Microbiology and Molecular Genetics
Area: Microbial Evolution, Ecology, Physiology and Genetics

Chris Adami: Evolutionary Theory, Computational Evolution

Using evolution to understand complex systems and behaviours.

Yann Dufour: Bacterial Signaling and Collective Behavior

The Dufour Lab studies the rules that govern emergent group behaviors leading to the successful establishment of bacterial communities inside a host or in open environments.

Sarah Evans: Microbial Communities and Climate Change

The Evans Lab studies how microscopic organisms, bacteria, fungi and archaea, function and respond to their environment. The Evans lab is based at the Kellogg Biological Station.

Bob Hausinger: Microbial Physiology

The Hausinger Lab investigates microbial physiology and enzymology related to transition metals. These include mechanisms of catalysis by metalloenzymes and characterization of the biosynthesis of protein metallocenters.

Lee Kroos: Bacterial Signaling and Gene Regulation.

The Kroos Lab exploit the biochemical and genetic simplicity of bacteria to explore the molecular mechanisms of signaling and gene regulation during development.

Sarah Lebeis: Microbial ecology and plant-microbe interactions

The Lebeis Lab explores host and microbial factors that influence plant microbiome assembly. Understanding mechanisms of plant microbiome assembly and function will be critical as we move from basic lab experiments into development of plant biological products with significant impact on improving food production to meet increasing global demands.

Rich Lenski: Experimental Evolution

The main focus of the Lenski Lab is on experimental evolution. Their approach is to watch evolution as it happens, in the context of experiments that are replicated and performed under controlled conditions.

Beronda Montgomery: Responses of photosynthetic organisms to light.

The Montgomery lab is to understand the dynamic molecular processes utilized by photosynthetic organisms to adapt to changes in their light environment.

Gemma Reguera: Environmental Microbiology, Biogeochemistry, Electromicrobiology

The Reguera lab studies the adaptive responses of microbes to their environment and exploits this knowledge to find novel biotechnological applications for microbial processes.

Matt Schrenk: Microbial Ecology, Subsurface Microbiology

The Schrenk lab uses culturing and metagenomic sequencing approaches to study the microbial ecology of extreme environments. These include studies of high temperature ecosystems associated with volcanoes, and deep ecosystems associated with circulating groundwater.

Ashley Shade: Microbial Ecology and Evolution

The Shade lab investigates the ecological and evolutionary dynamics of microorganisms within their communities.

Claire Vieille: Microbial Metabolism, Bioengineering

The Vieille lab focuses on engineering enzyme and microbial industrial biocatalysts for applications in biochemical and biomaterial production.

Nina Wale: Microbial Ecology and Evolution of Pathogens

The Wale lab seeks to understand how the ecology of a pathogen's environment impacts the evolution and expression of pathogen traits. We use a mouse model of malaria & a zooplankton-bacteria system to understand i) the ecology of the environment inside the host and ii) the evolution of virulence, drug resistance and secondary metabolite production.

Microbiology and Molecular Genetics

Area: Infectious Disease, Molecular Pathogenesis

Rob Abramovitch: Tuberculosis Pathogenesis and Drug Discovery.

The Abramovitch lab works to characterize Mycobacterium life inside a macrophage. In addition, they work to apply these discoveries towards the development of new drugs.

Sean Crosson: Pathogenesis and Infectious Disease.

My research is focused on understanding signal transduction mechanisms that regulate stress physiology and infection biology in bacteria. I have directed studies that have defined new mechanisms enabling growth and survival of bacteria in environments ranging from the interior of mammalian cells to dilute freshwater. Within this area of investigation, we solved the first structures of the core protein components of the General Stress Response (GSR) pathway of Alphaproteobacteria, which have informed dozens of published functional studies on this conserved gene regulatory system. More recently, we have defined important roles for two-component regulatory systems and alternative sigma factors in the control of *Brucella abortus* infection biology.

Vic DiRita: Microbial Pathogenesis and Drug Discovery.

