

Materials Research Laboratory

University of California Santa Barbara

Materials Research Outreach Program 2022 (Virtual)

Wednesday January 26th and Thursday January 27th 2022

Program and Speaker Bios



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NSF Materials Research Science and Engineering Center [DMR 1720256]

Program: Wednesday January 26th

8:45 am	Opening remarks by Dean Tresa Pollock	
Session Chair: Raphaële Clément		
9:00 am	Sriram Krishnamoorthy	Gallium Oxide Materials and Devices Towards Efficient Power Electronics
9:30 am	Nina Miolane	Shape Learning: From Images to Scientific Insights
10:00 am	Break	
10:30 am	Yangying Zhu	Microscale Thermal-Fluids Engineering for Energy Applications
11:00 am	Emily Foley	Towards More Sustainable Battery Chemistries — Na-Fe-F Cathodes
11:30 am	Tom Hunt (Sila Nanotechnologies)	Materials for the Electric Vehicle Revolution
12:00 pm	Break	
Session Chair: Angela Pitenis		
1:30 pm	Jessica Santana	Entrepreneurial Failure, Resilience, and Agility
2:00 pm	Omar Saleh	A Functional DNA Liquid
2:30 pm	Break	
3:00 pm	Ted Deisenroth (BASF)	Microfluidics and Screening — Two Successful Academic Collaborations at BASF
3:30 pm	Day 1 closing remarks	

Day 1: <https://ucsb.zoom.us/j/83371173917>

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Program: Thursday January 27th

Session Chair: Yang Yang		
9:30 am	Hunter Martin (HRL)	Investigating Microstructure and Precipitate Evolution in Additively Manufactured Aluminum Alloys
10:00 am	Break	
10:30 am	Sally Jiao	Automated Design of Chemically Functionalized Nanopores to Control Solute Transport and Selectivity
11:00 am	Vijay Mhetar (Kraton)	Block Copolymers: Unlocking Opportunities to Create A Sustainable Future
11:30 am	Joe Patterson (UC Irvine)	A Close Look at Molecular Self-assembly with the Transmission Electron Microscope
12:00 pm	Break	
Session Chair: John Harter		
1:30 pm	Ron Zuckermann (LBNL)	Mimicry of Protein Structure with Bio-inspired Peptoid Polymers
2:00 pm	Allison Abdilla	Polymer Stereocomplexation as a Scalable Platform for Nanoparticle Assembly
2:30 pm	Doug Grzetic	Electrostatic Manipulation of Mesoscale Structure in Charged Polymer Blends
3:00 pm	Break	
3:30 pm	Efrain Rodriguez (U. Maryland)	Breaking Symmetry to Induce Novel Properties in Inorganic Materials
4:00 pm	Justin Mayer	Magnetism, Mechanics, and Mixing in Heusler Compounds
4:30 pm	Katharine Page (U. Tennessee)	Tuning Chemical Short-Range Order in High-Entropy Oxide Perovskite and Spinel Lattices
5:00 pm	Day 2 closing remarks	

Day 2: <https://ucsb.zoom.us/j/89634472926>

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Allison Abdilla was born and raised in Hamilton, Canada. She attended McMaster University and earned a B.S. in Chemistry with summa cum laude honors in June 2017. During her undergraduate studies, Allison worked with Professor Harald Stöver to synthesize stimuli responsive polymers for applications in cell encapsulation. She then joined Professor Craig Hawker's group in 2015 and 2016 for two internships. In her time in the Hawker group, Allison worked under the mentorship Dr. Jimmy Lawrence and Dr. Jing Ming Ren and helped develop strategies to obtain discrete oligomers and tacticity controlled functional polymers. Afterwards, she moved to Tsukuba, Japan to work at the National Institute of Materials Science with Professor Mitsuhiro Ebara to create new materials for hemodialysis. In Fall 2017, Allison returned to UCSB to conduct her graduate studies in chemistry under the co-supervision of Professor Craig Hawker and Professor Javier Read de Alaniz.

