

Grants Awarded 2022

Doctoral New Investigator

Starter Grants Awarded to Faculty in Ph.D.-Granting Departments

Dr. Andrew Allman, University of Michigan, Understanding Reconfiguration Dynamics in Modular Shale Gas Upgrading Facilities, \$110,000.

Dr. Madelyn R. Ball, West Virginia University, Investigation of CO₂-ODH Mechanisms Over Supported Metal Nanoparticle Catalysts, \$110,000.

Dr. Junwei Lucas Bao, Boston College, Dry Reforming of Methane on Bimetallic Alloys: Catalysts Discovery Powered by Machine Learning and Density-Functional Theory and Refined by Embedded Correlated Wavefunction Theory, \$110,000.

Dr. Brandon Barnett, University of Rochester, Shape-Selective Hydrocarbon Oxidations Using Transition Metal Complexes with Zeolite-Inspired Cavities, \$110,000.

Dr. Mona Bavarian, University of Nebraska-Lincoln, Understanding the Thermodynamics Properties and Morphology of Supported Ionic Liquids Membranes and Their Significance on Gas Separations, \$110,000.

Dr. David S. Bergsman, University of Washington, Upgrading Polymer Membranes with Vapor-phase Reactants for Organic Separations, \$110,000.

Dr. Burcu Beykal, University of Connecticut, Constrained Reinforcement Learning for Waterflooding Control Optimization in Oil Reservoirs, \$110,000.

Dr. Kyle Biegasiewicz, Arizona State University, Vanadium-Dependent Haloperoxidases for Selective Biocatalytic Halofunctionalization Reactions, \$110,000.

Dr. Connor G. Bischak, University of Utah, Nanoscale Chemical Imaging of Asphaltene Aggregation in Paraffinic Solutions, \$110,000.

Dr. James R. Bour, Wayne State University, Elucidating Defect-Porosity Relationships in Porous Aromatic Frameworks, \$110,000.

Dr. Joshua Alan Buss, University of Michigan, Polysiloxide Ancillary Ligands for the Synthesis of Electrophilic Tantalum Complexes: Applications in Alkane Upgrading, \$110,000.

Dr. Lili Cai, University of Illinois (Urbana Champaign), Understanding and Design of Metal Oxide Nanowires for Photoelectrochemical Conversion of Methane to Methanol, \$110,000.

Dr. Han-Jae Jeremy Cho, University of Nevada, Las Vegas, Classifying Surfactant-Mediated Oil Ganglion Behaviors through Nondimensionalization, \$110,000.

Dr. Yamil Colon, University of Notre Dame, Molecular Modeling of Soft Porous Coordination Polymers for Natural Gas Storage and Separations, \$110,000.

Dr. Stacy Copp, University of California (Irvine), Hierarchical Order Driven by Solution-Phase Block Copolymer Self-Assembly, \$110,000.

Dr. Sidney E. Creutz, Mississippi State University, Reactivity of Iron-Carbon Multiple Bonds in Mono- and Multi-Metallic Systems, \$110,000.

Dr. Siyuan Dai, Auburn University, Nano-Infrared Study of Asphaltenes and Oil-Solid Interactions, \$110,000.

Dr. Anindita Das, Southern Methodist University, Boron-Based, Redox-Active Ligands for Predictive Metal Cluster Catalysis, \$110,000.

Dr. Leah Dodson, University of Maryland, College Park, Matrix-Isolation Studies of Weakly-Bound Complexes, \$110,000.

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Dr. Julia Dshemuchadse, Cornell University, Coarse-Grained Growth Models for Defect-Engineered Metal–Organic Framework Structures, \$110,000.

Dr. Benjamin Ross Elling, Wesleyan University, Ring-Opening Metathesis Polymerization of Benzoldioxids for Water-Soluble and Self-Immolative Materials, \$110,000.

Dr. Timothy M. Gallagher, Kent State University, Understanding Organic Matter Linkages and Transformations across a Cretaceous Terrestrial-Marine Interface, \$110,000.

Dr. Matthew A. Gebbie, University of Wisconsin-Madison, Tuning Electrochemical Reactivity with Petroleum-Derived Carbon Clusters, \$110,000.

