Thursday, June 22, 2023 | 1:00 pm – 2:30 pm Eastern

Virtual participation via Microsoft Teams

Meeting Link

Meeting ID: 264 389 037 700 Passcode: UrAuc4

Collected Researcher Slides and Bios are available here

Agenda

All times are EASTERN U.S. time zone

1:00 pm	**Welcome and Summary of Meeting Objectives**	**T. G. Guzik**
1:02 pm	**Overview of Ames Research Center**	**Harry Partridge**
1:07 pm	**Introduction to EPSCoR and the NASA EPSCoR Program**	**T. G. Guzik**

The remainder agenda items are two-minute flash talk presentations by jurisdiction researchers to illustrate capability and relevance to ARC research priorities.

1:25 pm Researcher Presentation Part 1:

Recent tests of gas-surface reaction products for carbon samples in air and oxygen plasmas — **Douglas G. Fletcher (VT)**

Unleashing the potential of quantum algorithms for the simulations correlated quantum materials — **Ka-Ming Tam (LA)**

Dynamic Adaptive Mesh Refinement for Wall Modeled LES of Complex Aero-Configurations — **Andrew Kirby (WY)**

Machine learning and deep learning models for hyperspectral unmixing of waterbodies — **Vidya Manian (PR)**

AI-enabled Joint Air Traffic and Aviation Spectrum Management — **Hongxiang Li (KY)**

Autonomous Structural Composites (AutoCom) for Autonomous Damage Detection and Healing — **Donghyeon Ryu (NM)**

Energy Efficient and Rapid Composite Manufacturing via Frontal Polymerization — **Xiang Zhang (WY)**

Q&A (9 minutes)

1:48 pm Ten-minute break in virtual meeting. Resume at 1:58 pm.

1:58 pm Researcher Presentation Part 1:

Advancements in Gene Sampling Technology: Unveiling Transcriptomic and Proteomic Biomarkers of Ionizing Radiation Exposure through Exosomal Liquid Biopsy **Gergana G. Nestorova (LA)**

Biogeography and ecophysiology of extremophiles in the deep biosphere **Anirban Chakraborty (ID)**

Identification of Prebiotic Molecules and Exploration of Astrochemistry through High-Resolution Laser Spectroscopy **Jinjun Liu (KY)**

Cracking the Histone Code **Karen C. Glass (VT)**

Stitching the Surface to the Sky: Surface & Drone-Borne Martian Boundary Layer Science **Brian Jackson (ID)**

Space Systems Operations Research and Next Generation Space Systems **Hang Woon Lee (WV)**

Semi-supervised Machine Learning for Anomaly/Rare Category Detection **Rohan Loveland (SD)**

Electro-spun polymer nanofibers for use as sensors and in low power consumption devices **Nicholas J. Pinto (PR)**

Big Data & Multi-Source Data Fusion/Integration and Analysis of Global Land Use/Cover Change in the Pacific Islands **Jose Edgardo L. Aban (GU)**

Methane Dynamics of Vegetation-Soil Interactions in Bald Cypress and Other Bottomland Hardwood Forests **Bassil El Masri (KY)**

Measuring the line-of-sight distribution of potential exoplanet host microlenses with K2 Campaign 9 data **Matthew Penny (LA)**

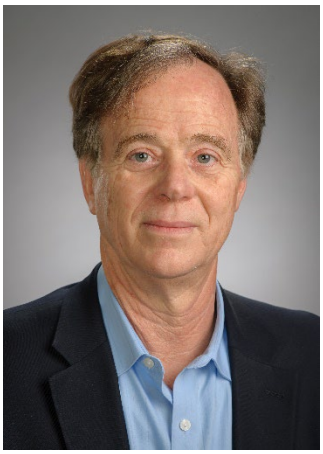
Q&A (10 minutes)

4:30 pm Adjourn Meeting

Speakers for the 2023 NASA EPSCoR Virtual Research Discussions with Ames Research Center
in order of appearance

T. Gregory Guzik
NASA EPSCoR Caucus Chair

T. Gregory Guzik is the Director of the Louisiana Space Grant / NASA EPSCoR program. His scientific career has focused on astrophysical energetic particles including large class cosmic ray balloon instruments launched as long duration balloon flights in Antarctica, heavy ion particle accelerator experiments, cosmic ray instruments on-board satellites, and is part of an international collaboration working with the CALET high energy cosmic ray instrument on-board the International Space Station. Dr. Guzik has been directly involved with Space Grant and NASA EPSCoR for close to 20 years including developing and managing both entry-level and advanced experiential student ballooning programs. Dr. Guzik currently serves as the Chair of the NASA EPSCoR Caucus.



