

# 2024 AVS Prairie Chapter Symposium



ALMA MATER

TO THY HAPPY CHILDREN  
OF THE FUTURE  
THOSE OF THE PAST  
SEND GREETINGS

**I** ILLINOIS

Materials Research Laboratory

GRAINGER COLLEGE OF ENGINEERING

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**AVS Prairie Chapter**

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Veronika Walkosz, *Lake Forest College*  
Matthias J. Young, *University of Missouri*

## Special Acknowledgements

Kristen Flatt (moderator), *University of Illinois at Urbana-Champaign*  
Mary Kraft (moderator), *University of Illinois at Urbana-Champaign*  
Mauro Sardela (moderator), *University of Illinois at Urbana-Champaign*  
Timothy Spila (moderator), *University of Illinois at Urbana-Champaign*

# Welcome

On behalf of the AVS Prairie Chapter, we welcome you to the 2024 AVS Prairie Chapter Symposium.

This year's symposium is a multi-topic conference, intending to instigate an exchange of ideas that goes beyond our usual collaboration circles. We have put together a very exciting program with 4 outstanding plenary talks, 10 contributed oral presentations and 34 posters on the many subjects of interest to the AVS.

We are presenting the 2024 AVS Prairie Chapter Outstanding Research Award and the 2024 AVS Prairie Chapter Early Career Award. We are fortunate to have both of this year's awardees presenting plenary talks. Dr. Seth Darling, from Argonne National Laboratory, will present the results of his studies about the mechanisms involved in transport of solutes through nanofabricated, defect-free isoporous membranes, showing promise for unprecedented membrane selectivity through judicious process design and tight pore-size control. Dr. Yi Li, also from the Argonne National Laboratory, will present his research about on-chip hybrid magnonic systems for quantum information science.

We are also honored and excited to have, completing our set of truly science cutting-edge research presentations, plenaries by two highly distinguished investigators. Prof. Elizabeth Goldschmidt, from the University of Illinois at Urbana-Champaign, who will share with us some of her group's studies on quantum light-matter interactions using rare earth materials, to understand quantum photonic physics in her talk "Quantum photonics with rare earth materials" and Dr. Elena Shevchenko from the Argonne National Laboratory, presenting how recent advances in the design and application of nanoscale materials are paving the way for groundbreaking solutions to some of the world's most pressing challenges, from energy production and storage to environmental sustainability.

We also have 4 companies, which will be presenting their newest technologies at our Scientific Equipment Exhibition, supporting the symposium. We encourage you to talk to their representatives and scientists about your instrumentation questions.

One of the highlights this year is our first Best Oral Presentation Award for the best oral presentation by a student or post-doctoral researcher. This award is sponsored by UC Components.

Thank you for your participation and contribution to the 2024 AVS Prairie Chapter Symposium, and thanks to all who contributed to enable this outstanding program.

2024 AVS Prairie Chapter Symposium program committee

## Awards ceremony and reception

Please join us at 5:45, after the last oral presentation, for a closing ceremony where we will present and celebrate this year's recipients of our Best Student Poster Presentation Award and a special Best Oral Presentation Award, sponsored by UC Components, this year.

**6:00 p.m.**

Exhibition hall



## Equipment Exhibition

We have four scientific equipment companies represented in our equipment exhibition this year. Several companies have brought some of their newest products, which could include the next tool you need to complete, extend, or enrich your current project, or even start a completely new one. They have experts who can answer most questions about the equipment and many of their applications. Make sure to take some time to talk to them during the coffee breaks.

Our exhibitors are the main sponsors of the AVS Prairie Chapter Symposia. Please make a point of thanking them for their support.