Dr. Ashutosh Giri, University of Rhode Island, Thermal Transport in Covalent Organic Frameworks: Experiments and Simulations on the Fundamental Role of Gas Adsorbates, with Applications to Natural Gas Storage, \$110,000.

Dr. Huiyuan Guo, State University of New York (Binghamton), Imaging of pH in Individual Water-in-Oil Emulsion Droplets, \$110,000.

Dr. Peijun Guo, Yale University, Impact of Host-Guest Interactions on Thermal Transport in Metal-Organic Frameworks: A Time-Resolved Spectroscopic Study, \$110,000.

Dr. Ankur Gupta, University of Colorado at Boulder, Nonequilibrium Analysis of Active Droplets Driven by Micellar Solubilization: Effect of In-Situ Change in Droplet Shape and Inter-Droplet Interactions, \$110,000.

Dr. James W. Harris, University of Alabama, Kinetic and Spectroscopic Characterization of the Dynamic Compositions and Reactivities of Metal Surfaces During Oxidation Catalysis, \$110,000.

Dr. Jennifer S. Hirschi, State University of New York (Binghamton), A Combined Experimental and Computational Mechanistic Analysis of Electrophotocatalysis, \$110,000.

Dr. Huiwen Ji, University of Utah, Characterizing the Channel Structure in Zeolites with Extensive Stacking Disorder Using X-ray Diffuse Scattering, \$110,000.

Dr. Kailong Jin, Arizona State University, Manufacturing Large-Scale and High-Performance 2D Covalent Organic Framework (COF) Membranes for Produced Water Treatment, \$110,000.

Dr. Serveh Kamrava, Colorado School of Mines, Data-Driven Prediction of Dynamic Displacements in Porous Media using Physics-Assisted Deep Learning: Experimental and Computational Modeling, \$110,000.

Dr. Laure Valerie Kayser, University of Delaware, C–H Functionalization of Aromatic Polymers by Thianthrenation, \$110,000.

Dr. Brian M. Kelley, Pennsylvania State University, Climatic Controls on the Origin of Cyclothem in the Upper Pennsylvanian and Lower Permian of the U.S. Midcontinent, \$110,000.

Dr. Siddarth Hari Krishna, University of Wisconsin-Madison, Zeolite Structural Effects on Dynamic Multi-site Interactions in Selective Heterogeneous Olefin Oxidation Catalysis, \$110,000.

Dr. Jonathan Kuo, Pennsylvania State University, Biologically Inspired Ligands for Aerobic Oxidation, \$110,000.

Dr. Jessica R. Lamb, University of Minnesota, Controlled Group Transfer Polymerization via Tunable N-Heterocyclic Carbene-Carbodiimide Adducts, \$110,000.

Dr. Kate Leary, New Mexico Institute Of Mining And Technology, Paleohydrologic Analysis and Quantitative Sedimentology of the Paleo-Rio Grande System during Transition from Aggradation to Incision, \$110,000.

Dr. Xiao Li, University of North Texas, Porous Liquid Crystal Elastomers for Dynamic Oil/Water Separation, \$110,000.

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Dr. Ajay B. Limaye, University of Virginia, Harnessing Earth Observations to Advance Predictions of Fluvio-Deltaic Stratigraphy, \$110,000.

Dr. Zhou Lin, University of Massachusetts Amherst, Nuclear Quantum Effects in Photocatalytic Direct Methane Oxidation Driven by Proton-Coupled Electron Transfers, \$110,000.

Dr. Brian M. Lindley, Baylor University, Development of Diboryl Chelates for Borylation Reactions Using Base Metals, \$110,000.

Dr. Fang Liu, Emory University, Quantum Chemistry Investigation of the Structure-Fluorescence Relationship for Asphaltene Aggregates, \$110,000.

Dr. Yayuan Liu, Johns Hopkins University, Electrochemically Mediated Carbon Dioxide Separation Based on Nitrogen Redox Centers for Petroleum Refining, \$110,000.

Dr. Xin Lu, Tulane University, Raman Spectroscopy Study of the MoS₂/MXene Hydrodesulfurization Catalyst, \$110,000.

Dr. Qiong Ma, Boston College, Fundamental Investigation of the Photocarrier Lifetime in Moiré Semiconductors for Photocatalysis, \$110,000.