Harry Partridge
Center Chief Technologist

Dr. Harry Partridge is the Ames Center Chief Technologist (CCT), and as such identifies, defines, develops and integrates new and emerging technologies for application to Agency and national goals through the NASA Space Technology Mission Directorate (STMD). Harry reports to Center management and serves as the principal advisor to the Center leadership on matters concerning Center-wide technology development and leverage. His duties include representation on the Agency-wide Center Chief Technologist's Council and management of the Center Innovation Fund, and he also serves as Center point-of-contact to the Office of the Chief Technologist (OCT).

In addition to his role as the CCT, Harry continues to serve as the Senior Technology Officer for the STP within OCT. In this role he serves as the chief technologist for the 10 programs within STP, and is a member of the OCT senior leadership team.

Previously, Harry was the Deputy Director of the Game Changing Technology Division at NASA Headquarters. While at Ames, he was the Deputy Director of the Entry Systems and Technology Division and was responsible for managing the entire range of entry system technology developments from foundational research on thermal protection materials development, to thermal protection system design, development, testing and evaluation for flight systems such as Mars Science Laboratory and Orion. In addition, he served as the Branch Chief of the Nanotechnology Branch at Ames and the program manager for the Bio-nano project within the Computing, Information and Communications Technology program. Harry received his PhD from Indiana University in Chemical Physics and has pu blished approximately 190 papers in computational chemistry.

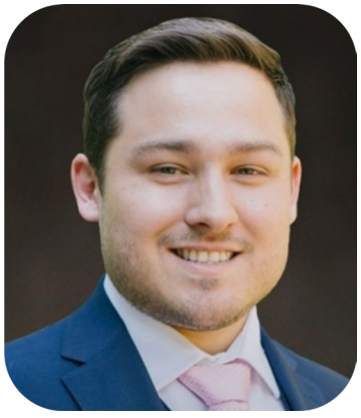
Douglas G. Fletcher

Dr. Fletcher is Professor and Chair of Mechanical Engineering at the University of Vermont, where he and his students have constructed 30 kW ICP Torch Facility for testing high temperature materials for aerospace applications and for quantifying the critical gas-surface interactions that control surface heating. Prior to his current position, Dr. Fletcher worked at NASA Ames Research Center from 1989-2000 and the von Karman Institute for Fluid Dynamics from 2000-2007 Dr. Fletcher's research interests also include the development and application of laser spectroscopic techniques to characterize non-equilibrium plasmas and to probe gas-surface interactions. He has experience testing in both arc-jet and ICP test facilities, and he has led numerous research projects in Europe (ESA and CNES) and in the US (NASA, AFOSR, ONR).

Ka-Ming Tam

Ka-Ming Tam is a Research Assistant Professor at the Department of Physics and Astronomy, Louisiana State University. His research expertise is on the simulations of correlated materials by utilizing high performance computer simulations, quantum computing algorithms, and data science approaches. Dr. Tam has extensive experience in the development of computer codes for heterogeneous computing architectures. These include classical and quantum Monte Carlo for optimizing systems with complex energy landscapes, such as spin glass and random field systems. Starting in 2018, Dr. Tam has developed various new approaches based on machine learning and quantum computing algorithms for studying the properties of correlated materials. Such methods include variational autoencoder, generative adversarial network, variational quantum eigensolver, and quantum convolutional neural network. These previous works pave the way to creating a quantum database of correlated materials which will expand our current understanding of materials relevant to NASA mission.

Andrew Kirby



Andrew Kirby is a Research Scientist in the School of Computing at the University of Wyoming. His research expertise is at the intersection of aerodynamics, computational mathematics, and high performance computing. Since 2015, Dr. Kirby's primary area of activity has been the development of high-order numerical methods with dynamically adaptive mesh refinement for aerospace and wind energy aerodynamic simulations. Such systems are intrinsic to missions that involve air traffic management, search and rescue, area coverage, perimeter protection, or co-transportation of large objects. Additionally, his research is intersecting into Wall-Modeled Large Eddy Simulation (WMLES) with fully dynamic adaptive mesh refinement for unstructured mixed-element meshes. These areas of research are critical toward the aircraft certification by analysis and the grand challenges issued in the NASA CFD2030 report. Additionally, Dr. Kirby has extensive experience in the development of scientific software for next-generation heterogeneous computing systems including GPU-based platforms. He was PI for a NASA SBIR STTR project focused on the GPU acceleration of an adjoint enabled real gas hypersonic flow solver designed for simulating planetary atmospheric entry.

