

# JOM THE MAGAZINE

JULY 2024

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News and insights about TMS, its members, and the professions it serves

## The Future of Additive Manufacturing in Materials Education



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5700 Corporate Drive  
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USA  
Phone: 1-724-776-9000  
Web: [www.tms.org/JOM](http://www.tms.org/JOM)  
E-mail: [membership@tms.org](mailto:membership@tms.org)

#### Publisher for TMS

James J. Robinson,  
Executive Director

#### Operations Management

Matt Baker,  
Department Head, Content

#### JOM: The Magazine

Ashley-Anne Bohnert,  
Department Head,  
Marketing and  
Communications

Kelly Zappas,  
JOM: The Magazine Editor

Cheryl M. Geier,  
Senior Graphic Designer

#### Contributing Writers

Megan Enright,  
Marketing Administrator

Jillian Schultz,  
Digital Engagement  
Specialist

#### Graphics Support

David Rasel,  
Senior Manager,  
Brand and Digital Assets

Bob Demmler,  
Visual Communications  
Coordinator

#### Advertising

TMS Sales Team  
Phone: 1-724-814-3174  
Email: [sales@tms.org](mailto:sales@tms.org)

# TMS

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## ABOUT THE COVER



This issue kicks off a two-part series focused on the future of additive manufacturing in materials education. In this issue, you'll find an introduction to the topic by Kaitlin Tyler of Ansys, who serves as the *JOM* liaison from the TMS Education Committee, followed by a look at how Arizona State University is incorporating additive manufacturing in its materials program. This series will continue in the August online issue of *JOM* with a roundtable discussion among industry experts on AM challenges in the workforce. Illustrating the theme on this month's cover is a close-up image of a 3D printer nozzle and build plate, a stock photo from a private lab in Poland. Cover designed by David Rasel, Senior Manager, Brand and Digital Assets, TMS.



### Access Technical Journal Articles

**TMS members receive free electronic access to the full library of TMS journals, including *JOM*. Technical articles published in *JOM: The Journal* are available on the Springer website. TMS members should log in at [www.tms.org/Journals](http://www.tms.org/Journals) to ensure free access.**

### About *JOM: The Magazine*:

This print publication is excerpted from the publication of record, *JOM*, which includes both The Magazine and The Journal sections. *JOM: The Magazine* includes news and insights about TMS, its members, and the professions it serves. To access the publication of record, visit [www.tms.org/JOM](http://www.tms.org/JOM).

### About TMS:

The Minerals, Metals & Materials Society (TMS) is a professional organization that encompasses the entire range of materials science and engineering, from minerals processing and primary metals production to basic research and the advanced applications of materials. Learn more at [www.tms.org](http://www.tms.org).

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# TABLE OF CONTENTS



Volume 76  
Number 7  
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## // FEATURES

- 8:** TMS Presents the 2025 Board of Directors Nominees: Kelly Zappas
- 11:** The Future of Additive Manufacturing in Materials Education: Kaitlin Tyler
- 13:** Reprising Materials Science in the Additive Manufacturing Classroom: C. Noe, K. Brim, R. Sparks, N. Lindquist, and D. Bhate
- 17:** Introducing the TMS Mentoring Program: Kaitlin Calva
- 19:** Something for Everyone at Extraction 2025: Kaitlin Calva
- 22:** Superalloys 2024 Marks 15th Symposium in 56 Years: Kelly Zappas

## // DEPARTMENTS

- 3:** In the Final Analysis: James J. Robinson
- 4:** JOM Technical Topics
- 6:** TMS Member News
- 24:** TMS Meeting Headlines



# IN THE FINAL ANALYSIS

*"Thank you, sir! That'll give me a chance to catch up on my technical journals."*

—Montgomery Scott, *Star Trek*

Bear with me for a few sentences if *Star Trek* leaves you cold. Personally, I find the multiple television series, the movies, indeed, the whole kit and caboodle thoroughly exhilarating! I have many favorite characters throughout this universe, but for this month's editorial let us consider enduringly reliable *Enterprise* Chief Engineer Scott, or simply Scotty. His hard work, innovation, and technical expertise saved the ship on many occasions. Oddly, my favorite Scotty moment is not last-second engineering heroics but rather reference to keeping current with the literature, just like every real-life scientist and engineer! In the endlessly entertaining episode "The Trouble with Tribbles," Scotty rejoices at being confined to quarters for a disciplinary infraction as it gives him some down time to review the literature. For a show that was predictive of many of today's technologies from smart phones and digital assistants to additive manufacturing and artificial intelligence, it is good to know technical journals will remain stalwarts of the science and engineering community into the 22<sup>nd</sup> century.

Numbers vary, but some estimates point to there being more than 50,000 technical journals currently in circulation. Early in the 21<sup>st</sup> century, they are propagating like, well, tribbles, and that is not a good thing. Some of the emergent journals are "predatory," meaning that they present themselves as legitimate publications but have little to no credibility and can even cause harm to the careers of the people who publish within them.

A very-much-non-predatory journal is the one that you are reading right now: *JOM*, which is celebrating its 75<sup>th</sup> year of publication. It is the oldest member of the TMS family of journals, which currently number six. For serious-minded organizations like TMS, journal publishing is all about quality. We don't try to engineer or flim-flam our way into building reputation statistics but instead work hard to earn them.