# Exhibitors

Equipment exhibition opens at 10:45 and closes at 4:15

The exhibition hall is located on the second floor



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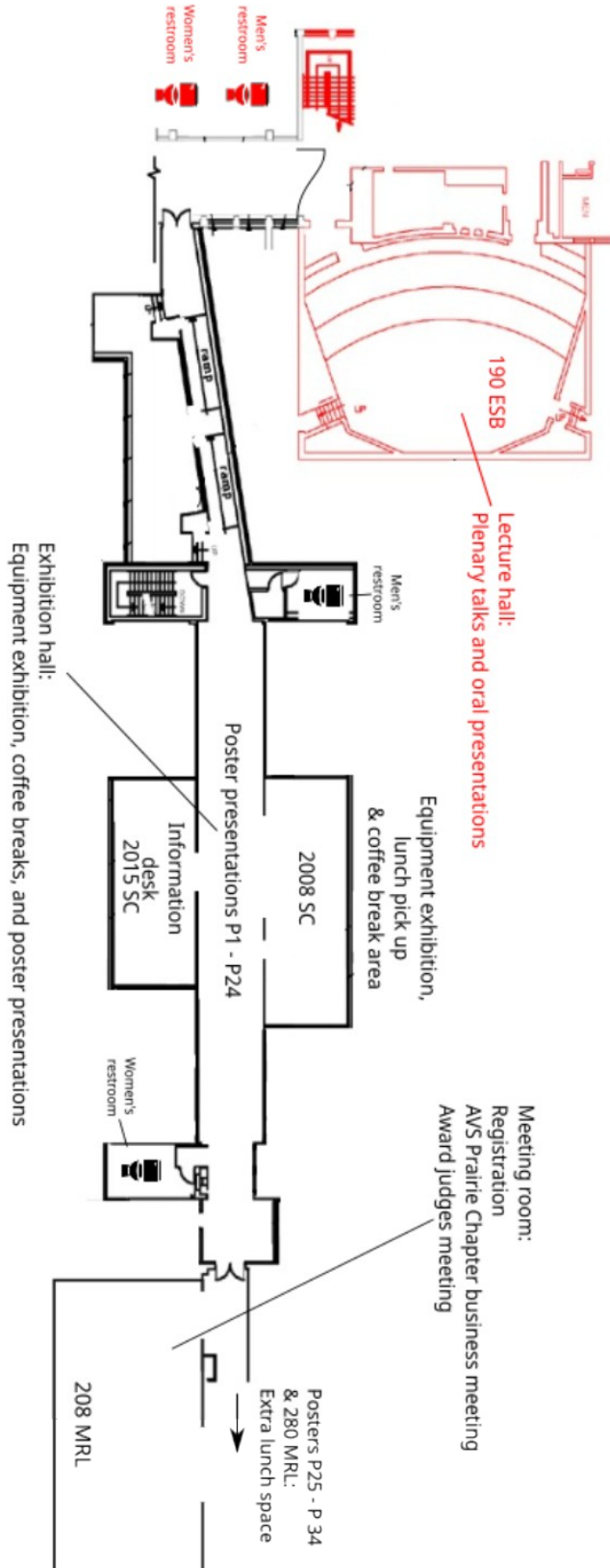
# Site map



— Metered Parking

➔ Materials Research Laboratory

# Conference rooms



Second floor areas indicated in black  
First floor areas indicated in red



# Schedule summary

September 5, 2024

Time

8:30 Registration

Session A (Lecture hall) – Moderator:

8:45 **Welcome remarks**

8:55 **Plenary talk** AVS Prairie Chapter Early Career Research Award

Li Yi, Argonne National Laboratory - **On-chip hybrid magnonic systems for quantum information science**

9:45 Jack D'Amelio, UIUC - **Optical characterization of single-crystal stoichiometric europium materials for quantum memory applications**

10:05 Hanyu Hou, UIUC/ANL - **High-resolution STEM cathodoluminescence of quantum emitters at the twist interface in 2D-exfoliated hBN**

10:25 Joshua Wagner, University of Chicago - **Coverage dependent diffusivity and binding of atomic oxygen on Moiré patterned graphene**

10:45 **Coffee break and poster presentations (Exhibition hall)**

Session B (Lecture hall) – Moderator: Mauro Sardela

11:05 AVS Prairie Chapter Outstanding Research Award presentation

11:10 **Plenary talk** AVS Prairie Chapter Outstanding Research Award

Seth B. Darling, Argonne National Laboratory - **Pushing the limits of membrane selectivity**

12:00 Abdeliah Asserghine, UIUC - **In situ detection of reactive oxygen species spontaneously generated on lead acid battery anodes: a pathway for degradation and self-discharge at open circuit**

Lunch (Exhibition hall and Meeting room)

12:20 Lunch and AVS Prairie Chapter business meeting (open to all)

1:10 **Poster presentations (Exhibition hall)**

Session C (Lecture hall) – Moderator: Kristen Flatt

1:50 Grace McKnight, UIUC - **Interstitial cluster families in semiconducting oxides: effects on post-synthesis defect engineering and purification using submerged surfaces**

**Plenary talk**

2:10 Elizabeth Goldschmidt, University of Illinois at Urbana-Champaign - **Quantum photonics with rare-earth materials**

**Plenary talk**

3:00 Elena Shevchenko, Argonne National Laboratory - **Design of nanoscale materials**

3:50 **Coffee break and poster presentations (Exhibition hall)**

Session D (Lecture hall) – Moderator: Timothy Spila

4:15 Xierong Qian, UIUC - **Experimental efforts in water-ethanol-dimethylformamide ternary solvent to optimize advanced Pourbaix diagrams**

