

# 2024 MATS Symposium and Workshop: Innovations for a Changing Environment

23-26 July 2024

UC San Diego



## Agenda

**Tuesday, 23 July 2024**

7:30–8:30 AM	<b>Continental breakfast and registration</b> Atkinson Auditorium Courtyard
8:30–8:45 AMs	<b>Welcome</b> —Atkinson Auditorium <b>Olivia A. Graeve</b> Elias Masry Endowed Professor in Engineering, Department of Mechanical and Aerospace Engineering; Director, CaliBaja Center for Resilient Materials and Systems; Director, Program of Materials Science and Engineering <i>University of California San Diego</i>
8:45–8:55 AM	<b>Welcome</b> <b>Pradeep K. Khosla</b> Chancellor <i>University of California San Diego</i>
8:55–9:40 AM	<b>Plenary presentation</b> <b>Subra Suresh</b> Professor at Large, School of Engineering <i>Brown University</i> Deep learning from nature and machines



ENDORSED  
MEETING

9:40–10:25 AM	<p><b>Plenary presentation</b></p> <p><b>Brian Cantor</b>  Emeritus Professor, Department of Materials; Research Professor,  Brunel Center for Advanced Solidification Technology  <i>University of Oxford and Brunel University</i></p> <p>Multicomponent high-entropy Cantor alloys</p>
10:25–10:40 AM	<p><b>Coffee break</b>  Atkinson Auditorium Courtyard</p>
<p>Session Chair: <b>Hyonny Kim</b>  Professor, Department of Structural Engineering and Program of Materials  Science and Engineering  <i>University of California San Diego</i></p>	
10:40–11:10 AM	<p><b>Ibrahim Karaman</b>  Chevron Professor and Head, Department of Materials Science  and Engineering  <i>Texas A&amp;M University</i></p> <p>High-throughput design, synthesis, and characterization of metallic  alloys for extreme environments</p>
11:10–11:40 AM	<p><b>Shen Dillon</b>  Professor, Department of Materials Science and Engineering  <i>University of California, Irvine</i></p> <p>Interfacial plasticity in extreme environments</p>
11:40 AM–12:10 PM	<p><b>Valery I. Levitas</b>  Anson Marston Distinguished Professor in Engineering,  Department of Aerospace Engineering  <i>Iowa State University</i></p> <p>New rules of coupled severe plastic deformations, phase  transformations, and nanostructure evolution under high pressure</p>
12:10–1:30 PM	<p><b>Lunch and poster session</b>  Atkinson Auditorium Courtyard</p>

<p>Session Chair: <b>Andrea Tao</b>  Professor, Aiiso Yufeng Li Family Department of Chemical and Nano Engineering and Program of Materials Science and Engineering; Co-Director, Institute for Materials Discovery and Design  <i>University of California San Diego</i></p>	
1:30–2:00 PM	<p><b>Patrick Grant</b>  Vesuvius Chair of Materials, Department of Materials  <i>University of Oxford</i></p> <p>Smart manufacturing to realize the potential of energy storage materials</p>
2:00–2:30 PM	<p><b>Yang Yang</b>  Distinguished Professor, Department of Materials Science and Engineering  <i>University of California, Los Angeles</i></p> <p>Metal halide perovskite materials and their applications</p>
2:30–3:00 PM	<p><b>Rishi Raj</b>  Professor, Paul M. Rady Department of Mechanical Engineering  <i>University of Colorado Boulder</i></p> <p>Far from equilibrium defect generation under electric fields: electrification of ceramics manufacturing</p>
3:00–3:30 PM	<p><b>Junqiao Wu</b>  Chancellor's Professor, Department of Materials Science and Engineering  <i>University of California, Berkeley</i></p> <p>What one material can do</p>
3:30–3:45 PM	<p><b>Coffee break</b>  Atkinson Auditorium Courtyard</p>