All TMS journals are published through Springer Nature, and every issue of every TMS journal is freely accessible to all TMS members via Springer Link. As our publishing partner, Springer Nature also grants TMS members gratis access to 20 additional materials journals.

This suite of journals offered to TMS members is an exceptional benefit. I was recently reminded of that truth as I previewed the early returns from the Society's biennial membership survey. The benefit of highest value to TMS members? *"Free digital access to all TMS journals,"* with 71% of respondents saying the journals have "high value." Second most highly valued benefit? It is a tie at 61%: *"Free digital access to 20 selected journals published by Springer"* and *"Digital access to nearly 3,000 technical articles in the TMS Member Library."* Another interesting data point: 58% of survey respondents say that TMS is "excellent" at publishing scholarly journals.

For all of the volunteers, staff, and contractors who diligently work to advance each TMS journal, the survey responses are especially gratifying. They augur well for the Society as technical journals are mission critical to how TMS serves the materials science and engineering community. Journals are also an essential element of the TMS *enterprise*, being one of the two primary ways (along with events) that fund almost all other initiatives in which the Society engages.

Looking for a more meaningful intersection of *Star Trek* and technical journals beyond this editorial? I suggest visiting Springer Link and viewing one of my *JOM* favorites. From 1996: "Needed: Materials for 24th Century Starships—Considering the Materials Demands of the Star Trek Universe" by André Bormanis, then science advisor of the series *Star Trek: Voyager*. It's "fascinating," as Mr. Spock might say, . . . and it's in a technical journal.



James J. Robinson  
Executive Director



James Robinson

*"The benefit of highest value to TMS members? 'Free digital access to all TMS journals,' with 71% of respondents saying the journals have 'high value!'"*

Find peer-reviewed technical articles covering the full range of minerals, metals, and materials science and engineering in the July issue of *JOM: The Journal*. Each issue features several technical topics presenting a series of related articles compiled by guest editors. A preview of July technical topics and articles are listed below. TMS members can log in to [www.tms.org/Journals](http://www.tms.org/Journals) for full access to technical articles from *JOM: The Journal* and additional TMS journals.

Below is a sample of articles that will appear in the July issue, based on information available at press time. For the most up-to-date article listing, visit [www.tms.org/JOM](http://www.tms.org/JOM).

## // JULY 2024

### Aluminum: Eliminating GHG Emissions

**Editors:** Gudrun Saevarsdottir, Reykjavik University; Sai Krishna Padamata, Reykjavik University

**Sponsor:** Aluminum Committee

"Research on Aluminum Electrolysis from 1970 to 2023: A Bibliometric Analysis," **Xin Li**, et al.

"Anodic Behavior of  $Ni_{48}Fe_{47}Cu_5$  and  $Ni_{42}Fe_{38}Cu_{20}$  in Potassium-Rich NaF-KF- $AlF_3$ - $Al_2O_3$  Melts," **Sai Krishna Padamata**, et al.

"Overpotential on Oxygen Evolving Platinum and Ni-Fe-Cu Anode for Low Temperature Molten Fluoride Electrolytes," **Kamaljeet Singh**, et al.

"Anode Process on Gold in KF- $AlF_3$ - $Al_2O_3$  Melt," **Andrey Nikolaev**, et al.

### Characterization Techniques and Methods for Low-Carbon Metallurgical Processes

**Editor:** Zhiwei Peng, Central South University

**Sponsor:** Materials Characterization Committee

"Effect of Refining-Slag Basicity on Precipitation Behavior of Spinel Inclusions in Al-Killed Steel," **Xinbo Yan**, et al.

"Investigating the Effect of the Iron Ore Pellet Addition on the Interaction Among Blast Furnace Burden in the Cohesive Zone," **S. Sudhir**, et al.

"Effect of Magnesium on the Mineral Phase Composition of Ilmenite in CO- $CO_2$  Atmosphere Under Various Conditions," **Yufeng Guo**, et al.

"The Preparation of Magnesium from Magnesite by Using Atmospheric Microwave Al-C Reduction Method," **Teng Zhang**, et al.

"A Clean Process for the Recovery of Potash Fertilizer from Glauconitic Rock via Hydrogen Gas Pre-treatment and Mild Acid Leaching," **Saurabh Shekhar**, et al.

"Effects of Thermo-mechanical Parameters on Microstructural and Mechanical Properties of API X70 Steel," **Sami Zidemel**, et al.

"Effect of Operation Parameters on the Inclusion Redistribution in the VAR Process," **Dongbin Jiang**, et al.

"Synergistic Mechanism of Sodium Fluorosilicate and Sodium Chlorate in the Extraction of Vanadium from Stone Coal," **Tao Long**, et al.

"Clean and Efficient Recovery of Valuable Metals from Bismuth Sulfide Concentrate by Low-Temperature Alkaline Smelting," **Wei Jin**, et al.

"Recovery of Ni and Co Elements from Superalloy Leaching Solution by Sodium Roasting and Water Leaching," **Junchen Liu**, et al.

"Study on the Quenching Hydration of Calcined Hydromagnesite and the Dissolving Properties of the Hydrated Products," **Xiaoja Tang**, et al.

"Enhanced Carbonation of Free CaO in Basic Oxygen Furnace Slag Under High Temperature and Moderate Pressure and its Kinetics," **Zhenghao Wang**, et al.