Email: aabdilla@chem.ucsb.edu



Ted Deisenroth is a Senior Technical Manager / Research Fellow within BASF's global Formulation Research Platform part of Advanced Materials and Systems Research. He received Ph.D. from Villanova University in Organic Synthesis and was a Post Doctoral Associate at Brown University working on Natural Product Synthesis. Ted has 33 years of industrial experience working in research, development, and production. During his career he has been responsible for over 20 new products. Currently he is leading a formulation research group engaged in a portfolio of projects related to material science and bioscience. This group provides a fundamental understanding of formulations, identifies new opportunities and solutions, and applies new formulation concepts to existing and new products at BASF.

Email: ted.deisenroth@basf.com

Emily E. Foley is a PhD candidate and NSF Graduate Research Fellow in the Materials Department at UC Santa Barbara in the Professor Raphaële Clément Group. She received her B.S. in Materials Science & Engineering from the University of Illinois Urbana-Champaign in 2018, conducting research with Professor Paul Braun on novel battery cathode preparation techniques. Her current research focuses on understanding the electrochemical performance of various Na-ion battery cathodes. She combines electrochemistry, synchrotron techniques, nuclear magnetic resonance, magnetometry, and density functional theory to understand the underlying electrochemical mechanisms in battery materials.

Email: eefoley@mrl.ucsb.edu



Douglas Grzetic received his B.Sc. Honours in Physics from Memorial University of Newfoundland, and his Ph.D. in Physics from the University of Guelph under the guidance of Robert A. Wickham. He is currently a Postdoctoral Researcher with Glenn H. Fredrickson at the University of California, Santa Barbara, where he is studying the structural and dielectric properties of polymer electrolytes and polymerized ionic liquids.

Email: dgrzetic@mrl.ucsb.edu

Tom Hunt is the VP of the Technology Pipeline at Sila Nanotechnologies, developing materials that enable the transition to clean energy. Sila's first product is a silicon anode material that delivers significant improvements in lithium ion battery energy density. Previously, Tom ran a project portfolio at X and Google that included biotechnology, internet access, and technologies for reducing climate change. Before Google, Tom spent a decade working and consulting for startups in energy, biotechnology, and chemistry. He founded a printed solar panel company in 2008. His academic work includes the Miller Fellowship at UC Berkeley, a PhD in Physics from Harvard, and a BS in physics from Stanford. Tom is a named inventor on over a dozen patents and author of ten academic publications. He is happiest while riding his bike.

Email: tom@silanano.com



Sally Jiao is a fourth-year PhD candidate in Chemical Engineering at UCSB and is advised by Prof. M. Scott Shell. She investigates the effect of chemical patterning of extended and molecular surfaces on the behavior of hydration water and solutes. Before coming to UCSB, Sally received a B.S.E. in Chemical and Biological Engineering from Princeton University, where she worked with Prof. Athanassios Panagiotopoulos on the prediction of surfactant critical micelle concentrations.

Email: sjiao@ucsb.edu

Sriram Krishnamoorthy is a Mehrabian Career Development Chair Assistant professor in the Materials Department at UC Santa Barbara where his group works at the intersection of materials, electrical engineering, and physics to study and engineer next-generation (ultra)wide band gap semiconductors such as Gallium Oxide. His group is interested in epitaxial growth, electronic transport, design/modeling, micro/nano fabrication, and characterization of electronic/optoelectronic devices for a wide range of applications such as power electronics, high frequency electronics and ultra-violet optoelectronics. Sriram received his Ph.D. in Electrical Engineering from The Ohio State University, and previously was an Assistant Professor at the University of Utah.

Email: sriramkrishnamoorthy@ucsb.edu



Justin Mayer is a third year graduate student advised by Professor Ram Seshadri. My research examines the relationships between atomic order, microstructure, and magnetism. I am particularly interested in the design of magnetic materials that can substantially improve the efficiency of electric power generation and conversion. Justin has a B.S. Chemical Engineering and Physics, Northeastern University, 2014–2018. Prior to joining UC Santa Barbara in 2019, Justin carried out a seven month co-op at HRL in Malibu where he worked as part of a team of scientists and engineers to demonstrate the successful 3D printing of aluminum 7075, a high strength alloy that was believed to be unweldable. After graduating in 2018, he returned to HRL to help the team further develop this technology so that it can one day be used to 3D print any unweldable alloy. He also worked on several other projects including: the development of Matlab scripts to analyze x-ray computed tomography (XCT) measurements of a ceramic composite during fracture and the design of a Rubidium source and sink for future atomic clocks.