Vidya Manian

Vidya Manian is a Professor in the department of electrical and computer engineering at the University of Puerto Rico, Mayagüez (UPRM). She is also a faculty in the Bioengineering graduate program. She is a research faculty in the Laboratory for applied remote sensing, imaging, and photonics. Her research involves development of deep learning architectures for processing airborne and satellite multispectral and hyperspectral images for unmixing and endmember extraction in coastal and inland waters, quantifying algal blooms, and water quality assessment. She has published 15 refereed journal articles in machine learning and artificial intelligence, and hyperspectral image processing, and currently applies artificial intelligence to modeling of remote sensing observations of waterbodies. She teaches the machine learning and pattern recognition course in the college of engineering. Her capability is in the development of physics informed machine learning models with uncertainty quantization to improve predictions from multidimensional and noisy datasets. She works with novel methods such as optimal transport for improving anomaly detection using autoencoders. Her research interests are in development of bio-inspired learning approaches such as reinforcement learning, and meta learning to improve performance of deep learning architectures and their application to Earth sciences.

Hongxiang Li

Hongxiang Li is an Associate Professor of Electrical and Computer Engineering at UofL. He has over 20 years of experience in the research and development of wireless communication and networking systems. He was the NASA Glenn Faculty Fellowship Program (NGFFP) awardee in 2013, 2018 and 2019, working on various topics including small UAS transceiver design, MIMO based interference mitigation, and delay sensitive aerial V2V communications. In recent years, his research interests include big data analytics and the application of machine learning to communication systems and spectrum optimization. Since 2019, Dr. Li has partnered with the Communications and Intelligent System Division of NASA Glenn Research Center (GRC) on autonomous spectrum allocation for aeronautical communications, where he co-invented the Air Traffic and Spectrum Modeling and Simulation Testbed consisting of environment visualization and various computational tools for sensing, scheduling, and communications. Using live air traffic data accessible through FAA's SWIM Flight Data Publication Service and ADS-B data, the testbed enables real-time assessment of future air traffic and spectrum management solutions.

Donghyeon Ryu

Dr. Donghyeon Ryu is an associate professor in the Department of Mechanical Engineering at New Mexico Tech (August 2014 – present) and a co-founder and Chief Scientific Officer of RD Health Sensing (November 2020 – present). He obtained a Ph.D. in the Department of Civil and Environmental Engineering in September 2014 and M.S. in the Department of Mechanical and Aerospace Engineering in March 2014 from the University of California, Davis. Before then, he obtained M.S. (2008) and B.S. (2004) in the Department of Civil and Environmental Engineering at Yonsei University in Seoul, South Korea. Dr. Ryu is active in research involving multifunctional materials, nanocomposites, and metamaterials for health monitoring of structural and biological systems; advanced sensor technologies; and energy harvesting. His research has been sponsored by NASA, Sandia National Labs, Office of Naval Research, Federal Aviation Administration, and others. He received New Mexico Space Grant Consortium Faculty Research Award and three best paper awards from ASME (America Society of Mechanical Engineers), 9IWSHM (9th International Workshop on Structural Health Monitoring), and DAMAS (10th International Conference on Damage Assessment of Structures).

Xiang Zhang

Dr. Xiang Zhang is an assistant professor in the Mechanical Engineering Department at the University of Wyoming, where he leads the Computations for Advanced Materials and Manufacturing Laboratory. Before joining UW in 2019, he conducted his postdoctoral research in the Aerospace Engineering Department at University of Illinois at Urbana-Champaign and earned his Ph.D. from the Civil Engineering Department at Vanderbilt University.
Dr. Zhang's group focus on developing computational tools to understand how materials response and evolve during their lifespan, from manufacturing to service and eventually failure. In the area of advanced manufacturing, his group has been developing multiphysics modeling approach to simulate the thermo-chemo-mechanical process associated with composite manufacturing, including additive manufacturing process, to provide insights and guidance for optimizing processing parameters. Recently, his group is building a customized 3D printer for composite 3D printing and aim to develop an augmented reality environment to use real-time analysis and optimization to optimize the printing process on the fly. His group also has access to various 3D printers at the UW Innovation Wyrkshop, including a state-of-the-art metal 3D printer, where one of his students is currently printing and testing 3D printed Titanium parts.

