

The 2016 Faculty Scholars

The Howard Hughes Medical Institute, the Simons Foundation, and the Bill & Melinda Gates Foundation announce the selection of 84 Faculty Scholars, early-career scientists who have great potential to make unique contributions to their field. The scientists represent 43 institutions across the United States. Through the new Faculty Scholars Program, the philanthropies will spend about \$83 million over five years to support the first cohort of scientists selected to receive grants.

Link to News Release: [Philanthropies Announce Selection of Faculty Scholars](#)



Neal Alto, PhD
University of Texas Southwestern Medical Center
HHMI-Simons Faculty Scholar

Infectious bacteria use toxins called effector proteins to invade host cells. **Neal Alto** studies how these proteins operate, with an eye toward uncovering new therapies to combat diseases caused by *Escherichia coli*, *Shigella*, *Salmonella*, and other microorganisms. He's also looking to harness effector proteins to explore the causes of auto-inflammatory diseases and cancer.



Alexei Aravin, PhD
California Institute of Technology
HHMI Faculty Scholar

Alexei Aravin's previous research led to the discovery of a group of small, non-coding RNAs called piRNAs. Now, he is studying the molecular mechanisms behind the piRNA pathway and investigating how these RNAs protect germ cells against mutations caused by transposons – segments of genetic material that undergo relocation within the genome.



Michel Bagnat, PhD
Duke University
HHMI Faculty Scholar

Michel Bagnat investigates how fluid secretion and hydrostatic pressure can shape the form and function of organs. Focusing his work on the spine and the intestine, he has found that faulty fluid regulation during early development can lead to conditions such as scoliosis and secretory diarrhea.



Emily Balskus, PhD
Harvard University
HHMI-Gates Faculty Scholar

Combining chemistry and microbiology, **Emily Balskus** studies how the microorganisms of the gut interact with each other and their human hosts. She is using this knowledge to design approaches for chemically manipulating the growth and composition of microbial communities.



Diana Bautista, PhD
University of California, Berkeley
HHMI Faculty Scholar

Chronic itch is a debilitating condition with few treatment options. Through her research on the molecular mechanisms that drive pain and itchiness, **Diana Bautista** is examining the ways that skin cells, immune cells, and sensory neurons interact to trigger eczema and other inflammatory diseases.



Thomas Bernhardt, PhD
Harvard University
HHMI-Simons Faculty Scholar

Thomas Bernhardt is interested in finding out how bacteria build their cell wall in order to grow and divide. By identifying key enzymes in cell-wall synthesis, his research could help combat drug-resistant infections by providing new targets for future antibiotics.



Jesse Bloom, PhD
Fred Hutchinson Cancer Research Center
HHMI-Simons Faculty Scholar

Jesse Bloom studies the evolution of proteins and viruses. He develops experimental and computational techniques to understand the forces that shape evolution at the molecular level. This work provides insight into how viruses such as influenza are able to rapidly change to evade the defenses of our immune systems.



Edward Boyden, PhD
Massachusetts Institute of Technology
HHMI-Simons Faculty Scholar

Edward Boyden is developing a strategy called expansion microscopy to capture images of complicated biological systems such as brain circuits and tumors. Tissue samples expand when combined with a polymer that swells on contact with water, allowing him to physically magnify their structures. In the future, this method could be applied at even smaller scales to view proteins, DNA, and RNA.



Siobhan Brady, PhD
University of California, Davis
HHMI Faculty Scholar

Siobhan Brady maps the gene networks that regulate the development of plant roots. Comparing these networks in different cell types across different species, including important crops such as tomato and sorghum, reveals how some plants adapt to frequent droughts and other harsh environmental conditions.



Clifford Brangwynne, PhD
Princeton University
HHMI-Simons Faculty Scholar

Clifford Brangwynne investigates how RNA and proteins organize into ribonucleoprotein (RNP) bodies. He has found that RNP bodies assemble through phase transitions, with RNA and protein condensing into liquid droplets. The unique physical properties of these membrane-free organelles may impact how RNP bodies regulate the flow of genetic information, and its dysregulation in disease.



Ken Cadwell, PhD
New York University School of Medicine
HHMI Faculty Scholar

Ken Cadwell studies how humans have adapted to the infectious agents that inhabit the gastrointestinal tract, looking for potential triggers of inflammatory bowel disease. His research has also revealed that, in the right contexts, normally harmful viruses and parasitic worms can provide some surprising benefits to their hosts.



