NEW INVESTIGATORS
@ the College of Biological Sciences
The pace of discovery in the life sciences is remarkable. The current convergence of physical, engineering and life sciences has greatly advanced technologies, vastly expanding our ability to characterize physical, chemical and biological phenomena. This presents unprecedented opportunities to capture and integrate comprehensive data sets into a meaningful picture of how biological systems work, and to discover how we can safely engineer biological systems to work for us. These new approaches open the door for innovative biological solutions to some of our greatest challenges. With this in mind, the College of Biological Sciences set out to harness the potential for cross-pollination by building capacity in key areas where collaboration both within the college and with other units can take root. Today, we introduce a cohort of new faculty who bring fresh techniques, expertise and the propensity for crossing those disciplinary boundaries.
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. SUZANNE MCGAUGH
Some of the most fundamental biological questions involve how, why and how fast organisms can adapt to new environments, including whether evolution would proceed down the same path if repeated. Suzanne McGaugh studies the genomes for signatures left by local adaptation to understand whether certain types of genetic variants are more likely than others to consistently contribute to evolutionary change. She also studies population genomics, conservation genetics, molecular evolution in vertebrates and how recombination shapes genomes. McGaugh received her Ph.D. in genetics from Iowa State University and was a post-doctoral research associate at Duke University and Washington University before joining the College of Biological Sciences.
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. RAN BLEKHMAN
RAN BLEKHMAN
ASSISTANT PROFESSOR // GENETICS, CELL BIOLOGY AND DEVELOPMENT

Ran Blekhman uses a variety of approaches — computational, statistical, network-theory, data mining and population genetic — to investigate human microbiomes with an eye to better understanding the nature of chronic conditions. Drawing on a background in bioinformatics and genetics, Blekhman explores how we interact with our microbial communities, how host-bacteria interactions affect complex traits and disease, and how the symbiosis between us and our microbiome evolved throughout human history. Before joining the College of Biological Sciences, Blekhman was a post-doctoral associate at Cornell University. He received a Ph.D. in human genetics from the University of Chicago.

AREAS OF EXPERTISE
• Host-bacteria interactions
• Population genomics
• Medical/personal genomics
• Evolutionary genomics

RESEARCH CLUSTER
• Genome Variation and Computational Biology

JOINT APPOINTMENT
• Ecology, Evolution and Behavior
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. YANIV BRANDVAIN
YANIV BRANDVAIN
ASSISTANT PROFESSOR // PLANT BIOLOGY

Yaniv Brandvain studies the genetic roots of self-pollinating flowering plants with an eye to understanding their origin, diversity, distribution and the evolutionary forces that shape them. Using genomic data, he examines patterns of mutation and recombination over the evolutionary history of plant species to develop models that explain why and how organisms that share a common ancestor split into different species. Brandvain received his Ph.D. in evolutionary biology from Indiana University and went on to complete a National Science Foundation post-doctoral fellowship in bioinformatics at the University of California, Davis before joining the College of Biological Sciences. His research has appeared in top journals including Science.

AREAS OF EXPERTISE

• Population genetics
• Genomics
• Speciation
• Plant mating systems

RESEARCH CLUSTER

• Genome Variation and Computational Biology

JOINT APPOINTMENT

• Ecology, Evolution and Behavior
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. FRANK ALBERT
Each individual carries its own unique genome, which differs from that of other individuals in the species at thousands to millions of DNA letters. What effects do all these differences have on organisms? Frank Albert uses experimental and computational genomics to probe the molecular and cellular consequences of genomic variation. He is particularly interested in how DNA variation influences gene expression, and how it reverberates through cellular systems to influence complex traits such as fitness, the risk for common diseases and traits that are important in evolution. Albert received his Ph.D. at the University of Leipzig & Max Planck Institute for Evolutionary Anthropology in Germany and was a post-doctoral researcher at the University of California, Los Angeles and Princeton University.
NEW INVESTIGATORS @ the College of Biological Sciences

DR. ALLISON SHAW
ALLISON SHAW
ASSISTANT PROFESSOR // ECOLOGY, EVOLUTION AND BEHAVIOR

Allison Shaw uses theoretical approaches to study how organisms use behavior to adapt to the environment. She develops theories that predict how we expect systems to change, especially with regard to climate change and disease. Shaw creates mathematical models to illuminate what factors drive organisms to move and what impact movement has on the structure, dynamics, viability and spread of populations. Before joining the College of Biological Sciences, Shaw was a National Science Foundation International Research Fellow at Australian National University. She received her Ph.D. in ecology and evolutionary biology from Princeton University.

AREAS OF EXPERTISE
• Complex systems
• Evolution of behavior
• Migration
• Population dynamics
• Theoretical ecology

RESEARCH CLUSTER
• Theoretical Biology
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. EMMA GOLDBERG
EMMA GOLDBERG
ASSISTANT PROFESSOR // ECOLOGY, EVOLUTION AND BEHAVIOR

Emma Goldberg uses mathematical models to answer questions relating to biological diversity, including what limits the geographic ranges of species, and how the various ways that plants reproduce contribute to speciation and extinction. She explores a range of questions about trait evolution within populations and its influence on the speciation and extinction of lineages. Goldberg’s research has been published in top journals including Science, Evolution, American Naturalist and Proceedings of the National Academy of Sciences. She was a post-doctoral research associate at the University of Illinois at Chicago before joining the College of Biological Sciences.