Dr. Matthew Malkowski, University of Texas at Austin, Paleogeographic Influence on Organic Carbon Burial: An Example from the Early Cretaceous South Atlantic Gateway, \$110,000.

Dr. Christine N. Morrison, Colorado School of Mines, First-in-Class [Fe₄S₄] Porous Frameworks: New Biomimetic Materials for Understanding and Optimizing C₁ Substrate Reduction into Fuels by [Fe₄S₄] Clusters, \$110,000.

Dr. Patricia Zhang Musacchio, Worcester Polytechnic Institute, Direct Installation of Ketone and Cyano Functional Groups for the Rapid Upgrading of Hydrocarbons and Feedstock Chemicals, \$110,000.

Dr. Gabe Nagy, University of Utah, Unraveling How Changes in the Natural Isotopic Envelope Affect Mass Distribution-based Shifts in the Gas-phase Ion Mobility Separations of Quinoline Derivatives, \$110,000.

Dr. Christopher G. Newton, University of Georgia, A Quadruple Diels–Alder Strategy for the Synthesis of Complex Biaryls, \$110,000.

Dr. Hee Jeung Oh, Pennsylvania State University, Molecular Recognition by Biomimetic Coordination Polymers, \$110,000.

Dr. Amir Pahlavan, Yale University, Solutal Migration of Emulsions in Disordered Media, \$110,000.

Dr. Marvin Parasram, New York University, Denitrogenative Dialkylation of Alkenes via Boro-Tethered Diazenes for the Sustainable Synthesis of Petroleum Commodities, \$110,000.

Dr. Jihye Park, University of Colorado at Boulder, Understanding Roles of d-p Conjugation in Metal-Organic Frameworks as Tools to Study Selectivity in Photocatalysis, \$110,000.

Dr. Daniel I. Pineda, University of Texas at San Antonio, Reaction Pathway Studies of Hypergolic-Hydrocarbon Fuel Blends in Detonation Environments via Laser Absorption Spectroscopy, \$110,000.

Dr. Ryan Poling-Skutvik, University of Rhode Island, Isolating the Yield Stress in Tunable Thixotropic Emulsions, \$110,000.

Dr. Raphael Florentino Ribeiro, Emory University, Theory of Blackbody Infrared Radiative Dissociation in Microcavities, \$110,000.

Dr. Nathan Romero, University of California (San Diego), Frustrated Lewis Pair Polymers, \$110,000. (Declined by PI)

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- Dr. Marcel Roland Schreier**, University of Wisconsin-Madison, Ambient electrocatalytic cracking of alkanes: Fundamental science pathways to address kinetic bottlenecks in thermal processes, \$110,000.
- Dr. Keith Searles**, University of Florida, Nitride Supported Single-Sites Designed for Hydrocarbon Conversions, \$110,000.
- Dr. Charles M. Shobe**, West Virginia University, Quantifying Physical versus Chemical Erosional Fluxes from a Lithologically Complex Source Area, \$110,000.
- Dr. Ioannis Spanopoulos**, University of South Florida, Elucidation of Gas-Framework Interactions of Light Hydrocarbons on Hierarchical Porous Graphene Oxide, \$110,000.
- Dr. Erin Stache**, Cornell University, Controlled Radical Polymerization of Strained Monomers, \$110,000.
- Dr. Xiangcheng Sun**, Rochester Institute of Technology, Single-Molecule Catalysis on Heck Reactions at Palladium Particles, \$110,000.
- Dr. Brian Tackett**, Purdue University, Kinetic Investigation and Catalyst Design for Aqueous Electrochemical Propane Dehydrogenation, \$110,000.
- Dr. Sho C. Takatori**, University of California, Santa Barbara, Dispersion Dynamics of Polymeric Surfactant-Stabilized Oil Emulsions, \$110,000.
- Dr. Lidya Tarhan**, Yale University, Sedimentary and Marine Biogeochemical Controls on Sandstone Authigenesis, \$110,000.
- Dr. Aaron Teator**, University of Kansas, Post-Polymerization Diversification of Polyacrylamides Using Amide Activation, \$110,000.
- Dr. Daniel A. Thomas**, University of Rhode Island, Unraveling the Structural Motifs of Deep Eutectic Solvents by Infrared Action Spectroscopy of Ionic Clusters, \$110,000.
- Dr. Rui Wang**, University of California (Berkeley), Interfacial Structures and Properties of Ionic Polymeric Surfactants, \$110,000.
- Dr. Shuya Wei**, University of New Mexico, Nanostructured Anodic Metal Oxides for Selective Electrocatalytic Conversion of Methane, \$110,000.
- Dr. Anna Wuttig**, University of Chicago, Localizing Co-Catalysts at Electroactive Surface Sites for Catalytic CO₂ Upgrading, \$110,000.
- Dr. Judy Yang**, University of Minnesota, Pore Scale Investigation of the Impacts of Swelling Clay on Oil-Brine Transport in Porous Media, \$110,000.
- Dr. Ming Yang**, Clemson University, Developing Optimal Structures of Supported Metal Atoms on Transition Metal Carbides for Selective CO₂ Reduction through Mild Thermocatalysis, \$110,000.
- Dr. Yang Yang**, University of California, Santa Barbara, Biomimetic C–H Functionalization of Unsaturated Petrochemicals, \$110,000.
- Dr. Christopher Zahasky**, University of Wisconsin-Madison, Experimental Quantification of Clay Particle Transport, Attachment, and Detachment Distributions During Transitions to Low Salinity Waterflooding and Alkaline waterflooding in reservoir formations., \$110,000.
- Dr. Xinyuan Zheng**, University of Minnesota, Towards Better Use of Sedimentary Mercury (Hg) in Elucidating Environmental Drivers of Black-Shale Deposition during Mesozoic Oceanic Anoxic Events: A Hg Isotope Perspective, \$110,000.