Email: jmayer@ucsb.edu

Hunter Martin is the lead metallurgist and a Research Staff member in the Materials and Microsystems Laboratory at HRL Laboratories and director and co-founder of HRL's Center for Additive Materials (CAM). Dr. Martin received a B.Sc. in Material Science and Engineering from the University of Washington and a PhD in Materials from the University of California, Santa Barbara in collaboration with Prof. Tresa Pollock. His research focuses on the physics of nucleation and growth in metal alloy systems and has led multiple internal development programs focused on development of new metal alloys for additive manufacturing. Dr. Martin currently has active research programs in adjacent research areas, including the development and commercialization of new powder metallurgy technologies for industry (General Motors and Boeing) and US Government agencies.

Email: jhmartin@hrl.com



Vijay Mhetar currently serves as Senior Vice President and Chief Technology Officer at Kraton Corporation – a global, \$2B specialty polymer and chemical company. He is responsible for global research and development, technical service activities as well as implementation of the company-wide innovation process for Kraton. Dr. Mhetar currently leads Kraton's R&D team in developing a range of sustainable solutions for recycling plastic waste, chemicals derived by renewable sources, development of novel block copolymers for applications in energy storage, water purification and advanced electronics. Dr. Mhetar holds a Ph.D., Chemical Engineering from Texas A&M University and a Masters in Technology from the Indian Institute of Technology in Bombay, India. He is inventor/co-inventor on more than 75 patents. He serves on Industry Advisory Committee for Chemical Engineering Department at Texas A&M University. He is also certified Six-Sigma Black Belt.

Email: Vijay.Mhetar@kraton.com

Nina Miolane received her M.S. in Mathematics from Ecole Polytechnique (France) & Imperial College (UK), her Ph.D. in Computer Science from INRIA (France) in collaboration with Stanford, and spent two additional years at Stanford in Statistics during her postdoc. She also worked as a deep learning software engineer in Silicon Valley for several years. At UC Santa Barbara, Nina directs the BioShape Lab, whose goal is to explore the "geometries of life". Her research investigates how the shapes of proteins, cells, and organs relate to their biological functions by developing innovative methods at the crossroads of geometry and (deep) learning. Her team is also co-developing the open-source Geomstats library, a package that provides methods at the intersection of geometry and machine learning, to compute with geometric data.

Email: ninamiolane@ucsb.edu



Katharine Page is an Assistant Professor of Materials Science and Engineering at the University of Tennessee Knoxville, and a Joint Faculty member with the Neutron Scattering Division at Oak Ridge National Laboratory. She works at the intersection of functional energy materials research and the advancement of x-ray and neutron scattering methods as applied to ferroelectric ceramics, energy conversion materials, and nanoscale catalysts, among other topics. She received her PhD in 2008 from the Materials Department at UC Santa Barbara. Kate was a Director's Postdoctoral Fellow and an Instrument Scientist at the Lujan Neutron Scattering Center, Los Alamos National Laboratory through 2014, and then an Instrument Scientist within the Diffraction Group at Oak Ridge National Laboratory until 2019. She is a 2019 recipient of the Presidential Early Career Award for Scientists and Engineers (PECASE). Kate lives in Oak Ridge, Tennessee, with her husband and fellow UCSB Materials graduate, Dr. Michael Crowell, and their children, Wriston (age 9) and Abbie (age 4).

Email: kpage10@utk.edu

Joe Patterson is an Assistant Professor in the Department of Chemistry at the University of California, Irvine. He received his PhD degree in polymer chemistry and self-assembly from the University of Warwick, UK. He completed postdoctoral research at the University of California, San Diego. Patterson also worked in the Laboratory of Materials and Interface Chemistry at the Eindhoven University of Technology, The Netherlands. His research elucidates the mechanisms that govern molecular self-assembly processes. His awards include the MacroGroupUK Young Polymer Scientist of the Year in 2011, the 2013 Jon Weaver PhD Prize, a Marie Skłodowska-Curie Individual Fellowship in 2017, a UCI Beal Innovation Award in 2020 and an ACS PRF Doctoral New Investigator Award in 2020.