Gergana G. Nestorova

Dr. Gergana G. Nestorova is an Associate Professor of Biology at Louisiana Tech University and the director of the Applied Genomics and Biotechnology Lab. She serves as the Program Chair for the MS and Ph.D. Programs in Molecular Sciences and Nanotechnology. Dr. Nestorova's research expertise lies at the dynamic intersection of technology development for nucleic acid and extracellular vesicle purification for the detection of genomic and proteomic biomarkers of ionizing radiation response. Dr. Nestorova's lab developed a micro-probe-based tool, which facilitates the rapid purification of RNA and exosomes. This technology enables precise and high-resolution sampling of specimens, enabling sensitive genotyping of various organisms, including plants, 3D spheroids, and bacteria. The Gene Sampling technology was successfully tested on the International Space Station in 2021 for plant genotyping in collaboration with the Wet Lab-2 team. Utilizing human astrocytes as a biological model, Dr. Nestorova's lab has identified exosome-derived microRNA biomarkers for neurological radiation injury. These studies are crucial for deepening the understanding of the impacts of radiation on the nervous system during spaceflight that may lead to the development of targeted biomarkers for diagnostic and therapeutic applications. In her most recent projects, Dr. Nestorova has focused on employing state-of-the-art TimsTOF mass spectrometry analysis to identify exosome-derived protein biomarkers using human astrocytes, neurons, and endothelial brain cells. The results from this work will provide new insights into the exosome-derived proteomic biomarkers including response to ionizing radiation.

Anirban Chakraborty

Anirban Chakraborty is an Assistant Professor of Environmental Microbiology at ISU. His research expertise includes interactions of microbial life with the lithosphere and the hydrosphere at physiological, organism and community levels. He frequently employs field- and laboratory-based approaches that integrate molecular diversity surveillance and meta-omics tools with traditional microbiological and geochemical techniques. Primary research areas in his lab include 1) microbial dispersal and its impact on biomass circulation and community assembly in the deep marine biosphere using subsurface extremophiles as model organisms, 2) activity of anaerobic thermophiles associated with biogeochemical cycling of elements in the continental subsurface, and 3) microbial metabolic diversity in contaminated groundwater and soil in relation to developing efficient pollutant cleanup strategies. His laboratory is equipped with anoxic cultivation facilities and is on the same floor as ISU's Molecular Research Core Facility which houses several state-of-the art equipment including an Illumina MiSeq benchtop sequencer, a quantitative PCR instrument, a newly acquainted FACSMelody flow cytometer, several microscopes, and a TEM. He uses ISU's high performance computing cluster for his research.

Jinjun Liu

Dr. Jinjun Liu is a Professor of Chemistry and Adjunct Professor of Physics at the University of Louisville (UofL). He is also the Spectroscopy Theme Leader of the Conn Center for Renewable Energy Research of the Speed School of Engineering at UofL. Research in Dr. Liu's group consists of high-resolution laser spectroscopy of gas-phase molecules, many of which can be found in space, through combined experimental, theoretical, and computational investigations. The experimental investigations center on the detection and characterization of stable molecules and transient species, including free-radical chemical intermediates and molecules in excited electronic states. The research lab is equipped with more than ten narrow-linewidth, widely tunable lasers that cover the spectral range from mid-IR to UV. The high-resolution, high-sensitivity laser spectroscopic techniques used by the Liu Group include laser-induced fluorescence/dispersed fluorescence (LIF/DF), cavity ring-down (CRD) spectroscopy, Doppler-free saturation absorption spectroscopy, and two-photon spectroscopy techniques. These studies provide a quantitative understanding of energy-level structure and intramolecular dynamics. Unambiguous identification and assignment of experimentally obtained spectra is often a prerequisite to subsequent work on chemical reactions. Dr. Liu's group also develops pectroscopic models and implement quantum chemistry calculations to predict and analyze the complex structure and dynamics of molecules embedded in their experimental spectra.

