



**Congratulations to the NSF LEAPS-MPS 2022 Awardees  
Launching Early - Career Academic Pathways in the Mathematical and  
Physical Sciences**

The intent of the LEAPS-MPS (NSF 22-503) awards is to initiate the research careers of pre-tenure faculty in tenure-track positions, particularly those at Minority Serving Institutions, Predominantly Undergraduate Institutions, and R2 institutions, promoting the participation of scientists from all segments of the MPS scientific community, including those from underrepresented groups. LEAPS-MPS complements the NSF CAREER program by providing additional funding opportunities to increase the number of proposals to MPS from such institutions, and by providing early federal funding to help launch the academic careers of individuals who can serve as role models for the U.S. scientific workforce of the future. These awards support innovative plans for recruiting and retaining a broad representation of researchers in MPS fields, increase opportunities for all scientists including those from groups underrepresented in MPS fields, and encourage individuals to become actively and competitively engaged in research as independent investigators.

The Mathematical and Physical Sciences Directorate is pleased to recognize the 2022 LEAPS-MPS Awardees.

Sean L. Jones

Assistant Director

National Science Foundation

Directorate for Mathematical & Physical Sciences

Michelle Bushey

Staff Associate, LEAPS Coordinator



Suzanne Ahmed  
University of North Carolina Greensboro  
Award Number: 2213371 (Division of PHY)  
LEAPS-MPS: Investigation of the Mechanism of Emergence of Collective Behavior in Motile Cilia Using Model Artificial Cilia



Mahmoud M. Asmar  
Kennesaw State University Research and Service Foundation  
Award Number: 2213429 (Division of DMR)  
LEAPS-MPS Quantum vortex states and non-collinear magnetic interactions in light-driven quantum materials



Can Ataca  
University of Maryland Baltimore County  
Award Number: 2213398 (Division of DMR)  
LEAPS-MPS: Understanding and Enhancing Magnetism in Correlated Two Dimensional Materials at Chemical Accuracy



Olalekan A. Babaniyi  
Rochester Institute of Tech  
Award Number: 2213493 (Division of DMS)  
LEAPS-MPS: Direct methods for data rich inverse problems



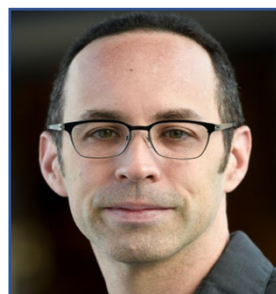
Michael W. Beck  
Eastern Illinois University  
Award Number: 2213273 (Division of CHE)  
LEAPS-MPS: Peroxisome Targeting Chemical Technologies  
and Tools to Study Subcellular Chemistry



Breanna Binder  
Cal Poly Pomona Foundation Inc.  
Award Number: 2213230 (Division of AST)  
LEAPS-MPS: Investigating Metallicity and Stellar Age Effects  
on X-ray Binary Populations



Mahua Biswas  
Board of Trustees of Illinois State University  
Award Number: 2213365 (Division of DMR)  
LEAPS-MPS: Nanopatterning Nitride Based Nanostructures  
Using Sequential Infiltration Synthesis for Optoelectronic  
Applications



Ryan D. Brown  
Clarkson University  
Award Number: 2213479 (Division of DMR)  
LEAPS-MPS: Mobility and reactivity of covalent organic  
framework precursors under physical confinement by  
exfoliated 2D materials



Konstantin Bukhryakov  
Florida International University  
Award Number: 2212944 (Division of CHE)  
LEAPS-MPS: Mechanism of Iron-Catalyzed Olefin Metathesis



David Cereceda  
Villanova University  
Award Number: 2213272 (Division of DMR)  
LEAPS-MPS: Unraveling the Surface Effects on Tungsten-Based Plasma-Facing Materials Through First-Principles Calculations



Eliana Christou  
University of North Carolina at Charlotte  
Award Number: 2213140 (Division of DMS)  
LEAPS-MPS: Functional Data Analysis for Conditional Quantiles with Applications in Medical Studies



Clyde A. Daly  
Haverford College  
Award Number: 2213339 (Division of CHE)  
LEAPS-MPS: Developing a Spectroscopic Map for Terminal Alkynes



Jessica C. De Silva  
California State University-Stanislaus  
Award Number: 2213394 (Division of DMS)  
LEAPS MPS: The Erdos-Ko-Rado Property of Well-Covered Graphs



