host Interactions

LECTURE TOPICS AND DESCRIPTIONS – Dr. Cheryl A. Nickerson

Force of Nature: Physiological Fluid Shear Regulates Bacterial Pathogenesis
Bacterial pathogens experience wide fluctuations in fluid shear forces during the infection process. While these forces are relevant to those experienced during the natural lifecycles of bacterial and human cells, they have been widely overlooked as environmental stressors with potential to dictate the outcome of infection. This talk describes how bacteria are "hardwired" to respond in unexpected ways to physiological force fluid shear forces encountered in the infected host and the resulting impact on microbial gene expression, pathogenesis-related stress responses and virulence. This rapidly emerging area of research is leading to the discovery of entire classes of microbial genes and proteins involved in host interactions not previously identified when microorganisms are grown conventionally, and has promising potential for new strategies to outpace infectious disease.

Outpacing Infectious Disease – Mimicking the Host-Pathogen Microenvironment
One of the grand challenges of the 21st Century is to understand how biological, chemical, and physical cues are integrated in cells (microbial and human), and how this integration results in coordinated structural and functional changes at the cellular, tissue, organ, and organism level that impact host-pathogen interactions. This talk will provide an overview of innovative model pathogenesis systems for studying mucosal infections in humans and key factors that are known to impact infectious disease outcomes.

Organotypic 3-D Tissue Models: Innovative and Predictive Platforms to Study Host-Pathogen Interactions and Infectious Disease
Appropriately simulating the three-dimensional (3-D) environment in which tissues normally develop and function is crucial for the establishment of *in vitro* tissue models that can be used for more meaningful dissection of host-pathogen interactions. This presentation highlights how dynamic bioreactor technology has been used to establish a series of 3-D organotypic tissue models that range in complexity from a single cell type to multicellular co-culture models, including immune cells, as predictive human surrogates to study host-pathogen interactions and

predict *in vivo*-like infectious disease mechanisms not mimicked by conventional cell culture models.

Spaceflight-induced Alterations in Microbial Virulence and Host-Pathogen Interactions: Novel Insight into Infectious Disease Mechanisms
The quiescent microgravity environment of spaceflight has been shown to elicit unexpected changes in microbial gene expression, stress responses, and virulence that are not observed using traditional experimental approaches on Earth, where the force of gravity can mask key cellular responses. This talk will highlight how the extreme environment of spaceflight is becoming an emerging platform to provide novel insight into biological response parameters from *both* the host and pathogen perspective that have potential for innovative solutions toward treatment and control of infectious diseases both in space and on Earth.

BIOGRAPHICAL SKETCH – Dr. Cheryl A. Nickerson

Dr. Cheryl A. Nickerson is a Professor in the School of Life Sciences, at the Biodesign Institute at Arizona State University. Her internationally recognized research takes a highly multidisciplinary and innovative approach that blends microbiology, tissue engineering, and physics to mimic the dynamic interactions between the host, its microenvironment, and the pathogens that lead to infection and disease. She focuses on characterizing the effects of biomechanical forces on bacterial pathogenesis mechanisms and host-pathogen interactions that regulate the transition between normal homeostasis and infectious disease. Her laboratory has developed several innovative model pathogenesis systems to study these processes, including 3-D organotypic tissue culture models as predictive platforms to study host-pathogen interactions, and characterizing pathogen responses to physiological fluid shear forces encountered in the infected host, as well as in the microgravity environment of spaceflight. Her research has flown on numerous NASA Shuttle missions, the International Space Station, and on SpaceX missions. She is a recipient of the Presidential Early Career Award for Scientists and Engineers and NASA's Exceptional Scientific Achievement Medal. She serves as founding Editor-in-Chief of the *Nature* journal *npj Microgravity*, and was selected as a NASA Astronaut candidate finalist.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Dr. Cheryl A. Nickerson

Teaching and research go hand-in-hand: one cannot exist without the other. It is our responsibility to provide a stimulating and interdisciplinary educational and research training environment for the next generation of scientists that will equip them with the knowledge and skills necessary for their success and leadership to solve global microbial challenges. In an era that promotes the integrated study of biological systems with engineering and physical sciences as the prevalent concept in contemporary scientific thinking, scientists must work in collaborative teams that reflect the growing multidisciplinary nature of microbiology. An important aspect of my career is the transdisciplinary mentorship and education of i) undergraduate and graduate microbiology students in the classroom (resulting in multiple teaching awards), and ii) undergraduate/graduate students, postdoctoral fellows, and early career faculty in their laboratory research activities – many of whom have gone on to hold prestigious positions in academia, industry and government. The opportunity to guide and mentor these individuals and to learn from them has been integral to the progress of my research program and

to my own personal and professional development. My spaceflight microbiology experiments with NASA are a perfect example of how unconventional, multidisciplinary research can provide an ideal foundation to expand a student's thinking process that transcends traditional boundaries. I appreciate the opportunity and privilege to share my experience and excitement for microbiology through the ASMDL program to help develop young scientists who are poised to become leaders in academic/research venues where breadth and interdisciplinary vision are required to solve complex problems.