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Dr. Aleksandr V. Zhukhovitskiy, University of North Carolina at Chapel Hill, Carbodiimide Ring-Opening Metathesis Polymerization, \$110,000.

Grants Awarded 2022

New Directions

Awards for Fundamental Research

- Dr. Fred Andrus**, University of Alabama, Coralline Algae Growth at the Flower Garden Banks, Gulf of Mexico, \$110,000.
- Dr. Ivan Aprahamian**, Dartmouth College, Using Photoreversible Strain in Controlling Reactivity, \$110,000.
- Dr. Hank S. Ashbaugh**, Tulane University, Treatment of Water Produced from Oil and Gas Extraction using MXene-Based Membranes, \$110,000.
- Dr. Janok P. Bhattacharya**, McMaster University, Measuring and Modeling Sedimentation Rates, Bioturbation and Preservation Potential of Event Beds in Modern Shelf Margin Systems, \$110,000.
- Dr. Vladimir B. Birman**, Washington University in St. Louis, Self-Complementary Urea-Based Arrays, \$110,000.
- Dr. Irmgard Bischofberger**, Massachusetts Institute of Technology, Fractures and Bubbles in Dense Suspensions, \$110,000.
- Dr. Amitava Choudhury**, Missouri University of Science and Technology, Developing sustainable catalyst for propane dehydrogenation: A fundamental case study on iron substituted zeolitic frameworks, \$110,000.
- Dr. Seth M. Cohen**, University of California (San Diego), Imbedding Structurally Dynamic Metal Sites into Commodity Polymers, \$110,000.
- Dr. Carlos E. Crespo-Hernandez**, Case Western Reserve University, Photochemical Relaxation Pathways in Polycyclic Aromatic Sulfur Heterocycle Pollutants, \$110,000.
- Dr. Yongming Deng**, Indiana University-Purdue University Indianapolis, Selective Functionalization of Unactivated C(sp³)-H Bonds with Pyridine N-oxide Based Photoinduced HAT Catalysts, \$110,000.
- Dr. Theodore S. Dibble**, SUNY College of Environmental Science and Forestry, Intermolecular Hydrogen-Bonding in Bimolecular Reactions, \$110,000.
- Dr. Birol Dindoruk**, University of Houston, High Pressure and High Temperature Experimental Investigation of Complex Bulk Phase Properties in Water-Oil-Surfactant-Polymer Systems, \$110,000.
- Dr. Hamid Emami-Meybodi**, Pennsylvania State University, Capillary Trapping Controlled by Geochemical Reactions in Porous Media, \$110,000.
- Dr. Behzad Ghanbarian**, Kansas State University, Molecular Mechanisms of Mass Transport in Shales, \$110,000.
- Dr. Scott M. Grayson**, Tulane University, Dithiol-yne Polymers: Linear-Dendritic Alternating and Hyperbranched Copolymers., \$110,000.
- Dr. Shoji (Anthony) Hall**, Johns Hopkins University, Electrochemical C-H Bond Conversion at Room Temperature & Atmospheric Pressure, \$110,000.
- Dr. Mark A. Hayes**, Arizona State University, Fundamental Examination of Organic Deposition on Micron Sized Minerals, \$110,000.
- Dr. Adam Holewinski**, University of Colorado at Boulder, Controlling hydrogenation selectivity for petrochemicals with well-defined active sites, \$110,000.
- Dr. Jessica Hoover**, West Virginia University Foundation, Difunctionalized Arenes and Alkenes from Ni-Catalyzed Deoxygenative Ring-Opening Reactions of Anhydrides, \$110,000.
- Dr. Todd Hudnall**, Texas State University-San Marcos, Enhancing Catalytic Activity at P-Block Element Centers Through Coordination to Electrophilic Carbene Ligands, \$110,000.
- Dr. Vanessa Huxter**, University of Arizona, Linking Structure to Function in Photoredox Catalysis through a Panoramic Spectroscopic Measurement, \$110,000.