The DiRita lab investigates the biology and pathogenicity of bacteria associated with infectious diseases. These include *Vibrio cholerae* (cholera), *Campylobacter jejuni* (a foodborne pathogen) and *Enterobacter cloacae* (which causes serious infections in health care settings.

Neal Hammer: Bacterial Physiology, Metabolism and Antibiotic Resistance

The Hammer Lab works to understand the metabolism of pathogenesis and antibiotic resistance.

Jonathan Hardy: Non-Invasive Imaging of Bacterial Infection.

The Hardy lab studies bacterial infections that affect children, exploiting multiple techniques of live animal, non-invasive imaging.

Kazem Kashefi: Extremophilic Environments

The Kashefi Lab works to understand the significance and diversity of metal reduction in extremophilic environments. The abundance of iron minerals in hot environments suggests that research on iron-reducing hyperthermophilic microorganisms will be instrumental to our understanding of how life originated and evolved at high temperatures.

Shannon Manning: Microbial Pathogenesis and Molecular Epidemiology

The Manning Lab studies the epidemiology and evolutionary genetics of infectious diseases, including *Escherichia coli* and *Streptococcus agalactiae*. They use a variety of techniques to understand these pathogens in both human and animal populations.

Linda Mansfield: Comparative Enteric Diseases

The Mansfield Lab works to understand how gastrointestinal infections involving the bacterial pathogen Campylobacter jejuni can lead to secondary autoimmune diseases like the neuropathy Guillain Barre Syndrome, Miller Fisher Syndrome and Reactive Arthritis.

Microbiology and Molecular Genetics

Area: Infectious Disease, Molecular Pathogenesis: page 2

Martha Mulks: Bacterial Pathogenesis, Respiratory Microbiome
The major focus of the Mulks lab is on Actinobacillus pleuropheumoniae, the causative agent of porcine pneumonia (an often fatal respiratory disease in pigs).

Andrew Olive: Chronic pathogens, Inflammation and Host-response to infection
The Olive lab combines genetic approaches with *in vivo* disease models to study chronic infections from both the host and bacterial perspective, focusing on *Mycobacterium tuberculosis* and *Chlamydia trachomatis*.

Jim Pestka: Food Safety, pathogeneisis, Immunology
Autoimmune disease affects over 25 million Americans. While genetically inherited susceptibility is recognized as the primary predisposing factor, lifetime environmental exposures can either potentiate or attenuate disease manifestation. The Pestka lab studies both toxic stressor and dietary factors and their connections to autoimmune disease.

Ned Walker: Mosquito biology, Emerging infectious Diseases.
The Walker lab uses vector-borne diseases as model systems to analyze landscape risk and landscape ecology in vector borne infectious disease. This work includes mosquito biology and the control of mosquito vectors (malaria, eastern equine encephalomyelitis, West Nile).

Chris Waters: Microbial Pathogenesis, gene regulation, drug discovery
Bacteria utilize chemical signals to adapt to an ever-changing environment. In pathogens, chemical signaling plays an important role in the initiation, maintenance and termination of infection. The Waters lab focuses on Vibrio Cholerae, to understand how chemical signals drive bacterial pathogenesis.

Zhiyong Xi: Microbe-host interactions, Symbiosis, Vector-borne Diseases
Dengue Fever is transmitted to humans by the mosquitos Aedes aegypti and Aedes albopictus. The Xi lab works to develop Wolbachia-based control strategies to block dengue virus transmission in mosquitoes.

Lixin Zhang: Infectious Diseases, Molecular Epidemiology
The Zhang lab studies the epidemiology of infectious diseases by analyzing genetic variations of pathogens over time, place and across human populations and relevant reservoirs.

Yong-Hui Zheng: Infectious Diseases: HIV
The Zheng lab focuses on retrovirus-host interactions using HIV-1, a human retrovirus that causes AIDS. They are interested in the natural host factors that have the ability to inhibit retrovirus replication.

Microbiology and Molecular Genetics

Area: Genomics and Genetics

Greg Bonito: Fungal systematics and plant-fungal-bacterial Interactions.

The Bonito lab studies the ecology and evolution of plant-fungal-bacterial associations. These organisms provide important links between plants and soils and are important to plant health and nutrition.

John Fyfe: Comparative Medical Genetics

The Fyfe lab works to define inherited disorders that occur in companion animals. Investigation of these disorders provides novel insight into normal physiologic functions and the benefits of improved control of disease in animal populations.

George Garrity: Bioinformatics and Computational Biology

Algorithm development for the rapid classification and identification of microorganisms and microbial products, nomenclature and annotation, data visualization and knowledge mining.

Joan Rose: Water Microbiology, Water Quality and Public Health Safety

The Rose lab works at the interface between environmental engineering and public health. Projects include: new methods for the detection of pathogenes in water, including metagenomics for viruses, surveillance of waterborne disease agents and removeal of pathogens by engineers treatment systems.

Brian Schutte: Mammalian Genetics, Development, Birth Defects

The Schutte lab works to determine the genetic architecture of cleft lip and palate, a common birth defect with significant impact to patients. They work to identify DNA variants and use mouse models to determine the pathophysiological mechanisms that lead to cleft lip and palate.

Pat Venta: Genetics of Purebred Dogs.

The Venta lab research program focuses on the genetics of purebred dogs with a primary goal of reducing the incidence of genetic diseases in the various breeds.

Vilma Yusbasiyan-Gurkan: Comparative Genetics and Cancer

Research in the Yusbasiyan-Gurkan lab focus on 1) understanding the molecular genetics of cancer, 2) using gene pools of purebred dogs to map and identify cancer susceptibility and 3) translating the molecular findings to useful prognostic tools and therapeutic targets.

Microbiology and Molecular Genetics
Area: Virology, Immunology, Cancer and Cell Biology

Andy Amalfitano: Gene transfer to treat genetic and non-genetic diseases.

The Amalfitano Lab studies a variety of genetic diseases in order to define targets for gene transfer therapy. In addition, they work to identify key components of the innate immune system, in order to subvert these systems for safer gene transfer.

Michael Bachmann: Immunology of Cancer and transplantation.

Using mouse models to investigate candidate genes important for both cancer immune escape and transplant rejection by the immune system.

Christopher Contag: Director of the Institute for Quantitative Health Science and Engineering.

The Contag lab develops macroscopic and microscopic optical imaging tools in order to use imaging to assess tissue responses to stress, reveal immune cell migration patterns and understand stem cell biology.

Kathy Meek: Immunology and DNA Repair.

The Meek lab focuses on the DNA dependent protein kinase (DNA-PK) in order to understand how the non-homologous end joining pathway works to repair double stranded breaks in DNA.

Margaret Petroff: Reproductive Immunology, Maternal-Fetal Immune Tolerance.

The Petroff lab works to understand the mechanisms of maternal immunological tolerance to the fetus and to increase our understanding of the contribution of autoimmune disease on male and female fertility.

Dohun Pyeon: Tumor Virology, Cancer Immunology, Cancer Genomics

The Pyeon lab focuses on Human papillomaviruses. These viruses are potent human pathogens and cause over 5% of all human cancers. Investigating virus-host interactions, they work to develop effective preventive and therapeutic strategies for HPV-associated cancers.

Rich Schwartz: Breast Cancer, Immunology Gene Regulation

The Schwartz lab focuses on the impact of a high fat diet on mammary tumorigenesis, the role of inflammatory and immune processes in mammary tumorigenesis and the roles of estrogen and progesterone in regulating the expression of proinflammatory genes.

Kefei Yu: Molecular immunology and DNA Repair

The Yu lab studies DNA recombination and DNA repair in immune cells in association with antigen receptor gene diversification. This includes the site-directed V(D)J recombinations important for assembly of the antigen binding domain of antibodies.

Yong-Hui Zheng: Host-pathogen interactions: HIV

The Zheng lab focuses on retrovirus-host interactions using HIV-1, a human retrovirus that causes AIDS. They are interested in the natural host factors that have the ability to inhibit retrovirus replication.