Chetan Dhital  
Kennesaw State University Research and Service Foundation  
Award Number: 2213443 (Division of DMR)  
LEAPS-MPS: Investigation of topological spin texture and magnetoelectric coupling in non-centrosymmetric orthorhombic oxides



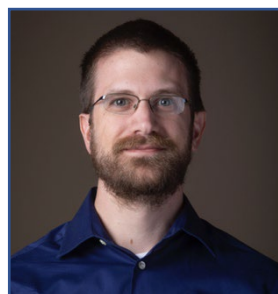
Alexander Diaz-Lopez  
Villanova University  
Award Number: 2211379 (Division of DMS)  
LEAPS-MPS: Combinatorics from an Algebraic and Geometric Lens



Michael J. Eller  
The University Corporation, Northridge  
Award Number: 2213444 (Division of CHE)  
LEAPS-MPS: Nano-Projectile Secondary Ion Mass Spectrometry for accurate molecular analysis at the nanoscale



Michael J. Ferracane  
University of Redlands  
Award Number: 2213528 (Division of CHE)  
LEAPS-MPS: Synthesis, Structural Analysis, and Characterization of Opioid Cyclic Tetrapeptides



Jacob D. Fillman  
Texas State University - San Marcos  
Award Number: 2213196 (Division of DMS)  
LEAPS-MPS: Ergodic Jacobi Matrices



Bartosz Fornal  
Barry University  
Award Number: 2213144 (Division of PHY)  
LEAPS-MPS: Searching for the Dark Side of the Universe with Gravitational Waves



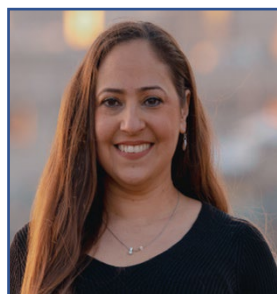
Jason A. Fry  
Eastern Kentucky University  
Award Number: 2213411 (Division of PHY)  
LEAPS-MPS: Precision Measurements of Neutron Beta Decay  
to Test Fundamental Symmetries



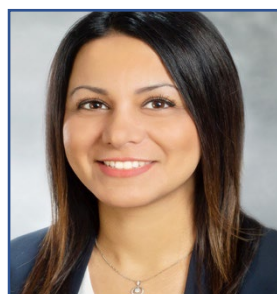
Joanna Furno  
University of South Alabama  
Award Number: 2213516 (Division of DMS)  
LEAPS-MPS: Limits in Mating and in Several Complex  
Variables



Wenyang Gao  
New Mexico Institute of Mining and Technology  
Award Number: 2213401 (Division of CHE)  
LEAPS-MPS: Taming the Radicals-Manipulating Lattice-  
Confined Metalloradicals for C-H Activation



Julianne Gripenburg  
Rutgers University Camden  
Award Number: 2213408 (Division of DMR)  
LEAPS-MPS: Rational design of macromolecular assemblies  
controlled via plasmonic activation



Shabnam Hematian  
University of North Carolina Greensboro  
Award Number: 2213341 (Division of CHE)  
LEAPS-MPS: CAS: Photoactivation of Metal-Oxo Bonds in  
Heterobinuclear Systems for Oxidative Catalysis



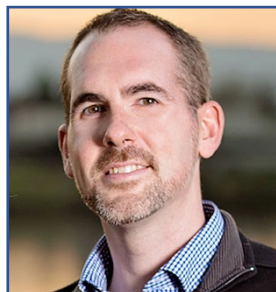
John M. Holmes  
Ohio State University  
Award Number: 224701 (Division of DMS)  
LEAPS-MPS: Analysis of Initial and Boundary Value Problems



Diana D. Hubbard  
CUNY Brooklyn College  
Award Number: 2213451 (Division of DMS)  
LEAPS-MPS: Braids and Mapping Class Groups: Investigating  
Left-orders, Twisting, and Positivity



Mark C. Hughes  
Brigham Young University  
Award Number: 2213295 (Division of DMS)  
LEAPS-MPS: Deep Learning the Knot Landscape