Fernando Camargo, PhD

Boston Children's Hospital
HHMI Faculty Scholar

Fernando Camargo's work with adult stem cells has helped describe the Hippo pathway, a stem cell regulatory system that controls the growth of organs and tumors. He also developed a new strategy that uses transposons to track stem cell lineages in situ, allowing him to investigate how blood cells are produced in bone marrow.



Flaminia Catteruccia, PhD

Harvard University
HHMI-Gates Faculty Scholar

Malaria-carrying mosquitoes are rapidly developing resistance to insecticides. To find new ways to control the spread of malaria, **Flaminia Catteruccia** investigates the molecular and genetic mechanisms behind mosquito reproduction and malaria transmission. She has found that disrupting key physiological processes in the mated blood-fed mosquito can both sterilize females and prevent development of malaria parasites.



Edward Chang, MD

University of California, San Francisco
HHMI Faculty Scholar

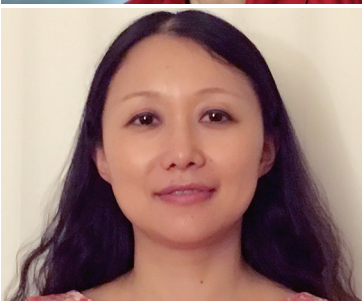
By figuring out how the human auditory cortex responds to spoken sounds, **Edward Chang** is studying how the brain interprets verbal communication. His research reveals a major role for the brain's superior temporal gyrus region in speech perception, and may shed light on the neural circuitry involved in language learning.



Elizabeth Chen, PhD

University of Texas Southwestern Medical Center
HHMI Faculty Scholar

Elizabeth Chen investigates what happens along the membranes of undifferentiated muscle cells, or myoblasts, during cell fusion, a crucial step in skeletal muscle development and repair. Her work has shown that mechanical tension drives the fusion process as one cell invades another one using finger-like protrusions of the cell membrane.



Xin Chen, PhD

Johns Hopkins University
HHMI Faculty Scholar

Xin Chen studies the genetic and epigenetic mechanisms that allow cells to acquire distinct morphologies and functions during development. Using the *Drosophila* male germline as a model, she has shown that the asymmetric distribution of histones during cell division helps to establish distinct fates for daughter cells.



Daniel Colón-Ramos, PhD

Yale University
HHMI Faculty Scholar

A fundamental problem in neuroscience involves understanding how synapses are assembled in living animals to produce behaviors and store memories. **Daniel Colón-Ramos** uses the nematode *Caenorhabditis elegans* to explore this question, examining the biological mechanisms cells use to create synapses during development, maintain them during growth, and modify them during learning.



Victoria D'Souza, PhD
Harvard University
HHMI Faculty Scholar

Victoria D'Souza is using nuclear magnetic resonance to understand how retroviruses employ various RNA structures to aid in the transcription and translation of their genomes. By mapping the three-dimensional topology of viral nucleic acids, she hopes to learn more about how these molecules interact with host molecular components and how new therapeutics could potentially interfere with these interactions.



Ralph DeBerardinis, MD, PhD
University of Texas Southwestern Medical Center
HHMI Faculty Scholar

Ralph DeBerardinis studies the metabolic pathways that go awry in cancer and other diseases. Eventually, he hopes to develop therapeutic agents that selectively manipulate metabolism in tumors, reducing their growth while leaving metabolism in the rest of the body undisturbed.



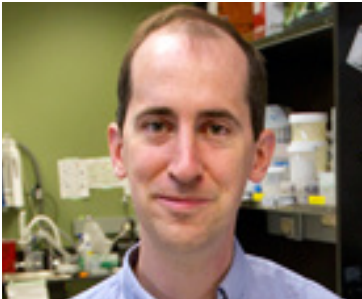
José Dinneny, PhD
Carnegie Institution for Science
HHMI-Simons Faculty Scholar

José Dinneny looks at the mechanisms plants use to sense water availability and adapt to drought conditions. He takes a holistic approach in his research, emphasizing the importance of developmental pathways and molecular genetic mechanisms in guiding acclimation and homeostatic processes.



Maitreya Dunham, PhD
University of Washington
HHMI Faculty Scholar

Maitreya Dunham uses comparative genomics and experimental evolution techniques to investigate how yeast genomes evolve over time periods ranging from a few weeks to millions of years. Her research may lead to therapies that counter the evolution of drug resistance in fungal and bacterial pathogens, viruses, and cancer.



Alex Dunn, PhD
Stanford University
HHMI Faculty Scholar

Alex Dunn uses biophysical measurements to understand how cells work together to build complex, multicellular tissues. His team seeks to learn how to guide cellular assembly in the context of tissue engineering, and to understand what goes wrong in diseases in which cells fail to work together to achieve their proper physiological function.