"Effect of Magnetic Field Intensity on Carbothermal Reduction Characteristics of Bayan Obo Iron Ore," **Jin-tao Jiang**, et al.

"Electrosynthesis of Titanium from High-Titanium Slag with Short-Process in Molten  $CaCl_2$ ," **Shiyu Wang**, et al.

"Activation Behavior and Mechanism of Sodium Sulfate for Iron Recovery from Red Mud through Magnetization Roasting-Magnetic Separation,"

**Mingxia Li**, et al.

"Preparation of Foam Glass Ceramics by Sintering of Hazardous Waste Vitrification Slag and Biochar,"

**Yuyang Long**, et al.

"Technology Optimization Analysis of Three-Roll Rotary Piercing Process for Seamless Steel Pipe,"

**Hao Liu**, et al.

"Phase Transformation Law of Manganese and Iron Oxides in Ferromanganese Ore During Gas-Based Simultaneous Reduction Roasting,"

**Meng-fei Li**, et al.

"Investigation of Direct Reduction of Copper Slag using Castor Oil as a Green Reductant: Metal Recovery, Reduction Characterization and Kinetic Analysis,"

**Yaohuan Wang**, et al.

"Effect of Basicity on Reduction Swelling of Bayan Obo Iron Ore Pellets: XRD and Mössbauer Analysis,"

**Yifan Chai**, et al.

"Novel Synthesis of CuW Composite Containing Micro- and Nano-tungsten Particles Coated with  $Si_xW_y$  Phase via Silicothermic Coupling with Aluminothermic Reduction,"

**Chu Cheng**, et al.

## Materials Processing and Kinetic Phenomena: In Honor of Carl V. Thompson

**Editors:** **Hang Yu**, Virginia Polytechnic Institute and State University; **Matteo Seita**, University of Cambridge; **Steven Boles**, Norwegian University of Science and Technology; **Jihun Oh**, Korea Advanced Institute of Science and Technology; and **Jerrold Floro**, University of Virginia

**Sponsor:** Thin Films and Interfaces Committee

"A Study on the Correlation of Liquid Kinetic and Thermodynamic Distribution Mapping,"

**Yangyang Zhang**, et al.

"Homogeneous Growth of 3C-SiC Crystal Surface at Solid-Liquid Interface and Its Competitive Relationship,"

**Tinghong Gao**, et al.

"Multi-Scale Simulation of Templated Casting: Understanding the Solidification Dynamics of Pb Nanowires,"

**Amir Reza**, et al.

"Holistic Processing of Sawdust to Enable Sustainable Hybrid Li-Ion Capacitors,"

**Xiaoyang Guo**, et al.

"Morphology Evolution of CuO Supported on CeO<sub>2</sub> and its Role in Electrochemical CO<sub>2</sub> Reduction,"

**Seungwon Hong**, et al.

"Thin Film NiCr-, TiCr- and CuNi-Based Cermets for Low-Temperature Ultra-Low Magnetoresistance Thermometers,"

**J.E. Palmer**, et al.

"Research Progress of Ultrasonic Impact Composite Arc Cladding Technology on Engineering Alloys: A Review,"

**Yiliang He**, et al.

"Design of Shape Memory Ceramics: Principles, Strategies and Perspectives,"

**Wangshu Zheng**, et al.

"Advances in Experimental Studies of Grain Growth in Thin Films,"

**Katayun Barmak**, et al.

## View More Technical Articles

*JOM* regularly publishes additional articles that fit within the scope of the journal, but not within the scope of a particular technical topic. Read these in the "Technical Articles" section of *JOM* on Springer.



# TMS MEMBER NEWS

## Share the Good News!

Contact Kelly Zappas, *JOM: The Magazine* editor, at [kzappas@tms.org](mailto:kzappas@tms.org) to share your professional accomplishments. Please note that only news submitted by current TMS members will be considered.

## Apelian Receives WPI Presidential Medal

The Worcester Polytechnic Institute (WPI) awarded its Presidential Medal to TMS member **Diran Apelian** for his innovative research and entrepreneurship in materials science and engineering. The Presidential Medal, established in 2001, recognizes individuals who exemplify the 'technological humanist' ideal at the heart of WPI's approach to education. Balancing theoretical studies with practical application, WPI states that it prepares students to take the knowledge they learn in the classroom and use it, not only to advance the frontiers of science and technology, but to serve the greater public good.

Apelian is a distinguished professor of materials science and engineering at the University of California, Irvine and a former provost and faculty member at WPI, where he founded the Metals Processing Institute. He was elected a

TMS Fellow in 2006 and served as president of the Society in 2008. His research has helped establish mechanisms and fundamentals in metal processing and helped lay the foundations for significant industrial developments. More recently, his work in the development of technologies to recover and recycle materials has become critically important for a sustainable future. He is a member of the National Academy of Engineering, European Academy of Sciences, National Academy of Inventors, and the Armenian Academy of Sciences.

TMS member **Diran Apelian** (center) received Worcester Polytechnic Institute's Presidential Medal Award from **William Fitzgerald** (left), chairman of WPI's board, and **Grace J. Wang** (right), WPI president. (Photo Credit: University of California, Irvine)



## Tripathi Appointed Research Assistant Professor



**Pawan Tripathi**

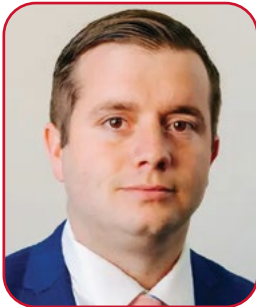
Congratulations to TMS member **Pawan Tripathi** on his faculty appointment to research assistant professor in the Department of Materials Science and Engineering at Case Western Reserve University (CWRU). His promotion comes on the heels of a postdoctoral scholar position in the same department at CWRU.