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New Directions

Awards for Fundamental Research

Dr. Prashant K. Jain, University of Illinois (Urbana Champaign), Mechanistic Elucidation of C-H Activating Carboxylation on Heterogeneous Catalysts, \$110,000.

Dr. Benjamin Janesko, Texas Christian University, Structural Petroleomics: Connecting Tandem Mass Spectra to Asphaltene Chemical Structure Using Quantum Chemical Simulations, \$110,000.

Dr. Birendra Jha, University of Southern California, Permeability Evolution during Enhanced Oil Recovery: Role of Subcritical Crack Growth, \$110,000.

Dr. Li Jia, University of Akron, Alternating Copolymers of Dienes and Olefins – Searching for Natural Rubber-like Strain-Induced Crystallization, \$110,000.

Dr. Timothy C. Johnstone, University of California (Santa Cruz), Novel Reactivity from Unprecedented Heavy-Element Pnictine Oxides and Pnictinidene Oxides, \$110,000.

Dr. Matthew R. Jones, Rice University, Metal Nanocluster Catalysts with Chemically-Accessible Surfaces, \$110,000.

Dr. Siris O. Laursen, University of Tennessee, Non-Metallic Electronic Structure for Enhanced Sigma Bonding of Adsorbates to achieve Heterogeneously Catalyzed Hydroformylation, \$110,000.

Dr. Daesung Lee, University of Illinois at Chicago, Tandem Conjugate Additions Controlled by a Hydrogen Bonding Element, \$110,000.

Dr. Matthew R. Libera, Stevens Institute of Technology, Measuring Counterion Concentrations in Polyelectrolyte Microgels, \$110,000.

Dr. Jerry Y.S. Lin, Arizona State University, Hydrocarbon Diffusion in Microporous COF Membranes, \$110,000.

Dr. Hao Liu, State University of New York (Binghamton), Understanding the Structural and Electronic Effects on Heterogeneous Catalysis of Aerobic Oxidative Desulfurization, \$110,000.

Dr. Jun Liu, North Carolina State University, Understanding Wettability and Slipperiness of Solid Surfaces Grafted with Polymer Brushes using Molecular Dynamics Simulations, \$110,000.

Dr. Kelly H. Liu, Missouri University of Science and Technology, A Numerical Modeling Study of the Thermal Evolution of Young Continental Rifts, \$110,000.

Dr. Robert E. Maleczka Jr., Michigan State University, Understanding Reagent Controlled Diboron-Mediated Reductive Couplings, \$110,000.

Dr. Susan C. Mantell, University of Minnesota, Fundamental studies of the combined effects of stress and oxidation on the structure and properties of PE with varying SCB content, \$110,000.

Dr. Caleb D. Martin, Baylor University, Carborane Substituted Neutral Boron Lewis Acids: Synthesis, Properties, and Application to Catalysis, \$110,000.