Benjamin Ebert, MD, PhD
Brigham and Women's Hospital
HHMI Faculty Scholar

Benjamin Ebert employs a range of genomic, cellular, and molecular biology techniques to investigate the basis of human disease, with an emphasis on hematopoietic malignancies and disorders of red blood cell production. He is also interested in identifying and developing small molecules that could be used to treat cancer and hematologic disorders.



Ila Fiete, PhD
University of Texas at Austin
HHMI Faculty Scholar

Ila Fiete builds theoretical models and numerical simulations while working closely with experimentalists to design experiments and analyze neural data, with the goal of understanding how the brain solves hard problems such as spatial navigation using components that are forgetful and noisy. Her focus is on circuits that underlie short-term memory, integration, and inference in the brain.



Michael Fischbach, PhD
University of California, San Francisco
HHMI-Simons Faculty Scholar

The bacteria that reside in and on the human body produce a wealth of small molecules, many of which play crucial roles in human physiology and disease. **Michael Fischbach** is examining the functions of these molecules, some of which may eventually be used to treat immune, metabolic, and neurological disorders.



Robert Froemke, PhD
New York University School of Medicine
HHMI Faculty Scholar

One of the central challenges in neuroscience is distinguishing how modification of synapses and neural circuits can change behavior. **Robert Froemke** is investigating this question by studying the circuits and molecular cues used by rodents when they give birth to and care for their offspring.



Adam Frost, MD, PhD
University of California, San Francisco
HHMI Faculty Scholar

Adam Frost studies the molecular machines that are too fragile to purify, too large or flexible to crystallize, or are dependent on lipids that cannot be replaced by detergent micelles. To do this, he integrates cryo-EM with genetics, biochemistry, and diverse imaging techniques.



Antonio Giraldez, PhD
Yale University
HHMI Faculty Scholar

Antonio Giraldez is interested in how fertilized eggs develop into complex multicellular embryos. Using zebrafish as a model system, he is looking at the mechanisms that activate the genome after fertilization and how this universal transition drives post-transcriptional regulation of the maternal instructions.



Amy Gladfelter, PhD
University of North Carolina at Chapel Hill
HHMI Faculty Scholar

Amy Gladfelter is looking at how the physical properties of molecules lead to cell organization and function. Her research focuses on two areas: how multinucleate cells are organized in time and space, and how cells perceive their shape and use geometry to inform signaling and decision making.



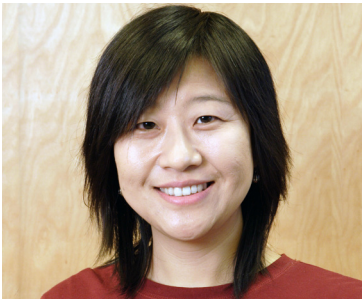
Andrew Goodman, PhD
Yale University
HHMI Faculty Scholar

Andrew Goodman's research is focused on dissecting the mechanisms that human commensal microbes use to cooperate, compete, and antagonize each other in the gut. His team works to understand how the communities that develop from these interactions influence our responses to pathogens and medical drugs.



Valentina Greco, PhD
Yale University
HHMI Faculty Scholar

Valentina Greco is investigating how stem cells initiate and coordinate tissue regeneration, both to maintain healthy tissues and to restore damaged tissue after injury. She is also investigating how regenerating tissues respond to the presence of cells with cancer-promoting mutations, seeking a better understanding of the earliest events in tumor development.



Chenghua Gu, PhD
Harvard University
HHMI Faculty Scholar

Chenghua Gu is studying how the blood/brain barrier forms and functions. Better understanding of this nearly impermeable barrier could make it easier to deliver drugs to the brain. She is also exploring how neural activity influences the development and function of the blood vessels that supply the brain.



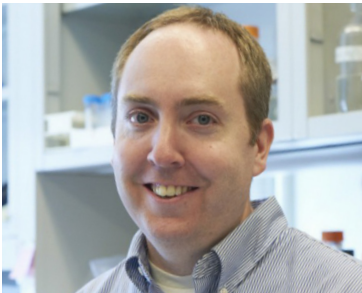
Elissa Hallem, PhD
University of California, Los Angeles
HHMI Faculty Scholar

Elissa Hallem is investigating how parasitic worms use sensory cues such as heat and odors to find their hosts. Her studies of neural circuits in skin-penetrating roundworms, as well as in the free-living roundworm *Caenorhabditis elegans*, focus on how the worms detect sensory cues and how the brain responds differently to those cues under different circumstances.