Manuela Raffatellu *(term: 7/1/19 through 6/30/21)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	D	Microbe-Host Interactions
Secondary Division	B	Microbial Pathogens

LECTURE TOPICS AND DESCRIPTIONS – Manuela Raffatellu

Guts, Germs, and Steel: The War for Metal in the Inflamed Gut
Obligate anaerobes (Firmicutes and Bacteroidetes) predominate in the normal gut. However, Proteobacteria expand in the inflamed gut by successfully competing for limited resources. This lecture will present mechanisms by which pathogenic and commensal Enterobacteriaceae compete for metal ions in the inflamed gut.

Nutritional Immunity in the Inflamed Gut
In response to infection with enteric pathogens that cause inflammatory diarrhea, such as *Salmonella* Typhimurium, the host mounts a response termed nutritional immunity, which limits the availability of essential metal ions including iron, zinc, and manganese. This lecture will discuss the host cytokines that regulate nutritional immunity, and will outline the roles of two antimicrobial proteins, lipocalin-2 and calprotectin, in sequestering metal ions during colitis and their effects on gut pathogens and on the gut microbiome.

Mucosal Responses to *Salmonella* Infection
The gut pathogen *Salmonella* Typhimurium is one of the leading causes of inflammatory diarrhea, worldwide. This lecture will discuss the pathogenesis of *Salmonella* Typhimurium infection in the gut, with a focus on the host responses that are protective during infection and keep the infection localized to the gut, thereby preventing bacteremia.

Learning from Bacterial Competition in the Host to Develop New Antimicrobials
In recent years, the alarming increase of antibiotic resistance has created serious concerns for public health. Moreover, current antibiotics also target the beneficial gut microbiome. This lecture will discuss what can be learned from investigating microbial competition *in vivo* and how this knowledge can be utilized to devise new narrow-spectrum therapeutics that target bacterial pathogens while minimizing deleterious effects to the microbiome.

BIOGRAPHICAL SKETCH – Manuela Raffatellu

Manuela Raffatellu is a Professor in the Department of Pediatrics at the University of California, San Diego School of Medicine. She received her M.D. at the University of Sassari, Italy, in 2000, followed by postdoctoral training at Texas A&M University and at the University of California, Davis. She started her own lab at the University of California, Irvine in 2008, where she was promoted to Associate Professor with tenure in 2014. She then relocated to the University of California, San Diego in 2017. Her research focuses on many aspects of *Salmonella* interaction with the mucosal immune response and with the intestinal microbiota in the inflamed gut. Her recent efforts aim to design strategies to reduce intestinal colonization of enteric pathogens without affecting the gut microbiota composition. She is the recipient of several awards, including the IDSA ERF/NFID Astellas Young Investigator Award, the ICAAC Young Investigator Award from the American Society for Microbiology, and the Burroughs Wellcome Funds Investigator in the Pathogenesis of Infectious Disease Award. In 2019, she was elected to the American Society for Clinical Investigation, and she became a fellow of the American Academy of Microbiology. She serves as Editor for *Infection and Immunity*.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Manuela Raffatellu

Pathogens often win the initial battle (and sometimes the war) against us despite our arsenal of antimicrobial effectors and trillions of commensal microbes. How can this happen? This is the question that I have been asking myself since medical school in Italy, and have been trying to answer with my research. Shortly after completing my medical training, I took a one-way ticket to the United States, where I have been working on host-microbe interactions for the past 16 years. Throughout this time I have been a member of the American Society for Microbiology, and an author in and a reviewer for ASM journals. More recently, I began serving as an Editor for *Infection and Immunity*. I am thus deeply committed to the success of ASM, and I am honored to be part of the ASM Distinguished Lecturer program and to speak at ASM Branch meetings all over the country. I am particularly committed to mentoring new generations of scientists, which is one of the most rewarding activities of my profession. I greatly look forward to interacting with and informally mentoring students and post-docs at ASM Branch meetings. Furthermore, as a woman in science, my hope is to inspire other women to pursue a fulfilling scientific career in academia.