<p>Session Chair: <b>Kent Griffith</b>  Assistant Professor, Department of Chemistry and Biochemistry and Program  of Materials Science and Engineering  <i>University of California San Diego</i></p>	
<p>3:45–4:15 PM</p>	<p><b>Horacio D. Espinosa</b>  James N. and Nancy J. Farley Professor in Manufacturing &amp;  Entrepreneurship, Department of Mechanical Engineering;  Director, Theoretical and Applied Mechanics Program; Director,  Institute for Cellular Engineering Technologies  <i>Northwestern University</i></p> <p>Mechanics of programmable DNA-assembled superlattices and 2D  metamaterials</p>
<p>4:15–4:45 PM</p>	<p><b>Angela Pitenis</b>  Assistant Professor, Materials Department  <i>University of California, Santa Barbara</i></p> <p>Bio-inspired materials and interfaces for extreme environments</p>
<p>4:45–5:15 PM</p>	<p><b>Rafael Vazquez-Duhalt</b>  Professor and Chair, Department of Bionanotechnology, Center of  Nanoscience and Nanotechnology  <i>Universidad Nacional Autónoma de México</i></p> <p>Virus-like nanoparticles for smart medicine</p>

Wednesday, 24 July 2024

7:30–8:30 AM	<p><b>Continental breakfast and registration</b> Atkinson Auditorium Courtyard</p>
<p>Session Chair: <b>Javier E. Garay</b> Professor, Department of Mechanical and Aerospace Engineering and Program of Materials Science and Engineering; Associate Dean for Research, Jacobs School of Engineering <i>University of California San Diego</i></p>	
8:30–9:15 AM	<p><b>Plenary presentation</b> <b>Yury Gogotsi</b> Distinguished University and Charles T. and Ruth M. Bach Professor, Department of Materials Science and Engineering, Department of Mechanical Engineering and Mechanics; Director, A.J. Drexel Nanomaterials Institute <i>Drexel University</i></p> <p>MXenes – scalable 2D materials for renewable energy, water, and hydrogen technologies</p>
9:15–9:45 AM	<p><b>Olivia A. Graeve</b> Elias Masry Endowed Professor in Engineering, Department of Mechanical and Aerospace Engineering; Director, CaliBaja Center for Resilient Materials and Systems; Director, Program of Materials Science and Engineering <i>University of California San Diego</i></p> <p>Grain-shape control in ceramics: design and opportunities</p>
9:45–10:15 AM	<p><b>Gregory S. Rohrer</b> W.W. Mullins Professor of Materials Science and Engineering, Department of Materials Science and Engineering <i>Carnegie Mellon University</i></p> <p>New perspectives on grain boundary migration in polycrystals</p>
10:15–10:45 AM	<p><b>Robert McMeeking</b> Tony Evans Distinguished Professor, Materials Department <i>University of California, Santa Barbara</i></p> <p>Storage particle cracking, solid electrolyte delamination and solid-state dendrite formation in lithium-ion batteries</p>
10:45–11:00 AM	<p><b>Coffee break</b> Atkinson Auditorium Courtyard</p>

<p>Session Chair: <b>Marc A. Meyers</b>  Distinguished Professor, Aiiso Yufeng Li Family Department of Chemical and Nano Engineering, Department of Mechanical and Aerospace Engineering, and Program of Materials Science and Engineering  <i>University of California San Diego</i></p>	
11:00–11:30 AM	<p><b>Elizabeth J. Opila</b>  Rolls Royce Commonwealth Professor of Engineering and Department Chair, Department of Materials Science and Engineering; Director, Rolls Royce University Technology Center on Advanced Material Systems  <i>University of Virginia</i></p> <p>High entropy ceramics for high temperature applications: promising and problematic</p>
11:30–12:00 AM	<p><b>Jan Schroers</b>  Robert Higgin Professor of Mechanical Engineering and Materials Science, School of Engineering &amp; Applied Science  <i>Yale University</i></p> <p>What diffuses through alloys: local diffusion through microstructures</p>
12:00–1:30 PM	<p><b>Lunch and poster session</b>  Atkinson Auditorium Courtyard</p>
<p>Session Chair: <b>Abdoulaye Ndao</b>  Assistant Professor, Department of Electrical and Computer Engineering and, Program of Materials Science and Engineering  <i>University of California San Diego</i></p>	
1:30–2:00 PM	<p><b>Manuel Quevedo-Lopez</b>  TI Distinguished University Professor in Nanoelectronics and Department Head, Department of Materials Science and Engineering  <i>University of Texas at Dallas</i></p> <p>Reliability testing for electronic materials and devices for harsh environments</p>