Dr. Steven Naleway, University of Utah, Biotemplating of Plant Tissues with Tailored Hydrophilicity for the Next Generation of Petroleum Filters, \$110,000.

Dr. Nashaat N. Nassar, University of Calgary, Towards Understanding the Mechanisms Underlying Polymer-Grafted Nanoparticles Coupled with Low Salinity Water for Enhanced Oil Recovery Applications, \$110,000.

Dr. Bahareh Nojabaei, Virginia Polytechnic Institute and State University, Fundamental Studies of the Oil/Brine/Surfactant Microemulsion Phase Viscosity and Percolation Threshold Using Molecular Dynamics Simulation, \$110,000.

Dr. Aaron L. Odom, Michigan State University, Earth-abundant catalysis for asymmetric reductive amination with CO as reductant, \$110,000.

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New Directions

Awards for Fundamental Research

- Dr. Davide Oppo**, University of Louisiana at Lafayette, Advanced Time-Lapse Seismic Characterization of a Methane Hydrate-Bearing System, \$110,000.
- Dr. Shanlin Pan**, University of Alabama, Electrochemical Atomic Layer Deposition of Layered Transition Metal Dichalcogenides for Electrochemical Desulfurization of Petroleum, \$110,000.
- Dr. Demyan E. Prokopchuk**, Rutgers, The State University of New Jersey, Using Adamantyl Ligands as Metal-Mediated C-H Activation Models, \$110,000.
- Dr. Xiaofeng Qian**, Texas A&M University, Exploring Topological Hydrotreating Catalysis with First-Principles Nonlinear Optical Spectroscopy, \$110,000.
- Dr. Regina Ragan**, University of California (Irvine), Illuminating Physical Mechanisms of Catalysis on Molecular Length Scales using Transmission Electron Microscopy, \$110,000.
- Dr. Omri Ram**, Technion-Israel Institute of Technology, The Flow Fields, Energy Losses, and Sedimentation in a Flow That is Laden with Solid Particles, \$110,000.
- Dr. Amir Riaz**, University of Maryland, College Park, Modeling of Interphase Coupling for Transient Multiphase Flow in Porous Media, \$110,000.
- Dr. Marina Ruths**, University of Massachusetts Lowell, Alignment and Assembly Mechanisms on Anisotropic Polymer Substrates, \$110,000.
- Dr. Adrienn Ruzsinszky**, Temple University, Ab initio Exploration of Exciton Dynamics for Environment-Friendly Photocatalysis and Carbon Dioxide Reduction, \$110,000.
- Dr. Justin B. Sambur**, Colorado State University, Fundamental Single Particle-level Studies of Chiral Inorganic Nanotubes: Toward Asymmetric Heterogeneous Photocatalysis, \$110,000.
- Dr. Joel Saylor**, University of British Columbia, Revolutionizing Field-based Quantitative Elemental Analysis with LIBS, \$110,000.
- Dr. Jennifer L. Schaefer**, University of Notre Dame, Porous Polymer Networks Fabricated by Molecular Layer-by-Layer, \$110,000.
- Dr. Sergey Semenov**, Weizmann Institute of Science, Electrochemical Transformations of Metallolactones and Related Compounds Obtained from Olefins and Carbon Dioxide, \$110,000.
- Dr. Matthew Sfeir**, City University of New York, Advanced Science Research Center, Semiconductor Metasurfaces with Photocatalytic Activity, \$110,000.
- Dr. Ken Shimizu**, University of South Carolina, Hydrogen Bonding Protecting Groups, \$110,000.
- Dr. Tatyana I. Smirnova**, North Carolina State University, Characterization of Free Radical Intermediates Generated by Nanoparticle Additives to Oil-Based Lubricants, \$110,000.
- Dr. Alexander Sokolov**, Ohio State University, Elucidating Spectroscopic Properties of Heterogeneous Transition Metal Oxide Catalysts with Accurate Electronic Structure Theory, \$110,000.
- Dr. Touradj Solouki**, Baylor University, Functional Group Mapping of Crude Oil via Mass Spectrometry and NMR: Novel Approaches to Maximize Data Interpretation for Chemical Interactions in Complex Mixtures, \$110,000.
- Dr. Paul J. Sylvester**, Texas Tech University, Age, Temperature and Carbonate Source of Bedding Parallel Fibrous Calcite Veins in Mudstones: A New Tool for Reconstructing Petroleum Source/Reservoir History, \$110,000.
- Dr. Mario F. Trujillo**, University of Wisconsin-Madison, Consistent RANS Modeling of Oil-Water Flows, \$110,000.