Dr. Marilyn C. Roberts *(term: 7/1/19 through 6/30/21)*
Waksman Foundation Lecturer

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ASM MEMBERSHIP AFFILIATION
Primary Division A Antimicrobial Chemotherapy

LECTURE TOPICS AND DESCRIPTIONS – Dr. Marilyn C. Roberts

One Health Approach to Multidrug Resistance MRSA in Primates, Humans and their Shared Environment
How a single strain of MRSA was passed from primates to personnel and their environment or from humans to wild primates in different settings including Nepal and a National Primate Research Center.

Why a One Health Approach is Important to the Understanding of Transmission of Antibiotic Resistant Bacteria and Resistance Genes throughout the World
This lecture looks at different resistant pathogens and examines how people, animals and their shared environment affect how they have spread. One example is vancomycin resistant *Enterococcus* spp. spread in the USA vs Europe.

Antibiotic Resistance and Foodborne Outbreaks
How antibiotic resistance bacteria are linked to antibiotic use or environmental contamination in food animals leading to foodborne outbreaks with antibiotic resistant pathogens.

Wild Animals as Vectors for the Spread of Antibiotic Resistant Bacteria and Genes through Different Environments Locally, Nationally and Internationally
This talk discusses how birds and other wildlife can spread and contaminate environments with specific human pathogens and influence potential risk to man.

BIOGRAPHICAL SKETCH – Dr. Marilyn C. Roberts
Dr. Roberts' research interests have included studies of antibiotic resistant bacteria, the genes they carry and their movement between ecosystems locally, nationally and internationally. She has worked with antibiotic resistant *Neisseria gonorrhoeae* and *Haemophilus influenzae* and was one of the first to determine that these resistant isolates carried the same TEM β-lactamase

conferring resistance to the first line drug penicillin/ampicillin and/or the tet(M) gene coding for tetracycline resistance which replaced penicillin as the first line antibiotic for treatment of *N. gonorrhoeae.*

About 15 years ago, Dr. Roberts' research began to focus on antibiotic resistant Gram-positive bacteria including methicillin resistant *Staphylococcus aureus* [MRSA], vancomycin resistant enterococci [VRE] and others shared by man, animals and their shared environment to study transmission and reservoirs using a One Health approach. She is interested in how antibiotic resistance genes and resistant bacteria move between the environment, humans and animals and ultimately, how these resistant bacteria and genes may affect clinical therapy. Recently Dr. Roberts has expanded her sampling to include *E. coli* strains isolated from endangered Southern Resident Killer Whale (*Orcinus orca*) scat, *E. coli* from river otters, as well as MRSA from both captive and wild primates, which has led to studies of wild primates in Nepal (one paper published) and in Thailand and St. Kitts (studies newly in progress).

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Dr. Marilyn C. Roberts

Dr. Roberts is a long time member of ASM and fellow in AAM. She has demonstrated particular capability to lecture about antibiotic resistant bacteria/genes to audiences that have limited backgrounds on the subject. She believes it is important to educate people on this important subject and has completed a video lecture for ASM on the topic. Being part of the ASMDL program will provide another opportunity of reaching more people that are learning about microbiology but may have limited knowledge about antibiotic resistant bacteria or the One Health Concept. Education of a wider group of citizens is one way to help be part of the solution to slow the use of antibiotics in both humans and agriculture and hopefully reduce or stop the dramatic increase in antibiotic resistance seen locally, nationally and internationally.

Dr. Roberts has often been asked by journalists to provide insight into her specific research, as well as what the community can do to try and reduce the use of antibiotics and related compounds such as tricolsan in their lives so that the world does not end up in a "post antibiotic era" – a time when few antibiotics are available for treatment and those that are available are very expensive.

Dr. Roberts is committed to teaching and mentoring students. She has trained more than 90 undergraduate students, some of whom have been authors on papers which helped them secure very good jobs upon their graduation. She has also trained a number of graduate students who have found jobs in university settings, industry or state agency laboratories.