Email: patters3@uci.edu



Efrain E. Rodriguez received his B.S. from the Massachusetts Institute of Technology and his PhD from the UC Santa Barbara. After his PhD, Efrain went to the National Institute of Standards and Technology (NIST) for his National Research Council post-doctoral fellowship. Today, Efrain is an Associate Professor of Chemistry and Biochemistry at the University of Maryland, College Park. Efrain received the Margaret C. Etter Early Career Award in 2019 from American Crystallographic Association and the CAREER award from the NSF. In 2020, he joined the Board of Directors at the American Institute of Physics and was awarded the Alexander von Humboldt Fellowship for Experienced Researchers. He is also a member of the US National Committee on Crystallography. At the University of Maryland, Efrain has established a program in solid-state chemistry with a multidisciplinary approach for the preparation and study of functional inorganic materials, and his group specializes in applying neutron scattering techniques toward such studies.

Email: efrain@umd.edu

Omar A. Saleh is a physicist and materials scientist with broad expertise in biomolecular and polymer science. Saleh received his B.S. in Physics from MIT in 1997, and his Ph.D. in Physics from Princeton in 2003. His graduate studies were supported by a Hertz Fellowship. He was a post-doctoral fellow at the École Normale Supérieure in Paris, France, where he developed single-molecule experimental techniques to study motor protein/DNA interactions. He is a professor in the Materials Department, with a minority appointment in the Biomolecular Science and Engineering (BMSE) Program. His research is focused on the molecular physics underlying biological systems, with particular experience in nucleic acids, protein/DNA interactions, motor proteins, biomolecular elasticity, and self-assembled biomolecular systems. His research achievements were recognized by an NSF CAREER award in 2008, by a Bessel Research Award from the Alexander von Humboldt Society in 2017, and by his selection as a Fellow of the American Physical Society in 2019 by the Division of Biological Physics.

Email: saleh@ucsb.edu



Jessica Santana is an Assistant Professor in the Technology Management Program at UC Santa Barbara, where she studies the role of networks in innovation and entrepreneurship. Her current research explores how entrepreneurs use peers and rhetoric to navigate sensemaking and stigma following startup failure. She also investigates the relationship among innovation, deviance, and ethics in contexts such as synthetic biology and software engineering. Her work is driven by insights from organizational theory, economic sociology, social psychology, and network science. She relies on a variety of methodological approaches, including experimental, statistical, and computational analyses. Jessica holds a Ph.D. and M.A. in Sociology from Stanford University and a Master of Information Management and Systems from UC Berkeley's School of Information, with certification in the Management of Technology from the Haas School of Business.

Email: jsantana@ucsb.edu

Yangying Zhu started as an assistant professor in the Mechanical Engineering department at University of California, Santa Barbara in July, 2019. Her work focuses on thermal management and characterizations of energy and electronic systems. She obtained her PhD from MIT, advised by Prof. Evelyn Wang, where she developed microsystems for aggressive cooling of electronics. During her postdoc with Prof. Yi Cui at Stanford University, she investigated thermal effects in lithium-based batteries. She received the NSF CAREER award, the MIT Meredith Kamm Memorial Award, and the ASME Pi Tau Sigma Gold Medal.

Email: yangying@ucsb.edu



Ronald Zuckermann is a Sr. Research Advisor at the Molecular Foundry at the Lawrence Berkeley National Laboratory, where he studies the mimicry of biomolecular architectures using bio-inspired polymers. He received his PhD at UC Berkeley with Prof. Peter Schultz, following which he became one of the founding chemists at Protos Corp., a combinatorial drug discovery start-up in Emeryville, CA. There he helped develop several key drug discovery technologies such as robotic combinatorial library synthesizers, affinity selection methods, and a novel class of heteropolymers called "Peptoids". Chiron Corp. acquired Protos in 1991 where this work continued and was applied to small molecule drug discovery, new biomaterials, and nucleic acid delivery. In early 2006, he left Chiron to direct the Biological Nanostructures Facility of the Molecular Foundry at Lawrence Berkeley National Laboratory where he pioneered the field of peptoid nanostructures, and continues to study the folding of sequence-defined peptoid polymer chains into protein-like nanoarchitectures.

Email: rnzuckermann@lbl.gov