Elizabeth Haswell, PhD
Washington University in St. Louis
HHMI-Simons Faculty Scholar

Elizabeth Haswell is studying how plants use mechanosensitive ion channels to sense and respond to mechanical forces such as tension, touch, or vibration. She is also developing research tools that will enable her to measure membrane tension in live cells and to explore electrical signaling during trap closure in a carnivorous aquatic plant.



Cole Haynes, PhD
University of Massachusetts Medical School
HHMI Faculty Scholar

Mitochondria, cells' tiny power plants, are essential for many cellular activities, and their dysfunction is associated with aging, metabolic disorders, Parkinson's disease, bacterial infections, and cancer. **Cole Haynes** is investigating the mechanisms cells use to monitor their mitochondria and, when faulty, the strategies employed to ensure cell survival and mitochondrial recovery.



Lin He, PhD

University of California, Berkeley
HHMI Faculty Scholar

Lin He is identifying functionally important, non-protein coding elements of the mammalian genome and then characterizing what they do, how they work, and how they are regulated. Her studies focus on a class of gene-regulating non-coding RNAs called microRNAs and a class of mobile elements called retrotransposons, both of which have wide-ranging impacts on development and disease.



Ekaterina Heldwein, PhD

Tufts University
HHMI Faculty Scholar

Ekaterina Heldwein is using structural biology to learn how herpes viruses get in and out of host cells. Her lab is working to develop a comprehensive, atomic-level map of the ways herpes viruses manipulate their hosts, with the ultimate goal of devising antiviral drugs that interfere with those interactions.



André Hoelz, PhD

California Institute of Technology
HHMI Faculty Scholar

To enable detailed studies of how molecules enter and exit cell nuclei – and how disruption of that process contributes to disease – **André Hoelz** is focusing on the nucleus's only gateway: the nuclear pore complex. He is developing an atomic-level model of the mega assembly, which is made up of about a thousand proteins, and working toward reconstituting it in the test tube.



Martin Jonikas, PhD

Princeton University
HHMI-Simons Faculty Scholar

Martin Jonikas is advancing biologists' ability to engineer photosynthetic organisms to address our civilization's challenges in agriculture, health, and energy. To enable engineering, he is developing the green alga *Chlamydomonas* into a platform for high-throughput genetics research. His laboratory also studies the algal carbon concentrating mechanism, which could someday be transferred to crops to make more food with fewer resources.



Katrin Karbstein, PhD

The Scripps Research Institute
HHMI Faculty Scholar

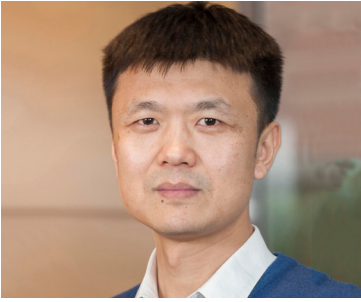
Katrin Karbstein studies how ribosomes – large cellular complexes that manufacture proteins – assemble and how cells ensure that new ribosomes are fully functional. She is also investigating what happens when ribosome quality control mechanisms are bypassed and how faulty ribosomes compromise human health.



Daniel Kronauer, PhD

Rockefeller University
HHMI Faculty Scholar

Daniel Kronauer is studying the origins of complex social behaviors in ants. The genetic resources and behavioral tracking system that he is developing for the clonal raider ant *Cerapachys biroi* will allow him to investigate how divisions of labor arise and how an ant colony's composition affects its social dynamics.



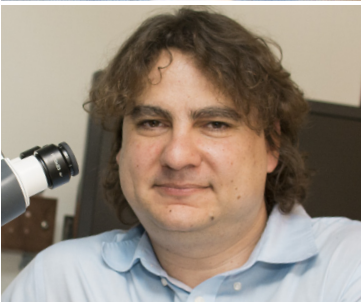
Ming Li, DPhil
 Memorial Sloan-Kettering Cancer Center
 HHMI Faculty Scholar

Ming Li is unraveling the signaling pathways that regulate immune system homeostasis, tolerance, and immunity. He is particularly interested in understanding how immune responses to tumors are distinct from those to healthy or infected tissue. Ultimately, he wants to use this knowledge to develop new cancer therapies.



Stephen Liberles, PhD
 Harvard University
 HHMI Faculty Scholar

The vagus nerve connects the brain to many of the body's internal organs, controlling breathing, heart rate, appetite, blood pressure, and other functions. **Stephen Liberles** is studying how the vagus nerve detects and alerts the brain to diverse stimuli such as nutrients ingested during a meal, inhaled respiratory gases, and toxins and irritants that cause nausea or cough.