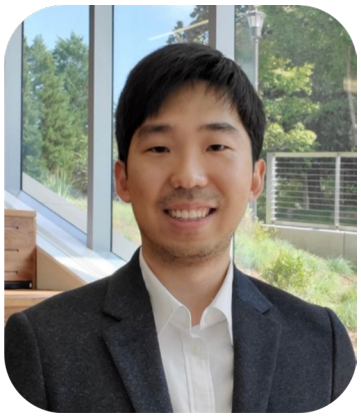
Karen C. Glass

Dr. Karen C. Glass is an Associate Professor in the Department of Pharmacology at the University of Vermont College of Medicine. She received her Ph.D. in Microbiology and Molecular Genetics from the University of Vermont in 2005, and completed her postdoctoral training in Pharmacology at the University of Colorado Denver.
Dr. Glass's research interests focus on understanding how epigenetic signaling regulates gene expression, and how alterations in these pathways are involved in disease development, particularly cancer and cardiovascular disease. She is interested in the molecular mechanisms driving the recognition of histone post-translational modifications, which are chemical changes that can be added to histone proteins in the nucleosome, the spools around which DNA is wrapped. Histone modifications play a role in regulating gene expression by controlling how tightly DNA is packed, which affects how aaccessible it is to transcription factors, the proteins that control which genes are turned on and off.
Dr. Glass uses a variety of techniques, including X-ray crystallography, nuclear magnetic resonance spectroscopy, and cryo-electron microscopy, to determine the three-dimensional structures of proteins. Protein structure is important for understanding how proteins function and how they interact with other molecules. Dr. Glass also has a strong background in molecular biology, genomics, biochemistry, biophysics, and proteomic techniques to study the function of proteins and other biological molecules. Dr. Glass's research has been published in leading scientific journals, including Nature, Molecular Cell, and the Journal of Medicinal Chemistry. She is currently conducting two research projects funded by the National Institutes of Health (NIH) to study how bromodomain-containing proteins recognize the histone code, and how the activity of these proteins influences the response to estrogen therapy in ER+ breast cancer. Dr. Glass is also a member of the American Society for Biochemistry and Molecular Biology, the American Crystallography Association, and the American Association for Cancer Research.
Dr. Glass is very excited about extending her research to NASA areas of interest. Particularly, regarding how radiation exposure during space flight may disrupt epigenetic regulatory responses and trigger uncontrolled inflammation, promoting disease development. Establishing new collaborations with NASA scientists has the potential to lead to new therapeutic strategies to extend our ability for space travel.

Brian Jackson

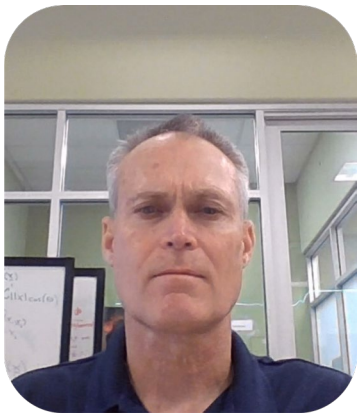
Brian Jackson is a professor of physics and planetary science at Boise State. His research expertise involves boundary-layer processes including aeolian transport. Since 2015, his group at Boise State has conducted field studies using miniature ground-based and drone-borne meteorological instrumentation to understand the connections between planetary surfaces and atmospheres as moderated by the boundary layer. His group has also used data collected by instruments on Mars and Saturn's moon Titan to extrapolate terrestrial field studies to better understand boundary layer processes on those distant worlds. Recent work includes exploring approaches to use drones as wind probes to determine wind speed and direction from only aircraft attitude without the need for additional instrumentation. Such an approach would be ideally suited for aerial exploration of Mars where drone-borne payloads will be severely mass-limited. In addition to research, Jackson has supported planetary exploration in several ways, including serving on the 2019 Discovery Mission Program review panel, participating in the selection of NASA's VERITAS and DAVINCI missions, on the Mars Exploration Program Analysis Group's Mars Concurrent Exploration panel, and as a member of the American Astronomical Society (AAS) Division for Planetary Science (DPS) Executive Committee.

Hang Woon Lee



Hang Woon Lee is an Assistant Professor of Space Systems at West Virginia University. He is the director of the Space Systems Operations Research Group. His research interest lies at the intersection of space systems engineering, operations research, and astrodynamics. He is dedicated to the development of innovative mathematical modeling techniques and optimization methods for tackling complex decision-making problems that arise during the life cycle of a space system. Applications include the design and operations of earth observation satellite constellations, space domain awareness in cislunar space, and space logistics. Hang Woon is a faculty member of the newly founded West Virginia Small Satellite Center of Excellence.