Tripathi's work focuses on materials data science, with an expertise in interface structural simulations and data analysis developing automated analysis pipelines for large multimodal datasets from diverse experiments. He is currently leading projects related to materials data science at the Center of Excellence for Materials Data Science for Stockpile Stewardship (MDS3).

As a TMS member, Tripathi was a member of the organizing committee for the 2nd World Congress on Artificial Intelligence in Materials and Manufacturing (AIM 2024), recently held in conjunction with the TMS Specialty Congress 2024.



## TMS Members Meet at OTC 2024



**Dillon Hoffman**

*Photo courtesy of OTC 2024.*

Over the course of four days, TMS members attended technical programming, networking events, the vast exhibit, and more at the Offshore Technology Conference 2024 (OTC 2024). Held from May 6–9, 2024, in Houston, Texas, OTC 2024 featured carefully curated sessions, panels, and more that connected experts in the field. TMS is one of 12 sponsoring organizations of OTC.

TMS member **Dillon Hoffman** was named to the 2024 class of OTC Emerging Leaders at OTC 2024. The Emerging Leaders program recognizes young professionals with less than 10 years of experience who are making key contributions in the offshore energy sector. Hoffman is the Offshore Projects/Engineering Manager at the Couvillion Group LLC and has been a TMS member since 2023.

On Tuesday, May 7, 2024, members of the TMS OTC Programming Subcommittee met to discuss future TMS-sponsored programming at future iterations of OTC. Attendees included the TMS representative on the OTC Board of Directors, **Greg Kusinski**, Chevron; TMS Subcommittee Chairperson, **Indranil Roy**,

DAMORPHE; TMS Subcommittee Vice Chair, **Joseph Gomes**, Offshore Operators Committee; **Ting Roy**, DAMORPHE; **Thomas Shattuck**, Clifford Chance; and **Hongwei Wang**, Humanization Energy Materials Consulting LLC.

OTC will return to Houston from May 5–8, 2025. Start making plans to submit a paper or to attend. You can learn more at [2025.otcnet.org](https://2025.otcnet.org).



Members of the TMS OTC Programming Subcommittee meet at OTC 2024.

## MS&T Papers Added to TMS Member Library

More than 600 papers published as part of the Materials Science & Technology (MS&T) proceedings series are now available at no charge to TMS members through the TMS Member Library. The newest additions include papers from MS&T17, MS&T18, and MS&T19. Nearly 3,000 additional technical articles from TMS publications are also available through the site.

TMS members can access all of these resources by logging in to the TMS Member Library at [www.tms.org/MemberLibrary](https://www.tms.org/MemberLibrary). The collection can be searched by paper title, keyword, or author name. Members can log in to [members.tms.org](https://members.tms.org) for access to additional online libraries and journal subscriptions as part of their membership.

## In Memoriam

TMS offers its condolences to the family, friends, and colleagues of **Peter L. Kern**, who passed away on February 14, 2024. Kern attended Pratt Institute, earning his bachelor's degree in chemical engineering, and then the Institute of Technology of the University of Minnesota, where he earned his master's in mathematics. He became a professional engineer and in 1965, joined the New Jersey Zinc Company's Research Department, eventually rising to the position of vice president, technology and special products. Kern was a TMS member since 1970.

# TMS Presents the 2025 Board of Directors Nominees

Kelly Zappas

The individuals highlighted in this article have been nominated to fill open positions on the 2025 TMS Board of Directors. These candidates, if elected by the TMS membership, will be installed at the conclusion of the TMS 2025 Annual Meeting & Exhibition (TMS2025), scheduled for March 23–27, 2025, at the MGM Grand Las Vegas Hotel & Casino in Las Vegas, Nevada, USA.

Additional nominations for these positions may be submitted for Board consideration by any 25 TMS members by August 15, 2024. Nominations for qualified individuals should be sent to James J. Robinson, TMS Executive Director, at [robinson@tms.org](mailto:robinson@tms.org), and should include the nominee's name, biography, and written consent to serve if elected.

If additional candidates are proposed, a majority vote of TMS members will determine who fills the position. If no new nominations are received, the individuals named in this article will be automatically elected on August 16, 2024.

*The following individuals are the nominees for the open positions on the 2025–2028 TMS Board of Directors.*



Presidential Cycle  
**Viola L. Acoff**  
 University of  
 Mississippi

**Viola L. Acoff** is the dean of the School of Engineering at the University of Mississippi. She is also a full professor of mechanical engineering and a member of the Board of Directors for Carpenter Technology Corporation. Prior to this position, Acoff served for over 28 years in the College of Engineering at The University of Alabama (UA). Her last position at UA was associate dean for undergraduate and

graduate programs and professor of metallurgical engineering. Acoff received her B.S., M.S., and Ph.D. in Materials Engineering from the University of Alabama at Birmingham. Her areas of expertise are additive manufacturing, welding metallurgy, physical metallurgy, and materials characterization.

Acoff has served for over 25 years in various

volunteer aspects of TMS including serving on the TMS Board of Directors (as chair of Membership, Diversity & Development), the TMS Foundation Board of Trustees, and chair of the Ad Hoc Public & Governmental Affairs Sub-Committee on Racial Justice. She was also named the inaugural recipient of the TMS Ellen Swallow Richards Diversity Award.

Acoff has been awarded more than \$15 million in research grants, including a National Science Foundation (NSF) CAREER Award. Acoff has over 25 years' experience in increasing the number of STEM degrees awarded to students from groups underrepresented in the STEM fields. She has also introduced materials science to students at 82 of the nation's 107 Historically Black Colleges and Universities in just over a decade. From September 2015 to June 2023, Acoff led the Alabama Louis Stokes Alliance for Minority Participation Program, which is a statewide effort funded by the NSF. She has published over 80 peer reviewed papers and given over 100 talks on her research on every continent except Antarctica. Acoff is also very active in her community, which includes serving on the Board of Trustees for the Four Little Girls Memorial Fund.

*Image courtesy of Kevin Bain, Ole Miss Digital Imaging Services*



Membership Diversity & Development Director  
**Jenifer Locke**  
*The Ohio State University*

**Jenifer Locke** (she/her) is an associate professor in the Department of Materials Science and Engineering and the Fontana Corrosion Center at The Ohio State University (OSU). Her research group at OSU focuses on understanding environment assisted cracking (EAC) and corrosion of metals and alloys. She earned her Ph.D. in Materials Science and Engineering in 2010 from the University of Virginia and her B.A. in Physics from Wittenberg University in 2004. Locke's career in materials started after earning her

bachelor's degree when she worked for a year as an engineering aide at Wright Patterson Air Force Base in the Materials and Manufacturing Directorate at the Air Force Research Laboratory (AFRL). After earning her Ph.D., Locke worked from 2011 to 2014 for Alcoa in the Alcoa Technical Center (ATC), the R&D facility for Alcoa Inc. (the sectors now known as Arconic and Howmet). At Alcoa, she worked in alloy development, EAC, and corrosion largely of aerospace and automotive aluminum alloys. She returned to academia and started her position at OSU in 2015.

Her first TMS Annual Meeting was in 2005. She has been an active member in the TMS Diversity, Equity, and Inclusion (DEI) Committee and Corrosion and Environmental Effects Committee. In DEI specifically, she served as the *JOM* Liaison from 2019 to 2022,

leading *JOM: The Magazine* special sections related to best practices to enable participation and success for both seen and unseen areas of marginalization and underrepresentation. She has also served as vice-chair (2021–2022) and chair (2022–2024) of the DEI committee. Since 2022, Locke also been an active member of the Membership Diversity & Development Committee as the DEI representative and now a member-at-large.

Locke's passion for ensuring the places around her allow everyone, regardless of their identity, to engage fully and demonstrate their best abilities started early with engaging in trainings while in undergraduate and graduate school and after moving to help start and co-lead ATC's EAGLE (Employees at Alcoa for Gay, Lesbian, Bisexual, and Transgender Equality—an Alcoa-wide employee resource group) chapter. She then spent time on the corporate-wide EAGLE leadership team serving as the Alcoa Recruiting Lead going out to conferences and career fairs serving underrepresented and marginalized identities to showcase Alcoa's actions and goals related to diversity, equity, inclusion, and justice (DEIJ).

Locke has won several awards related to education, research, and her DEIJ work. She was named the TMS Frank Crossley Award winner in 2023, earned the 2023 AMPP Educator Award in honor of Herbert Uhlig, a 2020 National Science Foundation CAREER Award, 2020 Lumley Research Award from OSU, the 2018 Mars G. Fontana Award for outstanding teacher of the year, 2016 Office of Naval Research Young Investigator Award, and was named a Greater Pittsburgh Area Dignity and Respect Champion in 2013.



Light Metals Division Chair  
**Randy Beals**  
*Magna International*

During his nearly 30-year career, **Randy Beals** has demonstrated outstanding long-term service to the light metals industry by consistently providing technical and/or operating knowledge that has enhanced the competitiveness of the light metals industry. He has held technical leadership positions at automotive original equipment manufacturers (OEMs) (Ford and Chrysler), automotive suppliers (American Racing and Magna), aerospace

(Wellman Dynamics), and military (Materion) foundry sectors. He has been to hundreds of non-ferrous foundries all over the world. For the past twelve years, he has worked for Magna International, a leading global automotive supplier. He is part of the global production development team for Magna Cosma's eight high-pressure vacuum die casting foundries that service

multiple OEM customers.

He has been presenting at/attending the annual TMS and Materials Science & Technology (MS&T) conferences since he was an undergraduate, has served as the TMS Magnesium Committee chair, and has been a member of the TMS Aluminum Committee, the TMS Industrial Advisory Committee, and the TMS Awards Committee. Since 2022, he served as the TMS Light Metals Division (LMD) vice chair and looks forward to serving as the 2025 LMD chair on the TMS Board of Directors. He is the outgoing Board of Directors chair of the University of California Irvine/the Ohio State University Advanced Casting Research Center (ACRC) consortium and serves as a member on the External Advisory Board (EAB) for the Michigan State University CHEMS engineering department. He has been the recipient of Magna's 2018 Inspiring Innovator Award, Magna's 2021 Product Innovation Award, the American Foundry Society's 2021 Casting of the Year Award, and the 2022 Automotive News PACEpilot Innovation Award. Beals holds a master's degree in materials science and engineering from Michigan State University.



Materials Processing & Manufacturing Division Chair

**Carelyn Campbell**  
*National Institute of Standards and Technology*

**Carelyn Campbell** is the leader of the Thermodynamics and Kinetics group in the Materials Science and Engineering Division in the Material Measurement Laboratory at the National Institute of Standards and Technology (NIST). Her group is focused on developing a materials data and tool infrastructure for accelerating the optimization and development of new materials and processes for a range of applications. Campbell became a member

of TMS while an undergraduate in 1988 and has been an active member ever since. She was co-

organizer of the 2nd World Congress on Integrated Computational Materials Engineering (ICME) in 2013 and participated in several TMS studies including the TMS ICME Implementation Study Review Team (2013) and the Modeling Across Length Scales study (2015). Recently, she served as a Materials Processing & Manufacturing Division (MPMD) representative to the Program Committee and was the chair of the ICME Committee from 2016 to 2018.

Campbell received both her B.S. and Ph.D. in Materials Science and Engineering from Northwestern University. She has more than 25 years of experience in the development of multicomponent diffusion databases and the application of alloy design methodologies. She has received three Bronze Medals from the Department of Commerce for superior scientific achievement, was awarded a TMS Brimacombe Medal in 2016, and is a Fellow of ASM International.



Structural Materials Division Chair

**Clarissa Yablinsky**  
*Los Alamos National Laboratory*

**Clarissa Yablinsky** is a scientist and team leader in the Dynamic and Mechanical Testing Team within the Materials Science and Technology Division at Los Alamos National Laboratory (LANL). Over her career, she has worked to understand microstructure evolution in extremes, including high strain rate, high temperature, and irradiation environments. She currently works in the Nuclear Materials group, where she focuses on mechanical behavior of

actinide materials over a range of temperature and strain rates. Yablinsky received her B.S. in materials science and engineering from Carnegie Mellon University in 2004 and her M.S. and Ph.D. degrees in materials science and engineering from The Ohio State University in 2007 and 2010, respectively. Yablinsky was a research associate at the University of Wisconsin–Madison in the engineering physics department before joining LANL in 2013.

Yablinsky has been a TMS member since 2002, when she joined as a student. She began volunteering with the Diversity, Equity, and Inclusion (DEI) Committee and broadened her service to both technical and functional committees in 2012 when she won the TMS Structural Materials Division (SMD) Young Leaders Professional Development Award. In addition to DEI, she has served on the Financial Planning, Membership Diversity & Development, Leadership Recruitment, Material Advantage, Emerging Professionals, and Professional Development functional committees. She has been a member of the Nuclear Materials and Mechanical Behavior of Materials committees for over a decade and has served as the *JOM* advisor and chair of the Nuclear Materials Committee. Yablinsky has helped organize multiple symposia at TMS Annual and Materials Science & Technology (MS&T) meetings, such as Materials & Fuels for Current & Advanced Nuclear Reactors, Actinide and Lanthanide Materials, and Mechanical Behavior of Nuclear Reactor Components. She was also an advisor for the Fourth Summit on Diversity in the Minerals, Metals, and Materials Profession (DMMM4) in 2022 and was recently the general chair for the Materials in Nuclear Energy Systems (MiNES) conference in 2023.

## View the 2024 TMS Board of Directors

Visit [www.tms.org/BOD](http://www.tms.org/BOD) to view a complete listing of the current TMS Board of Directors and their biographies.

# THE FUTURE OF ADDITIVE MANUFACTURING IN MATERIALS EDUCATION

Kaitlin Tyler



Additive Manufacturing (AM)—a technology started in the 1980s using polymeric materials—has expanded rapidly in the last 40 years to be compatible with multiple material families and used in a wide range of industries, from biomedical to aerospace. What was maybe considered a technology only suited for prototyping and hobby makerspaces is now being used in products every day, allowing complex product geometries to be realized with significantly less material waste.

But with this new technology comes the need for materials skills and understanding. The thermal conditions experienced by metal powders during these processes—i.e., laser powder bed fusion (LPBF)—are significantly different than the same metal would experience during a bulk casting. This change in processing affects material properties, structure, and ultimately performance once in service in a product. If we as engineers expect AM to be as dominant a processing method as the trends suggest, the next and current generation of engineers needs



to be trained to understand and tackle the challenges that come with this relatively new processing technique. How do educators meaningfully include additive in their full curriculums? What do industry experts see as the key areas for workforce training?

At the TMS 2024 Annual Meeting & Exhibition, the Student-led Symposium, sponsored by both the Education and AM committees, focused exactly on this: Incorporating Additive Manufacturing in Materials Science and Engineering Education. I wanted to take this topic beyond the conference itself and shed some light, both from the academic and industry perspectives, on the future of additive manufacturing in materials education.

Our first article in this series is from Professor Dhruv Bhate and his team of Ph.D. students and multimedia developers from Arizona State University. They have worked to create an accessible, engaging, and impactful course in materials science focused on AM.

Our second article (to be published in the August online issue of *JOM: The Magazine*) is an interview with AM industry experts, focusing on challenges AM faces in the current workforce and the value AM has for the future of engineering.

Participants will include:

- **Kristin Mulherin**, Director, Additive Manufacturing Technology, Hubbell Incorporated
- **Callie Higgins**, Project Leader, Photopolymer Additive Manufacturing, NIST
- **Josh Cramer**, Director of Education and Work force Development, America Makes

I hope this set of articles helps inform and inspire other materials educators and industry leaders about the need for including technologies like AM in the classroom. Manufacturing techniques are ever evolving to address the new challenges we face. While I recognize that adding new content into curriculum is no small task, topics like Additive Manufacturing allow for a collaboration opportunity between industry and academia to work together to better prepare the next generation. I look forward to seeing how AM continues to evolve over the next years, from research to industry and finally in the classroom.

**Editor's Note:** *Incorporating Additive Manufacturing in Material Science and Engineering Education, the 2024 Student-Led Symposium, was organized by Bryan Crossman, a Ph.D. student, and Elvin Beach, an associate professor, both of The Ohio State University. This symposium was held on March 5, 2024, as part of the TMS 2024 Annual Meeting & Exhibition in Orlando, Florida.*



### Kaitlin Tyler

**Kaitlin Tyler** is currently an academic content development lead in the Ansys Academic Development Team. Her role is focused on managing the development of educational content that supports the usage of Ansys products in the classroom. She received her Ph.D. in Materials Science and Engineering at the University of Illinois Urbana Champaign. Her research was split: focusing on manipulating eutectic material microstructures and engineering outreach. She is the *JOM* Liaison for the TMS Education Committee and a member of the TMS Diversity, Equity, and Inclusion committee.

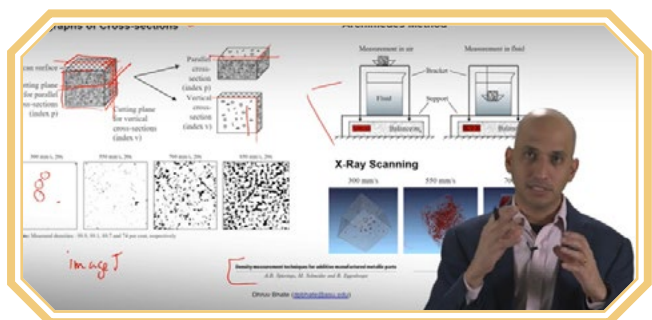
# REPRISING MATERIALS SCIENCE IN THE ADDITIVE MANUFACTURING CLASSROOM

C. Noe, K. Brim, R. Sparks,  
N. Lindquist, and D. Bhate

**It is said that Richard Feynman had the words “What I cannot create, I do not understand,” written on his blackboard at the time of his death.**

This is an apt, if opportunistic, position from which to begin the argument that if one is to truly understand materials, one must first create them. This article is about our five-year journey into making undergraduate materials science education more accessible, engaging, and impactful for our students at Arizona State University (ASU) by integrating it within a senior-level Additive Manufacturing (AM) course (MFG 472). Achieving this required the confluence of four foundational elements: pre-recorded lectures, accessible equipment, operator-level lab videos, and micro-classes on the floor, each discussed in turn in this article.

## Pre-Recorded Lectures



The flipped classroom model has been shown to be particularly useful in manufacturing education because it frees up classroom time for hands-on activities or team projects that are often made particularly feasible in the context of manufacturing.<sup>1,2</sup> For our course in AM, we pre-recorded lectures that described not only process science, but also reviewed key concepts in undergraduate materials science such

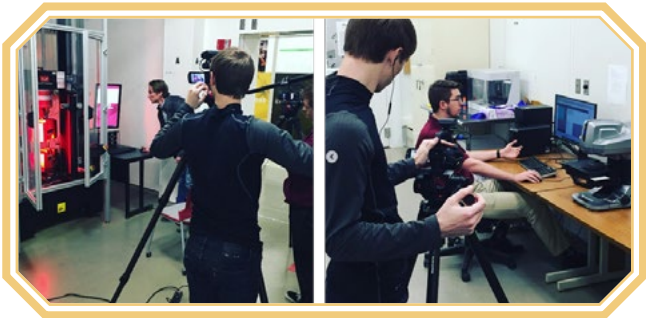
as process-structure-property relationships. Students were able to watch the videos and complete a 15–20 question quiz in our online learning management system prior to arriving in class for hands-on activities.

## Accessible Equipment



A critical element of enabling hands-on education in manufacturing and materials science is providing students access to processing and characterization technologies, respectively.<sup>3</sup> Our aim in designing this course was to have both technologies available in a central location with open access for students during the weekdays. While it has been shown in at least one study that engineering shops can be intimidating to undergraduates, makerspaces—with their emphasis on prototyping equipment and helpful staff—are more welcoming.<sup>4</sup> At ASU's Innovation Hub, we expanded our makerspace, holding equipment for six different AM processes, to include materials characterization equipment. It was crucial that all students were in one space to allow the instructor to monitor and participate in the activities, and that it be accessible to students outside of classroom time to address unexpected delays or explore tangential opportunities as they emerged.

## Operator-Level Lab Videos



A third foundational element we explored was the development of videos that provided operator-level training for each of the six AM processes and

associated characterization tools. While it is common to leverage videos to demonstrate manufacturing processes in action,<sup>5</sup> our technique promotes engagement by including operational details specific to the student's hands-on experience. This involves recording with multiple cameras in the same space in which students would later operate the equipment. The instructional content and high engagement of the videos meant that students would have some prior knowledge about operating the equipment before their first lab session. Students could also reference these videos during and after the session, promoting knowledge retention and independent exploration. Pictured are field training videos of mechanical tensile testing (left) and optical profilometry (right).