4:35 Dairong Liu, UIC - **Nanoscale chemical probing of metal-supported ultrathin ferrous oxide**

4:55 Benjamin Heiner, University of Notre Dame - **Scanning tunneling microscopy of ferrocenecarboxylic acid assemblies on Ag(111): a Comparison to Au(111)**

5:15 Myoung-Woo Yoo, UIUC - **Thermal contribution to current-driven antiferromagnetic-order switching in Mn<sub>3</sub>Sn**

5:35 Michael van Duinen, University of Chicago - **High-temperature diffraction and surface electron-phonon coupling of the unreconstructed metallic and (3x1)-o reconstructed nb(100) surfaces by helium atom scattering**

6:00 Closing reception and awards ceremony

# List of events

- 8:00 – Poster and vendor exhibit setup starts (Exhibition hall)
- 8:30 – Registration opens (Exhibition hall)
- 8:45 – Conference talks start (Lecture hall)
- 10:45 – Equipment Exhibition and poster area opens  
(Exhibition hall)
- 10:45 – Coffee break at the Equipment Exhibition  
(Exhibition hall)
- 10:45 – Poster presentations and judging - round 1  
(Exhibition hall)
- 11:05 – Conference talks resume (Lecture hall)
- 12:20 – Lunch served (Meeting room)
- 12:20 – AVS Prairie Chapter business meeting – open to all  
(Meeting room)
- 1:10 - Poster presentations and judging - round 2  
(Exhibition hall)
- 1:50 – Conference talks resume (Lecture hall)
- 3:50 – Coffee break at the Equipment Exhibition  
(Exhibition hall)
- 3:50 – Poster presentations and judging - round 3  
(Exhibition hall)
- 4:15 – Conference talks resume (Lecture hall)
- 4:15 – Equipment Exhibition closes
- 5:55 – Awards judges meeting (meeting room) – closed to the public
- 6:00 – Closing reception and awards ceremony  
(Exhibition hall)

Exhibition hall – 2008 SC and 2<sup>nd</sup> floor lobby SC

Lecture hall – 190 ESB

Meeting room – 208 MRL

# Plenary talks

9:15

*On-chip hybrid magnonic systems for quantum information science*



**Li Yi**

**Assistant Scientist in the Superconductivity and Magnetism Group**  
Argonne National Laboratory  
*2024 AVS Prairie Chapter Early Career Award*

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11:05

*Pushing the limits of membrane selectivity*



**Seth B. Darling**

**Chief Science & Technology Officer for the Advanced Energy Technologies Directorate**  
Argonne National Laboratory  
*2024 AVS Prairie Chapter Outstanding Researcher Award*

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2:15

Quantum photonics with rare-earth materials



**Elizabeth Goldschmidt**

**Assistant Professor, Physics**  
University of Illinois at Urbana-Champaign

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3:05

Design of nanoscale materials



**Elena Shevchenko**

**Scientist, Nanoscience**  
Argonne National Laboratory

# Oral presentations

## Lecture hall

### **Session A Moderator: Mary Kraft, University of Illinois**

- 8:55 – **Plenary Talk** AVS Prairie Chapter Early Career Research Award  
Li Yi - *On-chip hybrid magnonic systems for quantum information science*
- 9:45 – Jack A. D'Amelio, Amy Tram, Zach W. Riedel, Selvin Tobar, Donny Pearson, Elizabeth Goldschmidt, Daniel P. Shoemaker - *Optical characterization of single-crystal stoichiometric europium materials for quantum memory applications*
- 10:05 – Hanyu Hou, Muchuan Hua, Thomas E. Gage, Benjamin T. Diroll, Jian-Min Zuo, Jianguo Wen –*High-resolution STEM cathodoluminescence of quantum emitters at the twist interface in 2D-exfoliated hBN*
- 10:05 – Joshua Wagner, Steven J. Sibener - *Coverage dependent diffusivity and binding of atomic oxygen on moiré patterned graphene*

### **Session B Moderator: Mauro Sardela, University of Illinois**

- 11:10 – **Plenary Talk** AVS Prairie Chapter Outstanding Research Award  
Seth Darling - *Pushing the limits of membrane selectivity*
- 12:00 – Abdelilah Asserghine, Aravind Baby, Huimin Zhao, Joaquín Rodríguez-López - *In situ detection of reactive oxygen species spontaneously generated on lead acid battery anodes: a pathway for degradation and self-discharge at open circuit*