2:00–2:30 PM	<p><b>Feliciano Giustino</b>  W.A. "Tex" Moncrief, Jr. Chair in Simulation-based Engineering and Sciences, Department of Physics; Director, Center for Quantum Materials Engineering  <i>University of Texas at Austin</i></p> <p>Quantum materials design for next-generation electronics</p>
2:30–3:00 PM	<p><b>Zheng Chen</b>  Associate Professor, Aiiso Yufeng Li Family Department of Chemical and Nano Engineering and Program of Materials Science and Engineering  <i>University of California San Diego</i></p> <p>Enabling sustainable materials in advanced battery development from design and recycling</p>
3:00–3:15 PM	<p><b>Coffee break</b>  Atkinson Auditorium Courtyard</p>
3:15–5:45 PM	<p><b>Topical group discussion</b>  Group 1 Co-chairs: (in QI Theater)</p> <p><b>Jian Luo</b>  Professor, Aiiso Yufeng Li Family Department of Chemical and Nano Engineering and Program of Materials Science and Engineering  <i>University of California San Diego</i></p> <p><b>Eugene Olevsky</b>  Distinguished Professor and Dean, College of Engineering  <i>San Diego State University</i></p>
3:15–5:45 PM	<p><b>Topical group discussion</b>  Group 2 Co-chairs: (in QI 5302 Directors Room)</p> <p><b>David Fenning</b>  Associate Professor, Aiiso Yufeng Li Family Department of Chemical and Nano Engineering and Program of Materials Science and Engineering  <i>University of California San Diego</i></p> <p><b>Michael Burkart</b>  Professor and Chair, Department of Chemistry and Biochemistry and Program of Materials Science and Engineering  <i>University of California San Diego</i></p>

<p>3:15–5:45 PM</p>	<p><b>Topical group discussion</b></p> <p>Group 3 Co-chairs: (in QI 4004 Mtg Room)</p> <p><b>Oscar Vazquez Mena</b>  Associate Professor, Aiiso Yufeng Li Family Department of  Chemical and Nano Engineering and Program of Materials  Science and Engineering  <i>University of California San Diego</i></p> <p><b>Massimiliano Di Ventra</b>  Professor, Department of Physics and Program of Materials  Science and Engineering  <i>University of California San Diego</i></p>
<p>6:30–9:30 PM</p>	<p><b>Symposium dinner</b></p> <p>Estancia La Jolla Hotel &amp; Spa  Grande Room  9700 N. Torrey Pines Road  La Jolla, CA 92037</p>



Thursday, 25 July 2024

7:30–8:30 AM	<b>Continental breakfast and registration</b> Atkinson Auditorium Courtyard
Session Chair: <b>M. Brian Maple</b> Bernd T. Matthias Endowed Chair and Distinguished Professor, Department of Physics and Program of Materials Science and Engineering <i>University of California San Diego</i>	
8:30–9:00 AM	<b>Eric Fullerton</b> CMRR Endowed Chair Professor, Department of Electrical and Computer Engineering and Program of Materials Science and Engineering; Director, Center for Memory and Recording Research <i>University of California San Diego</i> Ultrafast response of magnetic materials to laser excitations
9:00–9:30 AM	<b>Yu Huang</b> Traugott and Dorothea Frederking Professor and Chair, Department of Materials Science and Engineering <i>University of California, Los Angeles</i> Accelerating catalyst design for a sustainable future
9:30–10:00 AM	<b>R. Edwin Garcia</b> Professor, School of Materials Engineering <i>Purdue University</i> Bottlenecks on the microstructural design of lithium-ion batteries
10:00–10:30 AM	<b>Natalie Stingelin</b> Professor, School of Chemical and Biomolecular Engineering <i>Georgia Institute of Technology</i> Cool plastics for a greener world
10:30–10:45 AM	<b>Coffee break</b> Atkinson Auditorium Courtyard