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New Directions

Awards for Fundamental Research

Dr. Gilbert C. Walker, University of Toronto, Directed Collisions Lead to Selective Reaction of Hydrocarbons at Surfaces, \$110,000.

Dr. Qiang Wang, Colorado State University, Exploring Frank-Kasper Phases in Model Block Copolymers with GPU-Accelerated Polymer Density-Functional Calculations in a Unified Framework, \$110,000.

Dr. Qing Wang, Pennsylvania State University, Search of Colossal Elastocaloric Effect in Ionic Elastomers for Solid-State Cooling, \$110,000.

Dr. James E. Whitten, University of Massachusetts Lowell, Effects of Strain on the Adsorptive and Electronic Properties of Metal Oxide Surfaces with Applications for Hydrodesulfurization and Hydrodenitrogenation of Petroleum Feedstock, \$110,000.

Dr. Yang Yang, University of Central Florida, Local Electrochemical Environment Effects on C–H Bond Activation of Methane under Ambient Conditions, \$110,000.

Dr. Yulia V. Zaikina, Iowa State University, Inducing Oxygen Vacancies in Perovskites via Synthesis – Oxygen Storage Materials for Methane Conversion, \$110,000.

Grants Awarded 2022

Undergraduate New Investigator

Starter Grants Awarded to Faculty in Non-Ph.D.-Granting Departments

Dr. Anna C. Brezny, Saint Olaf College, Development of Aerobic Oxygen Atom Transfer Reactions for Oxidation of Simple Alkenes, \$55,000.

Dr. Haoyuan Chen, University of Texas Rio Grande Valley, Quantifying the Strength of Brønsted Acid/Base Functional Groups in Metal-Organic Framework Catalysts, \$55,000.

Dr. Shuming Chen, Oberlin College, Probing Complex Post-Transition State Bifurcations in Reactions Between Boroles and Unsaturated Hydrocarbons, \$55,000.

Dr. Wan-Yi Chu, Saint Mary's College of California, Metal carboxylic complexes: synthesis and reactivities related to the catalytic reverse water gas shift reaction, \$55,000.

Dr. William M. Gilliland Jr., Furman University, Real-Time Monitoring of Polymerization Reactions via Microdroplet Mass Spectrometry, \$55,000.

Dr. Leslie Sachiyo Hamachi, California Polytechnic State University, Mechanistic Studies on Colloidal COF-300 Nucleation and Growth, \$55,000.

Dr. Patrick Hillesheim, Ave Maria University, Development of Empirical Structural Principles for Task-Specific Ionic Liquids with Discrete Aromatic Domains: A Combined Crystallographic and Surface Analysis Study, \$55,000.

Dr. Feier Hou, Western Oregon University, Inorganic-Organic Hybrid Materials: Compositions, Structures, and Catalytic Properties for Benzene Oxidation, \$55,000.

Dr. Walter Malone, Tuskegee University, Using Machine Learning to Predict Novel Catalysts for the Hydrodesulfurization of Petrochemical Fuels, \$55,000.

Dr. Vinicius Maron Sauer, California State University, Northridge, Effects of Ammonia and Hydrogen Addition on Sooting and Combustion Characteristics of Laminar Premixed Flames at Elevated Pressures, \$55,000.

Dr. Marsha D. Massey, University of Central Arkansas, Improving CO₂ Reduction Electrocatalysis by Manganese Carbonyl Halide Complexes using a Picoline-based NHC Ligand, \$55,000.

Dr. Catherine Mauck, Kenyon College, Mapping Effects of Perylene Core-Core Interactions on Vibrational Spectra in Thin Films of a Prototypical Polycyclic Aromatic Molecule, \$55,000.

Dr. Helen Minsky, Carleton College, Investigating flaw tolerance in adhesive elastomers, \$55,000.

Dr. Leslie Nickerson, Idaho State University, Zeolite-Catalyzed Friedel-Crafts Acylations, \$55,000.