Stavros Lomvardas, PhD
 Columbia University
 HHMI Faculty Scholar

In mammals, odor-detecting neurons each produce a single type of olfactory receptor, which is chosen from a pool of thousands. **Stavros Lomvardas** is studying the mechanisms that determine which olfactory receptor gene is switched on in an individual cell, with the larger goal of understanding how cells orchestrate random choices that generate diversity.



Joseph Marcotrigiano, PhD
 Rutgers University-New Brunswick
 HHMI Faculty Scholar

Joseph Marcotrigiano is studying a process by which some viruses produce a large protein and then break it apart into many functional proteins. By determining the structures of intact and partially cleaved polyproteins in HIV and chikungunya viruses, he is illuminating how polyprotein processing impacts the lifecycle of viruses.



Luciano Marraffini, PhD
 Rockefeller University
 HHMI-Simons Faculty Scholar

Luciano Marraffini is studying the biological principles behind CRISPR-based immunity in bacteria and other microbes. His research focuses on how bits of genetic material from viruses are presented to the CRISPR immune system and how this information is used to target and destroy the viral invaders.



David Masopust, PhD
 University of Minnesota-Twin Cities
 HHMI Faculty Scholar

David Masopust is investigating how immune cells find and respond to infection in the mucosal membranes that line the respiratory, intestinal, and reproductive tracts. Better understanding of these processes could change the way researchers think about vaccine design and cancer immunotherapies.



Frederick "Erick" Matsen, PhD
Fred Hutchinson Cancer Research Center
HHMI-Simons Faculty Scholar

Frederick Matsen is developing computational algorithms to analyze large sets of genetic data from an evolutionary perspective. This includes a special focus on methods that will reveal new insights about pathogens and their hosts' immune systems. He is also working more generally to improve the accuracy of phylogenetic analyses, which biologists use to infer evolutionary relationships between species or individual organisms.



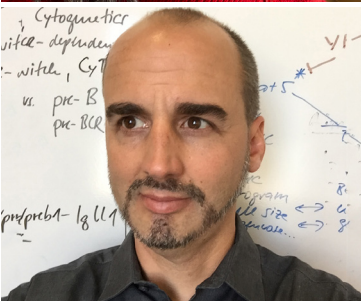
Coleen Murphy, PhD
Princeton University
HHMI-Simons Faculty Scholar

Coleen Murphy studies the molecular processes that regulate longevity, reproductive aging, and cognitive decline using the model system *Caenorhabditis elegans*. By identifying the active genes in each of the worms' tissues, she aims to enable new understanding of how biological processes change with age and how they can be manipulated to slow the declines that impact quality of life in humans.



Mala Murthy, PhD
Princeton University
HHMI Faculty Scholar

Mala Murthy is studying how the brain modulates behavior in response to dynamic sensory cues, using the acoustic communication system of fruit flies as a model. Flies use acoustic signals during courtship, and she is characterizing the neural activity underlying both the patterning of courtship song structure in males and the processing of song in females.



Markus Müschen, MD, PhD
University of California, San Francisco
HHMI Faculty Scholar

Markus Müschen explores oncogenic signaling in B cell-derived leukemia and lymphomas. Unlike other types of cancer, B cell tumors are subject to an autoimmunity checkpoint. As with normal B cells, B cell tumor cells are weeded out if they are self-reactive. Müschen uses pharmacological agents to engage autoimmunity checkpoints in B cell tumors, with the ultimate goal of overcoming resistance to conventional drug-treatment.



Celeste Nelson, PhD
Princeton University
HHMI Faculty Scholar

Celeste Nelson investigates the physical factors that govern embryonic tissue development and cancer using mouse and human lung and mammary gland as model systems. A clear understanding of the biochemical and physical cues directing embryogenesis may help identify the origin of certain congenital conditions and clarify how development can go awry.



Jennifer Nemhauser, PhD
University of Washington
HHMI Faculty Scholar

Jennifer Nemhauser studies plant signaling pathways to learn how multicellular organisms develop and respond to their environment. She gleans information about molecular networks in natural systems and then synthetically programs these core functions into yeast cells to measure the effect of evolved and engineered changes. Her ultimate aim is to develop technologies that support small-hold farmers and foster global health.