Rohan Loveland



Rohan Loveland is an Asst. Professor of Computer Science at South Dakota Mines. He's the founder of the Anomaly/Relevant Event Detection Institute as well as Faculty Co-Advisor for the Data Mining Club. His research expertise is in machine learning and data science, specifically in the development and application of semi-supervised active learning for anomalous and rare category and event detection. Dr. Loveland has applied his algorithms successfully to several NASA datasets in the past, including LIBS data from the Mars ChemCam, asteroid data from the ATLAS project, and most recently LROC high-resolution lunar imagery data. The goal of the current research is to develop algorithms that will help to identify anthropogenic activity sites on the moon, including crashed probes that remain unlocated at present. More generally the tools he's working on have potential application for augmenting human data analysis capabilities in a broad variety of areas, including system and human health monitoring, by providing real-time flagging of anomalous events. Beyond application to streaming data, these algorithms can also be used to facilitate exploration of massive imbalanced datasets where the classes of interest are not known in advance, thus providing a foundation for detecting technosignatures and Lunar and Martian resource exploration. Dr. Loveland makes it a priority to involve undergraduates in his research and is currently conducting research with them in Mountain View, CA.

Nicholas J. Pinto

Nicholas Pinto is a Professor of Physics at UPRH. He is the Director of the NSF sponsored Research at Undergraduate Institutions (RUI) grant at UPRH. He is interested in studying charge transport in conducting polymers, carbon nanotubes, graphene, and 2-D transition metal dichalcogenides. His research focusses on fabricating devices and organic electronics at the nanoscale. Pinto is the co-author of 120 refereed publications and holds four US patents. His primary interest is to motivate students into STEM fields by giving them hands on research experience in an undergraduate lab setting. He is also engaged in efforts to integrate research grade experiments into the undergraduate curriculum in the Physics and Electronics Department at UPRH. https://sites.google.com/a/upr.edu/nicholas-j-pinto/

Jose Edgardo L. Aban

Jose Edgardo L. Aban is a seasoned research and project manager and an advocate of satellite remote sensing education. He served for almost two decades at the Department of Science and Technology of the Philippines and has taught as a senior lecturer in the Department of Geography, Development, and Environmental Studies at the Universiti of Brunei Darussalam, where he was instrumental in the establishment of an image processing laboratory.
Dr. Aban teaches both introductory and advanced Remote Sensing and satellite image processing, Geographic Information Systems (GIS) as well as a host of Geography subjects such as World Regional Geography, Physical Geography, and Economic Geography.
Prior to joining UOG, Aban served as a technical consultant at the Asian Development Bank, as project manager of the GIS-based project dubbed “Communication and Information Systems for the Control of Avian Influenza” of the ASEAN Foundation, and as a consultant of a mapping unit of an agricultural company in Indonesia.

Bassil El Masri

Bassil El Masri is an Associate Professor in the Department of Earth and Environmental Sciences at Murray State University. His research focuses on investigating the soil-vegetation-atmosphere interactions and how these interactions are affected by the changing climate. He uses multi-sensors remotely sensed data for estimating terrestrial ecosystem carbon and water fluxes and for scaling up site measurements to the regional and global scales. He also uses land surface models to understand the terrestrial ecosystem carbon, water, and nitrogen fluxes responses to environmental change. The El Masri lab is home of trace gas analyzer and eddy covariance flux tower that can be used to measure ecosystem carbon and water fluxes. The trace gas analyzer is used to measure methane emissions from soil and woody structure of several bottomland hardwood species.

Matthew Penny

Dr. Penny is an observational astronomer with experience designing and conducting large-scale time-domain surveys for exoplanets using the gravitational microlensing and transit techniques. He is the PI of the MISHAPS survey searching for transiting hot Jupiter exoplanets in the Galactic bulge using the Blanco 4-m telescope and DECam imager. He has led efforts to simulate the performance of the Nancy Grace Roman Space Telescope’s Galactic Bulge Time Domain Survey to search for cold exoplanets using microlensing. He played a major role in the K2 Campaign 9 microlensing survey, and ground-based observing campaigns to support it using CFHT and other telescopes. He has expertise in gravitational microlensing and exoplanet transit techniques generally, time series photometry in crowded fields, and Galactic population synthesis modeling.