AREAS OF EXPERTISE
• Macroevolution
• Biogeography
• Character displacement
• Plant mating system evolution
• Theory

RESEARCH CLUSTER
• Theoretical Biology
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. WILL HARCOMBE
Will Harcombe uses synthetic microbial communities to investigate the interplay between ecological and evolutionary processes. Microbial communities drive processes ranging from human health to global nutrient cycling and could hold the key to better biofuels and novel pharmaceuticals. Harcombe uses computational approaches to quantitatively investigate how the behavior of metabolic networks influences the emergent properties of complex systems from cells to ecosystems. He received a Ph.D. in ecology, evolution and behavior from the University of Texas at Austin. Before coming to the College of Biological Sciences, Harcombe was an National Institutes of Health post-doctoral fellow at Harvard University.

AREAS OF EXPERTISE
- Evolution of cooperation/conflict
- Eco-evolutionary feedback
- Microbial community dynamics
- Metabolic basis of microbial interactions
- Systems biology

RESEARCH CLUSTER
- Microbial Systems and Synthetic Biology

JOINT APPOINTMENT
- BioTechnology Institute
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. LAURIE PARKER
Protein tyrosine kinases play key roles in disease and are particularly important in cancer. Mutations in several protein tyrosine kinase genes were identified as drivers of many tumor types, leading to the development of drugs targeted at inhibiting these enzymes. Laurie Parker focuses on assay development for post-translational modifications, with an emphasis on protein phosphorylation by tyrosine kinases. She uses proteomics to develop a test to quickly determine the effectiveness of a particular cancer treatment with an eye to improving patient outcomes. Before joining the college, Parker was an assistant professor at Purdue University and a postdoctoral fellow at the University of Chicago.
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. YUE CHEN
YUE CHEN
ASSISTANT PROFESSOR // BIOCHEMISTRY, MOLECULAR BIOLOGY AND BIOPHYSICS

Yue Chen is a researcher in the emerging field of functional proteomics. He studies the functions of proteins — the main components of the physiological metabolic pathways of cells for all living organisms — using mass spectrometry. Understanding how proteins change and modify is critical to discerning the difference in regulation between cancer cells and normal cells; a key step in better understanding cancer-signaling pathways and epigenetic mechanisms. Before joining the College of Biological Sciences, Chen was a senior research associate and post-doctoral fellow in the Ben May Department for Cancer Research at the University of Chicago. He received his Ph.D. in chemistry from the University of Texas at Arlington.

AREAS OF EXPERTISE
• Mass spectrometry
• Protein-protein interactions
• Epigenetics
• Cancer biology

RESEARCH CLUSTER
• Functional Proteomics
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. KATHRYN BUSHLEY
KATHRYN BUSHLEY  
ASSISTANT PROFESSOR // PLANT BIOLOGY

Kathryn Bushley studies the way fungal metabolism shapes the interaction of fungi with plants and other organisms. She is a leader in the use of genomic approaches to address fundamental questions in fungal biology and evolution. Bushley focuses on fine-scale evolution of secondary metabolites, transcriptomic approaches to identify metabolite genes and regulatory networks that allow fungi to interact with distinct hosts, and characterization of metabolites from endophytic and insect/nematode parasitic fungi. She investigates the evolution of non-ribosomal peptide synthetases, large modular proteins that produce bioactive peptides, including antibiotics such as penicillin and the drug cyclosporin. Bushley completed her Ph.D. at Cornell University and spent a year as an NSF post-doctoral research fellow in China.

AREAS OF EXPERTISE
• Population genetics
• Genomics
• Natural products chemistry
• Molecular genetics
• Insect pathogenic fungi

RESEARCH CLUSTER
• Fungal Evolution
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. PETER KENNEDY
Peter Kennedy investigates the diversity and function of fungal and bacterial symbioses with plants, focusing on how these microbial communities are structured and their ecological roles in forest ecosystems. His research has implications for agriculture, as well as helping forests adapt to climate change and re-establishing forests on cleared land. After receiving his Ph.D. from the University of California, Berkeley, Kennedy completed a post-doctoral fellowship at the Point Reyes National Seashore and studied mycorrhizal symbioses in Mexican forests on a Fulbright Fellowship. Before joining the college, he was a member of the biology faculty at Lewis and Clark College in Oregon. In 2014, he received an Outstanding Early Career Research Award from the International Mycological Association.
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. MIKAEL ELIAS
Mikael Elias studies enzymes in single-celled bacteria and archaea that survive in harsh environments with an eye to adapting them for biomedical, environmental and agricultural purposes. He is currently investigating mutant forms of a phosphate-uptake enzyme that may potentially be used in phosphate bioremediation. He also investigates enzymes that degrade molecules bacteria use to communicate with each other, which could lead to therapeutic applications designed to reduce the severity of infections. Elias received his doctorate in biology, biochemistry and structural biology from the Université de la Méditerranée, Marseille. He was also a Marie Curie Fellow at the Weizmann Institute of Science in Israel before joining the college.
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. MICHAEL FREEMAN
MICHAEL FREEMAN
ASSISTANT PROFESSOR // BIOCHEMISTRY, MOLECULAR BIOLOGY AND BIOPHYSICS