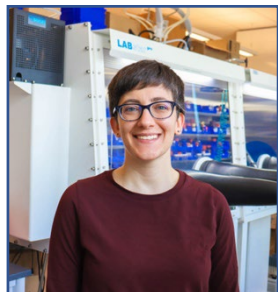
Matthew D. Johnston  
Lawrence Technological University  
Award Number: 2213390 (Division of DMS)  
LEAPS-MPS: Incorporating Stratification by Vaccination  
Status and Virus Variants in Mathematical Models of  
Infectious Disease Spread



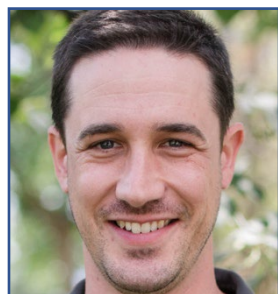
Changho Kim  
University of California - Merced  
Award Number: 2213368 (Division of CHE)  
LEAPS-MPS: Stochastic Particle-Continuum Hybrid  
Simulation Method for Model Heterogeneous Catalysts  
under Reaction Conditions



Wanlu Li  
St Peter's University  
Award Number: 2213222 (Division of DMR)  
LEAPS-MPS: Metal-Free Carbons as Efficient Antibacterial Materials



Allegra L. Liberman-Martin  
Chapman University  
Award Number: 2213507 (Division of CHE)  
LEAPS-MPS: Development of Carbodiphosphorane Catalysts for Organic and Polymer Synthesis



Adam D. Light  
Colorado College  
Award Number: 2213526 (Division of PHY)  
LEAPS-MPS: Production of Solvated Electrons by Atmospheric Pressure Plasma Jets



Yuan Liu  
Wichita State University  
Award Number: 2213436 (Division of DMS)  
LEAPS-MPS: Robust and High Order Numerical Simulation for Phase Field Modeling



Min Long  
Boise State University  
Award Number: 2213494 (Division of AST)  
LEAPS-MPS: A Systematic and Automatic Spectral Analysis of Physical Conditions of Circumgalactic Medium using Genetic Algorithms





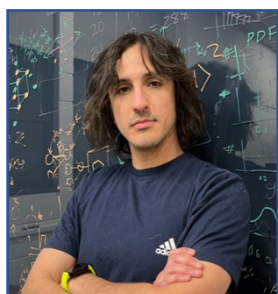
Vincent R. Martinez  
CUNY Hunter College  
Award Number: 2213363 (Division of DMS)  
LEAPS-MPS: Dynamical Parameter Estimation for  
Hydrodynamic Equations



Imran M. Mirza  
Miami University  
Award Number: 2212860 (Division of PHY)  
LEAPS-MPS: Entanglement, Transport and Collective Effects  
in Few-Photon Many-Emitter Chiral Waveguide Quantum  
Electrodynamics



Muhammad Mohebujjaman  
Texas A&M International University  
Award Number: 2213274 (Division of DMS)  
LEAPS-MPS: Fast and Efficient Novel Algorithms for MHD  
Flow Ensembles



Jorge A. Munoz  
University of Texas at El Paso  
Award Number: 2213527 (Division of DMR)  
LEAPS-MPS: Spin-lattice interaction in paramagnetic cubic  
iron at high pressure



Arundhati Nag  
Clark University  
Award Number: 2213425 (Division of CHE)  
NSF LEAPS-MPS: Macrocyclic Peptidomimetic Scaffolds for  
Sensing of Phosphate-containing Metabolites



Herve Nganguia  
Towson University  
Award Number: 2211633 (Division of DMS)  
LEAPS-MPS: Mathematical Modeling of Targeted Drug  
Delivery: Unifying Lighthill and Taylor Theories



Son C. Nguyen  
University of California - Merced  
Award Number: 2212960 (Division of CHE)  
LEAPS-MPS: Utilizing Interband Transitions in Metallic  
Nanoparticles for Photocatalysis



Ryan Norris  
New Mexico Institute of Mining and Technology  
Award Number: 2213518 (Division of AST)  
LEAPS-MPS: High Resolution Studies of Interacting Binaries



Arjun K. Pathak  
SUNY College at Buffalo  
Award Number: 2213412 (Division of DMR)  
LEAPS-MPS: Tailoring Magnetic Topological Phases in Rare-  
earth based Kagome Materials