Dr. Rita Tamayo *(term: 7/1/19 through 6/30/21)*

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ASM MEMBERSHIP AFFILIATION

Primary Division	B	Microbial Pathogens
Secondary Division	D	Microbe-Host Interactions

LECTURE TOPICS AND DESCRIPTIONS – Dr. Rita Tamayo

A Bacterial Lifestyle Switch: The Role of Riboswitches in Behaviors and Virulence of *Clostridium difficile*

As in many other bacterial species, c-di-GMP controls the switch between motile and non-motile lifestyles of *C. difficile*. In addition, *C. difficile* has incorporated c-di-GMP signaling to regulate the production of the cytotoxins required for virulence. This talk describes our work to identify the processes regulated by c-di-GMP in *C. difficile* and the mechanisms by which regulation is achieved. Unlike most species studied to date, *C. difficile* uses riboswitches to sense intracellular c-di-GMP and mediate the appropriate behavioral response.

When a Clone Is Not a Clone: The Case of *Clostridium difficile*

Work from the Tamayo lab recently revealed that in *C. difficile*, swimming motility, toxin production, and other factors are subject to phase variation through site-specific DNA recombination. This phase variation involves the reversible inversion of DNA sequences that impacts the expression of adjacent genes and results in considerable phenotypic heterogeneity in the population, with individual bacteria exhibiting variable phenotype profiles. This talk summarizes these studies and discusses the implications of phase variation and phenotypic heterogeneity in the survival and virulence of the *C. difficile* population as a whole.

Intersecting Paths to Phenotypic Heterogeneity

Phase variation in bacteria typically controls the ON/OFF production of individual factors exposed on the bacterial surface. In the case of *C. difficile*, phase variation regulates the expression of transcription factors and enzymes controlling c-di-GMP levels. This talk discusses these studies and the potential for these phase variation mechanisms to broadly impact *C. difficile* gene expression, physiology, and virulence.

The Power of Bacterial Genetics for Elucidating Molecular Mechanisms

The mechanism of flagellar phase variation resulting from DNA inversion is unusual, occurring at the mRNA level. This talk describes our use of a suppressor analysis to identify the factor involved in mediating regulation – a well-known protein with an unexpected function.

BIOGRAPHICAL SKETCH – Dr. Rita Tamayo

Dr. Rita Tamayo completed her Ph.D. in Microbiology and Immunology at the University of Texas Health Science Center in San Antonio and conducted her postdoctoral research at Tufts University School of Medicine. She is Associate Professor of Microbiology and Immunology at the University of North Carolina School of Medicine and a UNC Simmons Scholar. Dr. Tamayo's lab studies the regulatory mechanisms controlling the motility and virulence of *Clostridium difficile*, the most common cause of nosocomial infections in the United States and an urgent public health threat. Her lab has characterized the role of the bacterial signaling molecule c-di-GMP and its RNA-based sensors (riboswitches) in controlling multiple modes of *C. difficile* motility as well as cytotoxin production. In addition, her group is defining the mechanisms of phase variation and determining the consequences of the resulting phenotypic heterogeneity to *C. difficile* physiology and pathogenesis. Dr. Tamayo serves on the editorial board for the *Journal of Bacteriology* and *Infection and Immunity*, as an Associate Editor for *Frontiers in Microbiology*, and as an *ad hoc* reviewer for many ASM and other journals. Follow on Twitter @TamayoLab.

CV is available by request from adempsey@asmusa.org at ASM Headquarters

LECTURER'S PERSONAL STATEMENT – Dr. Rita Tamayo

During my graduate and postdoctoral training I was fortunate to find mentors that supported my scientific and career development and allowed me the opportunity to pursue my research interests. I have also benefitted from sponsors that have advocated for me along the way. To pay it forward, I promote tailored training and mentoring of undergraduate, graduate, and postdoctoral scientists –not only in my own lab, but at UNC and elsewhere. In fact, one of my favorite aspects of giving seminars at other institutions is the opportunity to interact with students and postdocs, learn about their science, aspirations, and concerns, and frankly discuss my own experiences. As an ASM Distinguished Lecturer, I would love to continue these interactions to pass on my passion for research and mentoring and to share insights I've gained during my career. Since 2009 I have mentored 11 undergraduates, 4 post-baccalaureate fellows, 5 Ph.D. students, and 4 postdocs. I am a frequent discussion leader for graduate and postdoctoral scientists, including topics in research program and lab management, academic career development, and issues affecting the well-being of our trainees. I am also a mentor for UNC's Initiative for Maximizing Student Development (IMSD) program, allowing me to interact with a diverse graduate student population and support their career and personal development. I am a member not only of ASM, but also the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS).