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Northwestern | CENTER FOR ENGINEERING SUSTAINABILITY AND RESILIENCE

CESR Newsletter, January 10, 2025

CESR NEWS

Join CESR and the Center for Water Research at the Water Jamboree

The January 28th event will convene water researchers from across the university to explore pathways for growth and collaboration

Tuesday, January 28th, 3PM to 7PM

Nona Jo's Café, Walter Athletic Center (2255 Campus Drive, Evanston)

Register to attend and present a research slide

Event Contact: water@northwestern.edu

The **Center for Water Research** and the **Center for Engineering Sustainability and Resilience** invite you to participate in the development of a new, university-wide vision for water-related research, education, and impact at Northwestern. To jumpstart this process, we are planning a "Water Jamboree" on the afternoon of Tuesday, January 28, 2025.

Overall, we aim to further distinguish Northwestern nationally and globally in the space of one of the world's most pressing challenges, water. To do this, we would like to collect inputs from

all faculty and staff with substantive interest in water.

Specifically, the two objectives of the Jamboree are:

1. To understand and energize Northwestern's diverse and interdisciplinary water community, across arts and the humanities, the social and physical sciences, engineering, and beyond.
2. Explore opportunities for growth, innovation, and increased collaboration across disciplines, colleges, and campuses.

Participants are asked to provide a brief presentation of their water-related research. We will prepare a slide for you based on your responses to four questions found in **this link**. Please answer the questions by Tuesday, January 21. Each presenter will have approximately 60 to 90 seconds to talk through their replies, which will be projected to the attendees at the event. Even if you are unable to attend the event, we value your answers to these four questions.

ANNOUNCEMENTS and ACCOMPLISHMENTS of CESR FACULTY AFFILIATES

RECENT PUBLICATIONS

Randall Berry, Chair and Professor of Electrical and Computer Engineering; John A. Dever Professor of Electrical and Computer Engineering

Title: **"Spectrum Rights in Outer Space: Interference Management for Low Earth Orbit (LEO) Broadband Constellations"**
Authors: Randall Berry; Pedro Bustamante; Dongning Guo; Thomas Hazlett; Michael Honig; Ilia Murtazashvili; Scott Palo; Martin B. H. Weiss
Publication: Journal of Information Policy, December 9, 2024

Giuseppe Buscarnera, Professor of Civil and Environmental Engineering

Title: **"Phase-Field Modeling of Fracture Under Compression and Confinement in Anisotropic Geomaterials"**
Authors: Maryam Hakimzadeh, Carlos Mora-Corral, Noel Walkington, Giuseppe Buscarnera, Kaushik Dayal
Publication: International Journal for Numerical and Analytical Methods in Geomechanics, December 30, 2024

Vinayak Dravid, Abraham Harris Professor of Materials Science and Engineering; Founding Director, Northwestern University Atomic and Nanoscale Characterization (NUANCE) Center; Founding Director, Soft and Hybrid Nanotechnology Experimental (SHyNE) Resource, an NSF-NNCI Node

Omar Farha, Charles E. and Emma H. Morrison Professorship in Chemistry and (by courtesy) Chemical and Biological Engineering

Title: **"Oxidation-Driven Enhancement of Intrinsic Properties in MXene Electrodes for High-Performance Flexible Energy Storage"**
Authors: Yongfa Cheng, Kunmo Koo, Yukun Liu, Michael L. Barsoum, Zizhen Cai, Omar K. Farha, Xiaobing Hu, Vinayak P. Dravid
Publication: Advanced Functional Materials, December 15, 2024

David Dunand, Professor of Materials Science & Engineering

G. Jeffrey Snyder, Professor of Materials Science & Engineering

Title: **"Ink Casting and 3D-Extrusion Printing of Yb14MnSb11 for High-Temperature Thermoelectric Material"**
Authors: Ming Chen, Alex Pröschel, Kurt E. Star, Sabah K. Bux, G. Jeffrey Snyder, David C. Dunand
Publication: Advanced Functional Materials, December 20, 2024

Omar Farha, Charles E. and Emma H. Morrison Professorship in Chemistry and (by courtesy) Chemical and Biological Engineering

Title: **"Architecting Ultra-Robust Zr(IV) Metal–Organic Framework for Energy-Efficient Desiccant Air Conditioning"**
Authors: Wei Gong, Haomiao Xie, Kyung Ho Cho, Xianhui Tang, Jaedeuk Park, Zhijie Chen, Jinqiao Dong, Omar K. Farha, Yong Cui
Publication: Journal of the American Chemical Society, December 25, 2024

Title: **"Flexibility-frustrated porosity for enhanced selective CO2 adsorption in an ultramicroporous metal-organic framework"**
Authors: Xu Chen, Dhruv Menon, Xiaoliang Wang, Meng He, Mohammad Reza Alizadeh Kiapi, Mehrdad Asgari, Yuexi Lyu, Xianhui Tang, Luke L. Keenan, William Shepard, Lik H. Wee, Sihai Yang, Omar K. Farha, David Fairen-Jimenez
Publication: Chem, January 3, 2025

Omar Farha, Charles E. and Emma H. Morrison Professorship in Chemistry and (by courtesy) Chemical and Biological Engineering

Vinayak Dravid, Abraham Harris Professor of Materials Science and Engineering; Founding Director, Northwestern University Atomic and Nanoscale Characterization (NUANCE) Center; Founding Director, Soft and Hybrid Nanotechnology Experimental (SHyNE) Resource, an NSF-NNCI Node

Title: **"The Road Ahead for Metal–Organic Frameworks: Current Landscape, Challenges and Future Prospects"**

Authors: Michael L. Barsoum, Kira M. Fahy, William Morris, Vinayak P. Dravid, Benjamin Hernandez, Omar K. Farha
Publication: ACS Nano, January 3, 2025

Omar Farha, Charles E. and Emma H. Morrison Professorship in Chemistry and (by courtesy) Chemical and Biological Engineering

Randall Snurr, John G. Searle Professor of Chemical and Biological Engineering

Justin Notestein, Professor of Chemical and Biological Engineering; Chair of Chemical and Biological Engineering

Title: **"Unveiling the Critical Role of Spatial Organization on Enzymatic Cascade Reactions in a Crystalline Framework with Hierarchical Porosity"**
Authors: Fanrui Sha, Geunho Han, Kunhuan Liu, Milad Ahmadi Khoshooei, Yongwei Chen, Randall Q. Snurr, Justin M. Notestein, Omar K. Farha
Publication: ACS Materials Letters, December 30, 2024

Jean-François Gaillard, Professor of Civil and Environmental Engineering and (by courtesy) Earth and Planetary Sciences

Title: **"Drinking water treatment residuals reduce toxicity to fish from metal-contaminated sediments"**
Authors: Guillermo Kurita Oyamada, Kevin J Kroll, Lang Zhou, Marianne Kozuch, Samuel M Wallace, Jean-François Gaillard, Jean-Claude J Bonzongo, Nancy D Denslow
Publication: Environmental Toxicology and Chemistry, January 6, 2025

Mark Hersam, Walter P. Murphy Professor of Materials Science and Engineering; Chair of Materials Science and Engineering; Director, Materials Research Science and Engineering (MRSEC)

Title: **"Two-Dimensional Materials for Brain-Inspired Computing Hardware"**
Authors: Shreyash Hadke, Min-A Kang, Vinod K. Sangwan, Mark C. Hersam
Publication: Chemical Reviews, January 2, 2025

Title: **"Enhancing Mechanical Resilience in Li-Ion Battery Cathodes with Nanoscale Elastic Framework Coatings"**
Authors: Jong-Heon Lim, Jaehyun Kim, Jiwoong Oh, Jaesub Kwon, Kyoung Eun Lee, Youngsu Lee, Seongeun Park, Jun Lim, Dongwook Shin, Changshin Jo, Yong-Tae Kim, Janghyuk Moon, Mark C. Hersam, Kyu-Young Park
Publication: ACS Nano, January 3, 2025

Daniel Horton, Associate Professor of Earth and Planetary Sciences and (by courtesy) of Civil and Environmental Engineering

Title: **"Evaluation of historical precipitation interannual variability in CMIP6 over the United States"**
Authors: Ryan D Harp, Thierry N Taguela, Akintomide A Akinsanola and Daniel E Horton
Publication: Environmental Research: Climate, January 2, 2025

Julius Lucks, Professor of Chemical and Biological Engineering

Jean-François Gaillard, Professor of Civil and Environmental Engineering and (by courtesy) Earth and Planetary Sciences

Title: **“A Sensor for Detecting Aqueous Cu2+ That Functions in a Just-Add-Water Format"**
Authors: Tyler J. Lucci, Abigail Neufarth, Jean-François Gaillard, Julius B. Lucks
Publication: ACS Omega, December 19, 2024

Adilson Motter, Charles E. and Emma H. Morrison Professor of Physics and Astronomy

Title: **“Global network control from local information”**
Authors: Aleksandar Haber; Ferenc Molnar; Adilson E. Motter
Publication: Chaos, December 24, 2024

Yu Nie, Professor of Civil and Environmental Engineering

Title: **“Effective Timescale of the Northern Hemisphere Winter Circulation Waviness”**
Authors: Gang Chen and Yu Nie
Publication: Journal of Climate, December 23, 2024

George Wells, Associate Professor of Civil and Environmental Engineering

Title: **“Effect of NO Concentration on the Biological Conversion From NO to N2O under Thermophilic Conditions”**
Authors: Dan Li, George Wells, Wei Liu, Marvin Yeung, Lishan Niu, Jinying Xi
Publication: ACS ES&T Engineering, December 11, 2024

Title: **“Acyl-Homoserine Lactone Enhances the Resistance of Anammox Consortia under Heavy Metal Stress: Quorum Sensing Regulatory Mechanism”**
Authors: Chong-Jian Tang, Caiyan Qu, Xi Tang, Richard Spinney, Dionysios D. Dionysiou, George F. Wells, Ruiyang Xiao
Publication: Environmental Science & Technology, December 26, 2024

FUNDING OPPORTUNITIES

ALFRED P. SLOAN
FOUNDATION

Alfred P. Sloan Foundation
Energy and Environment Grant
Amount: Unspecified (recent grants average $500,000)
Deadline: Rolling (LOI)
OFR Contact: Catherine Cotter

The Sloan Foundation seeks letters of inquiry for collaborative social science research projects led by early- and mid-career scholars examining critical and under-explored questions related to issues of energy insecurity, distributional equity, and just energy system transitions in the United States.

Agilent
Solutions Innovation Research Award (SIRA)
Amount: In-kind support
Deadline: January 29, 2025

The Agilent Solutions Innovation Research Award (SIRA) program is excited to announce a new call for proposals for groundbreaking research on battery technology in the United States and Canada. We invite submissions that leverage advanced techniques such as gas chromatography, liquid chromatography, mass spectrometry, and gel permeation chromatography to explore cutting-edge advancements in battery, energy conversion, energy storage, and battery recycling research. Selected projects will receive Agilent's analytical instrument support in 2025 to drive impactful and innovative research in these critical fields.

Tata Steel
Reduction of Trivalent Chromium in Steel-Making By-Product Slag
Amount: $100,000
Deadline: February 28, 2025

LD slag is one of the most significant by-products of integrated steel plants around the world, particularly from the perspective of government agencies, regulatory bodies and local authorities. India generates more solid waste per ton of steel (approximately 1.2 tons) compared to Western countries (around 0.55 tons). Among this waste, LD slag contributes substantially, accounting for 120 to 180 kg per ton of steel produced. Current LD steelmaking processes generate slag with chromium concentrations that exceed acceptable thresholds for reuse, creating a pressing need for scalable solutions that enable this by-product transformation into valuable agricultural inputs. We are looking for solutions capable of reducing trivalent chromium concentrations from over 1500 ppm to less than 100 ppm in LD slag, ensuring safety and enabling its sustainable reuse.