Microorganisms communicate using the molecular language of natural products. Amazingly, the vast majority of microorganisms on Earth are completely unknown to experimental science. Mike Freeman’s research focuses on exploiting this microbial ‘silent majority’ to discover unique biochemical pathways for possible biotechnological and health-related applications. He is also developing cutting-edge methods to manipulate genetically intractable microbes in the context of symbiosis. Freeman received his Ph.D. in biology at Johns Hopkins University and was a Human Frontier Science Program post-doctoral fellow at the University of Bonn, Germany and ETH Zurich, Switzerland before joining the College of Biological Sciences.
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. MICHAEL SMANSKI
Michael Smanski leverages the latest synthetic DNA technologies to redesign and rebuild multi-gene biosynthetic pathways for bacterial natural products. He seeks to understand the diverse specialized metabolites produced by bacteria and to engineer the production of molecules with applications in medicine or agriculture. He applies new high-throughput methods to manipulate complex genetic systems in order to discover genetic-design rules. Smanski received his Ph.D. in microbiology from the University of Wisconsin-Madison and was a post-doctoral fellow at MIT in the Department of Biological Engineering before joining the college. He received a 2015 Damon Runyon-Dale F. Frey Award for Breakthrough Scientists.
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. DANIEL SCHMIDT
DANIEL SCHMIDT
ASSISTANT PROFESSOR // GENETICS, CELL BIOLOGY AND DEVELOPMENT

Daniel Schmidt invents and applies technologies to study fundamental functional principles of living systems at a cellular level. He seeks to not only delineate such principles in natural systems, but also to control them and explore their unrealized potential in engineered systems. In doing so, Schmidt looks to better understand how cells sense, integrate and exchange information, comprehend how pathologic changes in these processes relate to health and disease, and provide insights into new therapies. Before joining the College of Biological Sciences, Schmidt was a post-doctoral fellow in the Synthetic Neurobiology group at MIT. He received his Ph.D. in biological sciences from Rockefeller University.

AREAS OF EXPERTISE
• Optogenetics
• Ion channel physiology
• Protein engineering
• Phenotypic high-throughput screening

RESEARCH CLUSTER
• Cellular Biophysics
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. SIVARAJ SIVARAMAKRISHNAN
Cellular communication or signaling employs vast interconnected networks of proteins that translate diverse stimuli to distinct cellular responses. While much is known about the structure and function of individual components of signaling networks, a systems understanding of the decision-making process employed by the cell is still in its infancy. Shiv Sivaramakrishnan focuses on engineering protein interactions to bridge the gap between our structural understanding and their emergent cellular function. Before joining the college, he was a faculty member at the University of Michigan Medical School. He received his Ph.D. in biomedical engineering from Northwestern University, and was a post-doctoral fellow at Stanford University. He received the NIH Director’s New Innovator Award and the American Heart Association Scientist Development Grant Award.
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. NAOMI COURTEMANCHE
NAOMI COURTEMANCHE
ASSISTANT PROFESSOR // GENETICS, CELL BIOLOGY AND DEVELOPMENT

Naomi Courtemanche studies actin assembly dynamics using biophysical techniques and thermodynamic modeling. Her current aim is to characterize the mechanism of actin filament nucleation and elongation by formins, a family of proteins that direct the assembly of unbranched actin filaments. These filaments are incorporated into cellular structures such as actin cables, filopodia, sarcomeres and cytokinetic rings. Disruption of formin-mediated actin assembly is implicated in a number of diseases. Before joining the College of Biological Sciences, Courtemanche was a post-doctoral fellow at Yale University. She received her Ph.D. in biophysics from Johns Hopkins University.
NEW INVESTIGATORS
@ the College of Biological Sciences

DR. SEHOYA COTNER
SEHOYA COTNER
ASSOCIATE PROFESSOR // BIOLOGY TEACHING AND LEARNING

Sehoya Cotner investigates several aspects of course-based undergraduate research. Her research focuses on the differences for majors and non-majors in overall experience and specific educational gains associated with participation in course-based undergraduate research. She also identified aspects of the experience critical for non-majors to achieve these gains. Cotner also focuses on evolution education and identifying barriers to acceptance and understanding of evolutionary theory. Cotner has been an instructor with the college’s Biology Program (now Department of Biology Teaching and Learning) since 2002. Before joining the college, she taught biology at Penn State University. She received her Ph.D. in conservation biology from the University of Minnesota.

AREAS OF EXPERTISE
• Course-based undergraduate research experiences
• Active-learning techniques
• Inclusivity in the sciences
• Science for the non-scientist
• Barriers to teaching and learning biology

RESEARCH CLUSTER
• Biology Teaching and Learning