Jacquin Niles, MD, PhD
Massachusetts Institute of Technology
HHMI-Gates Faculty Scholar

Malaria continues to impact global human health, and **Jacquin Niles** wants to change that. Niles studies functional genetics in the malarial pathogen *Plasmodium falciparum*, as well as pathogen-host interactions. He's working toward a clearer understanding of the parasite and disease to provide the scientific foundation for new malarial diagnostics, treatments, and prevention/elimination strategies.



Clodagh O'Shea, PhD
Salk Institute for Biological Studies
HHMI Faculty Scholar

Clodagh O'Shea studies the mechanisms of cancer growth, using a common respiratory pathogen, adenovirus, for help. She discovered that adenovirus genetics and replication machinery hint at how cancer proliferates. Using the virus, she hopes to decipher the principles that govern cancer growth and apply that knowledge to create more effective treatments.



Benjamin Ohlstein, MD, PhD
Columbia University
HHMI Faculty Scholar

For the intestine to carry out digestive functions and act as a chemical and bacterial barrier, its cells must be replenished at a high rate. This steady cellular turnover requires highly controlled mechanisms of regeneration. **Benjamin Ohlstein** investigates the regulatory pathways that control intestinal stem cell behaviors necessary to maintain balance in the tissue.



Julie Pfeiffer, PhD
University of Texas Southwestern Medical Center
HHMI Faculty Scholar

Julie Pfeiffer discovered that gut bacteria can inadvertently advance enteric viral infections by influencing viral replication and transmission. Now, using poliovirus and reovirus as models, Pfeiffer is exploring this connection further to better understand how viruses in general may depend on intestinal bacteria for their survival.



Kathrin Plath, PhD
University of California, Los Angeles
HHMI Faculty Scholar

As immature cells grow and differentiate, gene-expression patterns shift accordingly to lock in a single cell fate. **Kathrin Plath** wants to determine how adult cells can be specifically and efficiently reprogrammed to return the cell to a pluripotent, undifferentiated state. More broadly, Plath is interested in the molecular mechanisms that control genome organization, chromatin, and gene expression.



Manu Prakash, PhD
Stanford University
HHMI-Gates Faculty Scholar

Manu Prakash is a biophysicist who studies simple animals to better understand how a small collection of cells gives rise to a multicellular organism. He develops new imaging tools and techniques based on soft matter physics that aid in his quest to understand the origins of complex behavior in simple animals. He is also developing novel tools for "frugal science" applied to global health and democratizing access to scientific experience.



Shu-Bing Qian, PhD
Cornell University
HHMI Faculty Scholar

Shu-Bing Qian researches mRNA translation and the mechanisms that regulate the onset of protein synthesis under certain cellular conditions. A clearer conception of the factors that control the quality and quantity of protein production during events such as cell growth, differentiation, or stress response could help define new therapeutic strategies for diseases such as cancer, diabetes, and neurodegenerative diseases.



Jayaraj Rajagopal, MD
Massachusetts General Hospital
HHMI Faculty Scholar

Tissue regeneration requires significant coordination among numerous cell types. Understanding this finely choreographed process drives **Jayaraj Rajagopal's** research. Rajagopal employs an outside-the-body model of lung regeneration to analyze the principles that govern cellular ensembles in organs and human disease.



Samara Reck-Peterson, PhD
University of California, San Diego
HHMI-Simons Faculty Scholar

Samara Reck-Peterson wants to understand the driving factors behind microtubule-based transport within cells. Microtubule networks and the motors that move on them play critical roles in cellular processes such as division, development, and neuronal function. Deciphering the overarching principles that regulate and support the transport system could help reveal how even subtle disruptions can lead to neurological disease.



John Rinn, PhD
Harvard University
HHMI Faculty Scholar

John Rinn was one of the first to discover that the human genome hosts thousands of new long noncoding RNA genes. He has dedicated his research to understanding how these genes contribute to human health and disease. He further aims to dissect the molecular grammar guiding their functional roles in hopes of finding new avenues of therapeutic intervention.



Jody Rosenblatt, PhD
University of Utah
HHMI Faculty Scholar

Extrusion, the process by which cells destined to die are squeezed from a tissue, is a necessary step in maintaining healthy organs. **Jody Rosenblatt** discovered extrusion and researches how the mechanisms that regulate this process become impaired to instead cause diseases, including asthma and metastatic cancers.



Carla Rothlin, PhD
Yale University
HHMI Faculty Scholar

Inflammation plays a critical role in the immune response. Left unchecked, however, it can cause chronic inflammation, trigger autoimmune disorders, or fuel cancer. **Carla Rothlin** studies the biochemical mechanisms that control immune response activation and intensity, with an eye toward inflammation. A better understanding of immune system regulation could lead to new treatments for inflammation-associated diseases.