### **Session C Moderator: Kristen Flatt, University of Illinois**

- 1:50 – Grace McKnight, Heonjae Jeong, Elif Ertekin, Edmund Seebauer - *Interstitial cluster families in semiconducting oxides: effects on post-synthesis defect engineering and purification using submerged surfaces*
- 2:10 – **Plenary Talk**  
Elizabeth Goldschmidt - *Quantum photonics with rare-earth materials*
- 3:00 – **Plenary Talk**  
Elena Shevchenko - *Design of nanoscale materials*

### **Session D Moderator: Timothy Spila, University of Illinois**

- 4:15 – Xierong Qian, Joonsoo Kim, Jiadong Chen, Toby Woods, Wenhao Sun, and Daniel Shoemaker - *Experimental efforts in water-ethanol-dimethylformamide ternary solvent to optimize advanced Pourbaix d*
- 4:35 – Dairong Liu, Linfei Li, Nan Jiang - *Nanoscale chemical probing of metal-supported ultrathin ferrous oxide*
- 4:55 – Benjamin R. Heiner, Kaitlyn M. Handy, Alex L. Walter, Jacob P. Petersen, S. Alex Kandel - *Scanning tunneling microscopy of ferrocenecarboxylic acid assemblies on Ag(111): a comparison to Au(111)*
- 5:15 – Myoung-Woo Yoo, Virginia Lorenz, David Cahill, Axel Hoffmann - *Thermal contribution to current-driven antiferromagnetic-order switching in Mn3Sn*
- 5:35 – Michael F. Van Duinen, Caleb J. Thompson, Michelle M. Kelley, Cristobal Mendez, Sarah A. Willson, Van Do, Tomas A. Arias, S. J. Sibener - *High-temperature diffraction and surface electron-phonon coupling of the unreconstructed metallic and (3x1)-O reconstructed Nb(100) surfaces by helium atom scattering*

# Poster Presentations

Exhibition hall – round 1 - 10:45 a.m. to 11:05 a.m.

round 2 – 1:10 p.m. to 1:50 p.m.

round 3 - 3:50 p.m. to 4:15 p.m.

- P1 Mohammad Rahat Hossain, Michael Trenary - *Selective hydrogenation of 1,3-butadiene on a Pd/Cu (111) single-atom-alloy*
- P2 Ayoyele Ologun, Michael Trenary - *Homoepitaxial growth of ZrB<sub>2</sub> on a ZrB<sub>2</sub>(0001) surface*
- P3 Bidipta Ghosh, Cheng Zhang, Stefanie Frick, En Ju Cho, Toby Woods, Yujie Yang, Nicola H. Perry, Andreas Klein, Hong Yang - *Active site defect engineering in pyrochlore electrocatalysts for oxygen evolution through targeted composition and band tuning*
- P4 Sonji Lamichhane, Mary L. Kraft - *A new tool for visualizing protein distribution in the marine diatom, *Phaeodactylum tricornutum**
- P5 Adnan Mohammad and Jeffrey W. Elam - *Investigating the emissive properties of Ba-containing thin films synthesized via thermal atomic layer deposition*
- P6 B. Kamiyama, M. A. Eslamisaray, E. Gillmore, A. Tomita, R. M. Sankaran - *Correlating process conditions to product distributions for nitrogen fixation by plasma electrolysis*
- P7 Yoav Malka, Chi Thang Nguyen, Jeffrey W. Elam - *Fabrication of Ru:Al<sub>2</sub>O<sub>3</sub> resistive layer for microchannel plates using atomic layer deposition*
- P8 Shuchen Li, Niu Chang, Axel Hoffmann, and Peide Ye - *Spin polarizations in chiral tellurium*
- P9 Alexis Gonzalez, Elizabeth Jamka, Maxwell Gillum, Elizabeth Serna-Sanchez, Alisson Kerr, Dan Killelea - *Investigation of carbon monoxide (CO) oxidation on Rh(111) with reflectance absorbance infrared spectroscopy (RAIRS) and temperature program desorption (TPD)*
- P10 Amit K. Datta, Nikhila C. Paranamana, Andreas Werbrouck, Patrick J. Kinlen, Matthias J. Young - *Synthesis of disulfide polymer by oxidative molecular layer deposition (oMLD)*
- P11 Zhixin Zhang, Axel Hoffmann - *FeGaB alloys for magnetoelastic coupling at microwave frequencies*
- P12 Musa O. Azeez, Andreas Werbrouck, Nikhila C. Paranamana, Matthew R. Maschmann, Matthias J. Young - *Examining UV-induced functional group formation on 2D nanomaterials for patterned ALD*
- P13 Shima Mehregan, Mahya Mehregan, and Matthias J. Young - *Oxidative molecular layer deposition of polythiourea: unraveling its electrochemical and chemical characteristics*
- P14 Maxwell Gillum, Arved Dorst, Alexis Gonzalez, Elizabeth Serna-Sanchez, Allison Kerr, Stephanie Danahey, Tim Schaefer, Daniel Killelea - *Characterization of oxygen species on Rh-based model catalysts*
- P15 Jasper Brown and Steven J. Sibener - *Even-odd directed dehalogenation of bromine terminated alkane sams via atomic hydrogen*
- P16 Elizabeth A Jamka, Francisco Lizano, & Steve J Sibener - *Sticking probabilities of carbon dioxide (CO<sub>2</sub>) isotopologues*
- P17 Yufei Bai,<sup>1</sup> David L. Wisman,<sup>1,2</sup> and Steven L. Tait<sup>1</sup> - *Using Single-layered COFs to Stabilize Single-atom Catalysts on Model Surfaces*