Dr. Thomas Osberger, California State Polytechnic University, Pomona, Synthetic Methods for the Synthesis of Polyfunctionalized Cyclobutane-Containing Small Molecules and Spirocycles, \$55,000.

Dr. Steven Pellizzeri, Eastern Illinois University, Non-Oxidative Methane Coupling with Subnanometer Catalysts: Assessment of the Effects of Subnanometer Catalyst Configuration, \$55,000.

Dr. Prashanth K. Poddutoori, University of Minnesota Duluth, Structural Stabilization of Oxidative Catalytic Centers Using Main-Group Porphyrins, \$55,000.

Dr. Rebecca J. Rapf, Trinity University, Photochemically-Driven Interfacial Reactivity of Petroleum-Derived Organics and Surfactant Films, \$55,000.

Dr. Christopher Shugrue, University of Richmond, Development of Mild and Rapid Cycloadditions of Electron-Rich Oxazoles, \$55,000.

Dr. Hao Sun, University of New Haven, Transformation of Non-Depolymerizable Poly(oxanorbornene)s to Depolymerizable Polyolefins via Ring-Opening of Backbone Cyclic Ethers, \$55,000.

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Undergraduate New Investigator

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Dr. Xindi Sun, Slippery Rock University of Pennsylvania, Transportation and Crosslinking Performance of Nanosilica Gel for in-depth delivery for enhanced oil recovery, \$55,000.

Dr. Rebecca Thompson, St. Edward's University, Disorder and Aggregation in Alkane Mixtures: Characterizing the Impact of Embedded Surfactants and Adsorbed Asphaltene Mimics, \$55,000.

Dr. Christian Wallen, Appalachian State University, Coordination of Molecular Hydrogen Sulfide to Abundant Transition Metals Facilitated by Intramolecular Hydrogen-bonding, \$55,000.

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Undergraduate Research

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- Dr. Ehsan Atefi**, Manhattan College, Data Driven Drop Shape Analysis for Interfacial Tension Measurement, \$70,000.
- Dr. Timothy J. Barker**, College of Charleston, Pd Catalyzed Coupling of Alkylbisboronic Esters, \$70,000.
- Dr. Abdelaziz Boulesbaa**, California State University, Northridge, Ultrafast Dynamics of the Formation of Organic Radicals at Organometallic Interfaces, \$70,000.
- Dr. Christopher J. A. Daley**, University of San Diego, Synthesis of Chiral Metal Complexes as Catalysts for Stereocontrolled Polymerizations, \$70,000.
- Dr. Hongshan He**, Eastern Illinois University, Photoactive Nickel Complexes for Catalytic C-N Coupling, \$70,000.
- Dr. Shawn Raynard Hitchcock**, Illinois State University, A Curtius Rearrangement Driven Dehomologation from Carboxylic Acids Bearing Alpha-Leaving Groups to Aldehydes and Ketones, \$70,000.
- Dr. Nathanael M. Kidwell**, College of William and Mary, Intermolecular Interactions Drive Chemical Outcomes: Controlling Chemical Pathways with Quantum State Preparation, \$70,000.
- Dr. Mingheng Li**, California State Polytechnic University, Pomona, Plastic Depolymerization on Ni/W/ZSM-5 Catalyst, \$70,000.
- Dr. Andrew S. Paluch**, Miami University, A Molecular Understanding of Azeotrope Formation and Breaking, \$70,000.
- Dr. Santimukul Santra**, Pittsburg State University, Synthesis of Petroleum-based New Dendritic Macromolecules for Designing Reusable Copper Catalysts to Promote Fundamental Chemical Transformations, \$70,000.
- Dr. Monica C. So**, California State University, Chico, Tunable Porous Membranes for Separation of Petroleum-Relevant Products, \$70,000.
- Dr. Marie F. Thomas**, Fordham University, Computational and Synthetic Approaches to the Development of Amphiphilic Supramolecular Ionic Liquid Based Gels for Extraction of Nitrogen and Sulfur compounds, \$70,000.
- Dr. Guoqi Zhang**, John Jay College of Criminal Justice, Development of Alkali Metal Catalysts for Reduction of Olefins and Carbonyl Derivatives, \$70,000.
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