<p>Session Chair: <b>Wanlu Li</b>  Assistant Professor, Aiiso Yufeng Li Family Department of Chemical and Nano Engineering and Program of Materials Science and Engineering  <i>University of California San Diego</i></p>	
10:45–11:15 AM	<p><b>Paul V. Braun</b>  Grainger Distinguished Chair in Engineering; Department of Materials Science and Engineering and Department of Chemistry;  Director, Materials Research Laboratory  <i>University of Illinois Urbana-Champaign</i></p> <p>Learning from electronic materials to change the paradigm in materials for energy storage</p>
11:15–11:45 PM	<p><b>David Estrada</b>  Professor, Micron School of Materials Science and Engineering;  Associate Director, Center for Advanced Energy Studies;  Advanced Manufacturing Deputy Director of Academic Research,  Idaho National Laboratory  <i>Boise State University</i></p> <p>2-dimensional and layered materials for energy, water, and healthcare</p>
11:45–1:00 PM	<p><b>Lunch and poster session</b>  Atkinson Auditorium Courtyard</p>
<p>Session Chair: <b>Kesong Yang</b>  Professor, Aiiso Yufeng Li Family Department of Chemical and Nano Engineering and Program of Materials Science and Engineering  <i>University of California San Diego</i></p>	
1:00–1:30 PM	<p><b>Ivan Schuller</b>  Distinguished Professor, Department of Physics and Program of Materials Science and Engineering  <i>University of California San Diego</i></p> <p>Energy efficient neuromorphic computing</p>
1:30–2:00 PM	<p><b>Yu-Hwa Lo</b>  Professor, Department of Electrical and Computer Engineering; and Program of Materials Science and Engineering; Director, Nano3 Facility  <i>University of California San Diego</i></p> <p>Achieving extreme sensitivity for photon detection using novel materials and heterogeneous integration</p>

2:00–2:30 PM	<p><b>Symposium highlights and continuation of topical group discussions</b></p> <p><b>Olivia A. Graeve</b>  Elias Masry Endowed Professor in Engineering, Department of Mechanical and Aerospace Engineering; Director, CaliBaja Center for Resilient Materials and Systems; Director, Program of Materials Science and Engineering  <i>University of California San Diego</i></p>
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2:45–5:00 PM	<p><b>Topical group discussion</b></p> <p>Group 3 Co-chairs: (in QI 4004 Mtg Room)</p> <p><b>Oscar Vazquez Mena</b> Associate Professor, Aiiso Yufeng Li Family Department of Chemical and Nano Engineering and Program of Materials Science and Engineering <i>University of California San Diego</i></p> <p><b>Massimiliano Di Ventra</b> Professor, Department of Physics and Program of Materials Science and Engineering <i>University of California San Diego</i></p>
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Friday, 26 July 2024

10:30 AM–6:00 PM	<b>Visit to the <i>Centro de Nanociencias y Nanotecnología</i></b> <i>Universidad Nacional Autónoma de México</i> Ensenada, México	
	10:30 AM	Depart from Estancia La Jolla Hotel & Spa
	12:30-2:00 PM	Lunch—Solar Fortun winery
	2:00-2:15 PM	Rafael Vazquez-Duhalt UNAM: History and its global presence
	2:15-2:30 PM	Gustavo Hirata Flores Rare-earth doped nanophosphors for applications in opto-electronic devices and nanomedicine
	2:30-2:45 PM	Hugo Tiznado Atomic layer alchemy: engineering nanomaterials for batteries, memristors, waveguides, and beyond . . . One layer at a time
	2:45-3:00 PM	Manuel Herrera Zaldivar The use of cathodoluminescence in characterizing point defects in materials
	3:00 PM	Depart from Solar Fortun winery
	3:15 PM	Arrival at CNyN-UNAM
	3:15-4:30 PM	Lab tours of CNyN-UNAM
	4:30 PM	Depart to UC San Diego
6:00 PM	Arrival at UC San Diego	



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