Michael Rust, PhD
University of Chicago
HHMI-Simons Faculty Scholar

Michael Rust combines mathematical modeling and wet lab experiments to investigate how the circadian clock, a molecular oscillator, controls daily fluctuations in metabolism and energy use in cyanobacteria. These daily rhythms are likely to provide growth and survival advantages to cells.



Elizabeth Sattely, PhD
Stanford University
HHMI-Simons Faculty Scholar

Elizabeth Sattely studies the biosynthesis of plant-derived molecules that have a role in plant fitness and benefit human health. She is also interested in using metabolic engineering to produce new versions of plant compounds with potential therapeutic benefits, as well as plants that have enhanced tolerance to environmental stress.



Frank Schroeder, PhD
Boyce Thompson Institute for Plant Research
HHMI Faculty Scholar

Frank Schroeder investigates how previously unidentified products of cell metabolism function as signals between individuals and within cells in the worm *Caenorhabditis elegans*. These small molecules exhibit fascinating chemical diversity and regulate lifespan, reproduction, behavior, and many other phenotypes, often via signaling pathways that are evolutionarily conserved throughout the animal kingdom.



Song-Hai Shi, PhD
Memorial Sloan-Kettering Cancer Center
HHMI Faculty Scholar

Song-Hai Shi uses imaging, mouse genetics, and electrophysiology to dissect the molecular and cellular mechanisms that control the formation and operation of neuronal circuits in the mammalian brain. These circuits account for critical brain functions such as sensory perception, movement, and reasoning.



Jan Skotheim, PhD
Stanford University
HHMI-Simons Faculty Scholar

Jan Skotheim studies how yeast and animal cells control their size by coordinating growth and division. As cells grow, some regulatory molecules inhibiting cell division are diluted, while other regulatory molecules activating cell division are not. This produces a size-dependent biochemical signal through which cell growth triggers division.



Agata Smogorzewska, MD, PhD
Rockefeller University
HHMI Faculty Scholar

Agata Smogorzewska studies how DNA is maintained during DNA replication. She is guided by human genetic diseases that are caused by mutations in DNA repair genes and strives to understand the mechanism by which lack of the proper DNA repair predisposes patients to cancers and bone marrow, kidney, and liver failure.



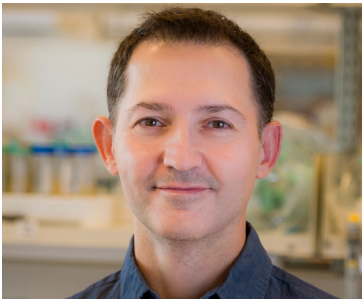
Daniel Stetson, PhD
University of Washington
HHMI Faculty Scholar

Daniel Stetson studies how our cells detect infection with a virus. Sensors of foreign DNA and RNA are essential for activating immune responses to viruses, but they can also cause severe autoimmune disease if they are not properly regulated. Stetson's lab seeks to understand this dichotomy of protective immunity and autoimmunity activated by the same antiviral sensors.



Francesca Storici, PhD
Georgia Institute of Technology
HHMI Faculty Scholar

Francesca Storici is studying how cells use RNA as a template to repair DNA lesions in a process in which genetic information flows in reverse from RNA to DNA. Furthermore, during DNA metabolism, subunits of RNA can be incorporated into the genome, and Storici is investigating spectra, consequences, and whether these RNA intrusions are associated with cellular stress and/or cancer.



Gurol Suel, PhD
University of California, San Diego
HHMI-Simons Faculty Scholar

Gurol Suel studies how bacteria coordinate their behavior to collectively organize into communities called biofilms, which have a higher resilience against antibiotics. His research suggests that, similar to neurons in the brain, bacteria use electrical cell-to-cell signaling mediated by ion channels to coordinate their action.



Sohail Tavazoie, MD, PhD
Rockefeller University
HHMI Faculty Scholar

Sohail Tavazoie investigates the roles of small noncoding RNAs and proteins that alter the biology of distant organs and facilitate their colonization by metastatic cancer cells. His work has led to the development of anti-metastatic small molecules that are advancing to clinical trials. These studies have also provided basic insights into mechanisms of gene regulation.



Benjamin Tu, PhD
University of Texas Southwestern Medical Center
HHMI-Simons Faculty Scholar

Benjamin Tu is characterizing the mechanism of action of two cell metabolites that are critical for coupling cell growth and homeostasis to nutrient availability: acetyl-CoA and S-adenosylmethionine. These metabolites play a critical role in the epigenetic regulation of gene expression, signal transduction, and metabolism.