Tata Steel
Argon Gas Purification and Recycling
Amount: $100,000
Deadline: February 28, 2025

We are looking for a solution to enable the a) use of industrial pipeline argon gas for optical emission spectrometry (OES) analysis of steel samples, ensuring the removal of impurities (including N2) and moisture, with the potential for argon gas recycling and regeneration in the process of usage, and/or b) regeneration/ recycling of used argon gas (supplied to OES from cylinders) in the OES process.

CONFERENCES and SEMINARS

BIOPROCESSING SEPARATIONS CONSORTIUM

Save the Date: Bioprocessing Separations Input and Innovation Forum
Host: Bioprocessing Separations Consortium
Thursday, February 6th, 2025
1:00 PM CT via Zoom

You are invited to participate in a listening day hosted by the Bioprocessing Separations Consortium, supported by the U.S. Department of Energy's Bioenergy Technologies Office (BETO).

This virtual, interactive forum will explore technical opportunities, identify knowledge gaps and prioritize challenges related to bioprocessing separations. We invite stakeholders from industry,

academia, and national laboratories to provide their expertise, insights, and vision for separations technologies in the bioprocessing sector.

We will discuss the current state of science in bioprocessing separations and highlight research and development needs for the community to address. We will also highlight the national laboratories user facilities that support the development of separations technologies and discuss how to collaborate with the labs. This workshop will include breakout sessions for stakeholders to provide input on the following topic areas:

- Identifying gaps that limit technology development and deployment in bioprocessing separations
- Defining and prioritizing streams and targets for bioprocessing separations
- Defining market opportunities and building strategic partnerships to make separations research and development at the national laboratories relevant to industry

REPORTS and ARTICLES

NOAA Announces BIL-IRA Awards Explorer

NOAA is launching a new interactive tool, the **BIL-IRA Awards Explorer**, to help constituents and policymakers track and understand investments made through the **Bipartisan Infrastructure Law** and **Inflation Reduction Act**.

The Explorer contains more than three years of data on grants and cooperative agreements implemented by NOAA to help communities across the country enhance their resilience to climate change, restore coastal and marine habitats, improve public safety and create jobs. Users can filter award data by state, program, and funding source for more than 900 awards that total $3.2 billion combined appropriations to NOAA.

The tool also features a filter to view awards by program goal, including reducing risks to communities from flooding, wildfire and drought, and advancing equity for underserved communities.

JOB OPPORTUNITIES

Tenure Track Assistant Professor in Mechanical Engineering
McGill University
Deadline: January 31, 2025 (review begins)

The Department of Mechanical Engineering at McGill University invites applications for one tenure-track position in Mechanical Engineering, preferably at the Assistant Professor level. The Department is particularly interested in the following areas: (1) Thermal energy systems, and (2) Combustion and alternative Fuels.

Assistant Professor of Coastal Engineering and Infrastructure Resilience
University of Maine
Deadline: February 17, 2025

The Department of Civil and Environmental Engineering (CIE) at the University of Maine (UMaine) invites applications for an academic year, tenure-track Assistant Professor position in coastal engineering and infrastructure resilience. The desired areas of expertise may include but are not limited to, coastal infrastructure risk assessment, coastal infrastructure design under uncertainty, and compound coastal extreme event assessment and impacts. The CIE program is especially interested in applicants whose focus includes equity and sustainability considerations in coastal engineering, particularly improving community resilience.

This position is a joint appointment between the Department of Civil and Environmental Engineering and the **Maine Sea Grant**. Maine Sea Grant, in partnership with the **University of Maine Cooperative Extension** and others, has a geographically dispersed Marine Extension Team that continually works with and identifies on-the-ground needs in coastal Maine communities to ensure that its work is relevant to the people of Maine. The MSG team has a deep commitment to capacity building and problem-solving to enhance the resilience of Maine's coastal communities.

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