- P18 Seth Putnam, Joaquin Rodriguez-Lopez - *Redox-Active Spin Traps for the In-Situ Investigation of Radical Species at Electrocatalytic Interfaces*
- P19 Yong-Yun Hsiau, Bernadette Cladek, Liz Griffin, Roberto dos Reis, Gabriel Trindade dos Santos, Katharine Page, Vinayak P. Dravid, Nicola H. Perry - *Growth, structure, and kinetics of triple-conducting vertically aligned nanocomposites*
- P20 Jongmin Lee, Haley B. Buckner, Nicola H. Perry - *Proton surface exchange coefficients of perovskite thin films for efficient steam electrodes in protonic ceramic electrolysis cells*
- P21 Zirui Wang, Michael A. Pence, Joaquín Rodríguez-López - *An automated platform for high-throughput surface interrogation studies on electrochemical energy storage materials*
- P22 Alexia Popescu, Supriyo Majumder, Michael Bedzyk, Nicola H. Perry - *Understanding the transitioning surface exchange behavior between pure proton conducting to triple conducting thin films for steam electrodes*
- P23 Supriya (Riyo) Das, Joaquin Rodriguez Lopez - *Harnessing electrostatics for the conversion of biomass inside a microdroplet to generate value-added products (DROPLETS Project)*
- P24 Effie Gong, Myoung-Woo Yoo, Axel Hoffmann - *Enhancing the Magneto-Optical Kerr Effect in Non-collinear Antiferromagnets via a Dielectric Layer*
- P25 Van Do, Helena Lew-kiedrowska, Chi Wang, and Steven J. Sibener - *In-situ characterization of Au capping on superconducting Nb(100)*
- P26 Aditi Prasad, Joaquin Rodriguez-Lopez - *In-situ detection of reactive oxygen species generated from aptamer-based electrochemical biosensors using SECM*
- P27 Sipei Zhang, Zhengwu Fang, Miaofang Chi, Nicola H. Perry - *Influence of particle size on defect chemistry - transport - chemical strain coupling of mixed-conducting (Pr,Ce)O<sub>2-δ</sub> nanoparticles*
- P28 Jiu Kang, Chi Thang Nguyen, and Jeffrey W. Elam - *3D Ruthenium Block Design Strategy Using Area Selective Deposition Combined with Subsequent Etching*
- P29 Hrishikesh Tupkar, Jack Verich, Sila Alemdar, Jack McAlpine, Matthew A. Gebbie - *Enhancing Interfacial Capacitance Using Anionic Amphiphiles in Ionic Liquid Electrolyte Blends*
- P30 Samuel Johnstone, Seth Anderson, Matthew Gebbie - *Elucidating the Impact of Interfacial Anions on Electrochemical Reduction Reactions*
- P31 Shilpa Choyal, Buddhika S.A. Gedara, Michael Trenary, and Nan Jiang - *Probing metal nanocluster on graphene via scanning probe microscopy*
- P32 Chamath Siribaddana, Nan Jiang - *Surface-catalyzed Ullmann coupling via activation of highly labile C-I for nanostructure synthesis*
- P33 Sean M. Peyres, Hoang M. Nguyen, Chiedozie B. Ogueri, Necip B. Üner, David B. Go, and R. Mohan Sankaran - *Reaction and Diffusion of Plasma-Injected Solvated Electrons in Non-Aqueous Solvents*
- P34 Alaina Humiston, Jeff Terry, Daniel Olive, Mui (Andy) Lau, Ming Long, Evan Restuccia, and Timothy Stack - *X-ray Photoelectron Spectroscopy Data Fitting Using A Genetic Algorithm*