Matthew Vander Heiden, MD, PhD
Massachusetts Institute of Technology
HHMI Faculty Scholar

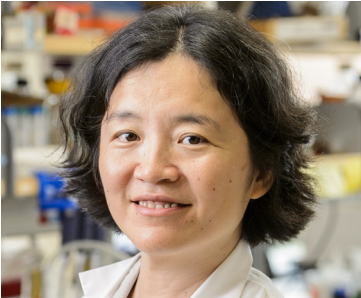
Matthew Vander Heiden uses mouse models to understand how cancer cells alter their metabolism to meet the requirements of growth and proliferation. Identifying rate-limiting steps in critical metabolic pathways, such as the breakdown of glucose and the production of the basic subunits of DNA, may lead to new cancer therapies.



Gia Voeltz, PhD

University of Colorado at Boulder
HHMI Faculty Scholar

Gia Voeltz is investigating how the endoplasmic reticulum (ER) interacts with and controls the division of organelles such as mitochondria and endosomes. This represents a completely new function for the ER, a cellular organelle whose traditional function is to provide an environment for protein folding and modification.



Jue Wang, PhD

University of Wisconsin-Madison
HHMI Faculty Scholar

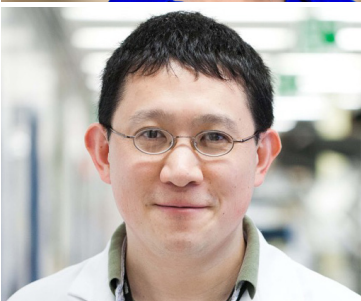
Jue Wang is studying the conflicts between the replication and transcription machineries in bacteria, which are exacerbated by stresses such as nutrient deprivation or exposure to antibiotics. She is characterizing how such conflicts have shaped the evolution of microbial genomes, and how conflicts are avoided by coordinating cellular metabolism in response to stress.



Meng Wang, PhD

Baylor College of Medicine
HHMI Faculty Scholar

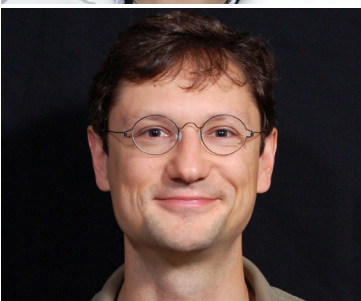
Meng Wang is developing new high-throughput screening and imaging methods to discover metabolites in the worm *Caenorhabditis elegans* that signal between the lysosome and the nucleus, and between bacteria and host mitochondria. Understanding the signaling role of these metabolites may lead to new nutraceutical therapies to improve health and prevent diseases.



Sing Sing Way, MD, PhD

Cincinnati Children's Hospital Medical Center
HHMI Faculty Scholar

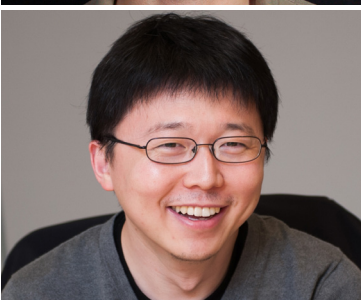
Sing Sing Way studies how genetically foreign maternal and fetal tissues coexist during pregnancy and how babies respond to commensal and pathogenic microbes during the early newborn period. Understanding how the immune system works in each of these unique developmental contexts may lead to new therapeutic strategies for improving pregnancy outcomes and protecting newborn babies against infection.



Marius Wernig, MD, PhD

Stanford University
HHMI Faculty Scholar

Marius Wernig investigates the molecular mechanisms that determine cell lineage identity, focusing on reprogramming skin and stem cells into functional neurons. His work includes translational efforts to treat an incurable genetic skin disease and various diseases of the nervous system such as multiple sclerosis.



Feng Zhang, PhD

Broad Institute of MIT and Harvard
HHMI-Simons Faculty Scholar

Feng Zhang is a bioengineer whose research focuses on developing technologies to study the role of genetic and epigenetic mechanisms underlying brain function and diseases. He is advancing genome editing methods, including CRISPR, and applying them to investigate brain function and disease.



Daniel Zilberman, PhD
University of California, Berkeley
HHMI-Simons Faculty Scholar

Daniel Zilberman investigates how epigenetic regulation of gene expression functions and evolves. His work with diverse, distantly related species aims to elucidate the evolutionary history of eukaryotic DNA methylation, understand how methylation patterns are faithfully inherited across generations, and determine the influence of such epigenetic inheritance on the agricultural characteristics of crops.