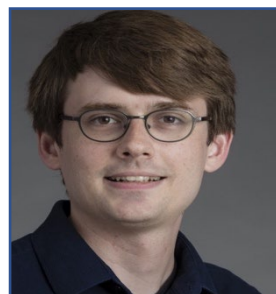
Erin B. Purcell  
Old Dominion University Research Foundation  
Award Number: 2213353 (Division of CHE)  
LEAPS-MPS: Determining the Mechanisms by Which  
Alarmone Signaling in Clostridioides Difficile Differs From  
That in other Bacteria



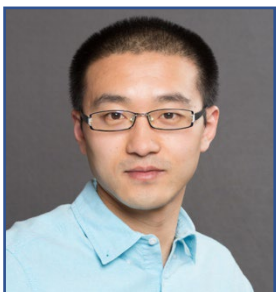
Michael J. Reddish  
Appalachian State University  
Award Number: 2213207 (Division of CHE)  
LEAPS-MPS: Determining All the Contributions of Adrenodoxin to Cytochrome P450 Catalysis



Souvik Roy  
University of Texas at Arlington  
Award Number: 2212938 (Division of DMS)  
LEAPS-MPS: Stochastic Frameworks for Control of a Class of Aberrant Signaling Pathways in Esophageal Cancer



Stanley E. Snelson  
Florida Institute of Technology  
Award Number: 2213407 (Division of DMS)  
LEAPS-MPS: Diffusive Partial Differential Equations in the Physical Sciences



Binglin Sui  
University of North Dakota Main Campus  
Award Number: 2213445 (Division of CHE)  
LEAPS-MPS: CAS:Stimuli-Responsive Biodegradable Polymeric Nanomaterials for Biomedical Applications



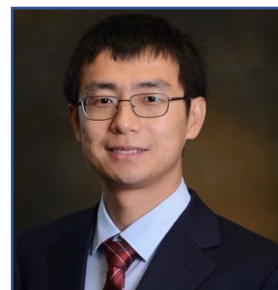
Daniel A. Thomas  
University of Rhode Island  
Award Number: 2212926 (Division of CHE)  
LEAPS-MPS: Innovative Approaches to the Structural Characterization of Biomolecular Ions by Mass Spectrometry and Infrared Action Spectroscopy



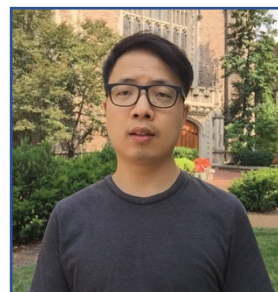
Sylvestre Twagirayezu  
Lamar University  
Award Number: 2213264 (Division of CHE)  
LEAPS-MPS: CAS: Rotational Dynamics of Perfluorinated Carboxylic Acid in the Presence of Helical Chirality



Nicholas G. Vlamis  
CUNY Queens College  
Award Number: 2212922 (Division of DMS)  
LEAPS-MPS: Topological Symmetries of Non-Compact Riemann Surfaces



Heng Wang  
Illinois Institute of Technology  
Award Number: 2213441 (Division of DMR)  
LEAPS-MPS: Solution Processed 2D Tellurene with Outstanding Thermoelectric Properties



Honglang Wang  
Indiana University  
Award Number: 2212928 (Division of DMS)  
LEAPS-MPS: Advancement of Functional Data Inference with Applications to Neuroimaging



Abraham Wolcott  
San Jose State University Foundation  
Award Number: 2213520 (Division of DMR)  
LEAPS-MPS: Electric field sensing with nitrogen vacancy centers and chemical tuning of the diamond host



Anthony E. Wong  
Rochester Institute of Tech  
Award Number: 2213432 (Division of DMS)  
LEAPS-MPS: Computational Modeling to Characterize and Attribute Uncertainty in Future Coastal Risk



Tian An Wong  
Regents of the University of Michigan - Dearborn  
Award Number: 2212924 (Division of DMS)  
LEAPS-MPS: Elliptic Dedekind Sums, Eisenstein Cocycles, and  $p$ -adic L-Functions



Weinan Xu  
University of Akron  
Award Number: 2213054 (Division of DMR)  
LEAPS-MPS: Molecular Engineering and Synergic Integration of Perovskite Nanomaterials with Thermoplastic Elastomers for Flexible Multifunctional Optical Materials



Yuan Zhang  
Old Dominion University Research Foundation  
Award Number: 2213366 (Division of DMR)  
LEAPS-MPS: Seeking Superlubricity at Single Molecule Level on Graphene Nanoribbons