## Micro-Classes on the Floor



After the first three years of offering this course, we felt a need for additional intervention to close the loop on concepts taught in the lecture videos. Work by others suggests that having students complete hands-on activities *prior to* explaining underlying theory is more valuable than a theory-first approach.<sup>6</sup> As a result, we conducted short 15-minute conversational lectures with groups of five students each as they worked on their lab activities. The goal of this interaction was to check individual student understanding of lecture concepts and use the ongoing lab to relate these concepts more tangibly to their immediate experiences.

## Mapping Materials Science to Additive Manufacturing

To enable scalability for an in-person course leveraging limited resources, we designed the course as six different modules, pairing one AM process with one characterization technique to instill a deeper understanding of the material science concepts associated with each process (Figure 1). This pairing was developed based on accessibility to characterization equipment as well as ensuring the measurement was relevant to the process in



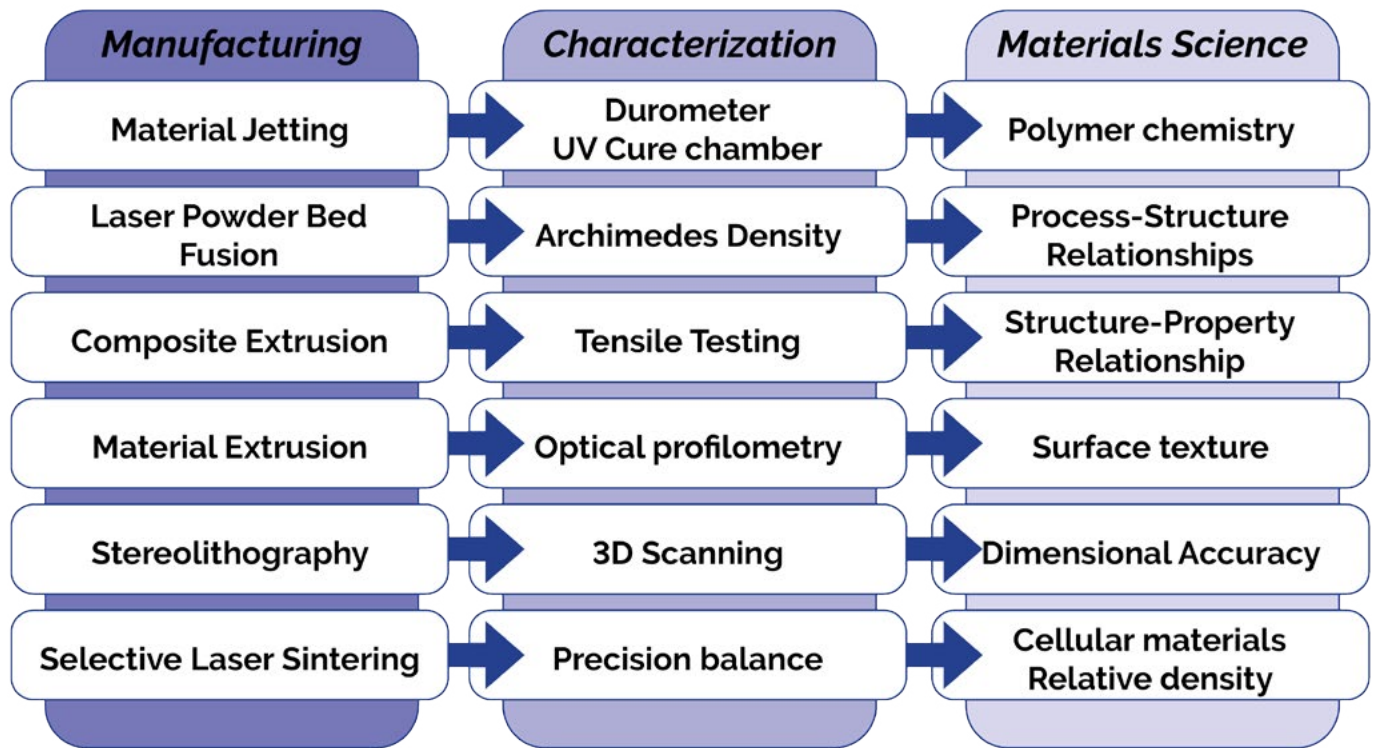


Figure 1. Mapping concepts in materials science to an additive manufacturing process, connected via a characterization technique.

question, such as measuring Archimedes density in Laser Powder Bed Fusion or the Shore hardness for Material Jetting specimens. Students in groups of five spent two weeks in each of these modules, which all ran simultaneously in the innovation hub. A total of 30 students took this course during each offering, which was supported by one instructor, one lab manager, and one undergraduate teaching assistant. Students were tasked with designing, 3D printing, and characterization tasks of varying complexity. They submitted their final 3D printed part along with the characterization data as a project report for each module.

## Conclusions

Student evaluations for this course have steadily risen over the past five years from 4.57 to 4.80 out of 5.00 as each aspect of the curriculum discussed here was put in place. (The response rate ranged between 30% and 60%.) While an imperfect indicator, it is nonetheless an affirming trend, especially when coupled with anecdotal feedback from students. The four elements of this course described in this article have also produced a few additional benefits not initially anticipated. The creation of studio-shot and edited lecture and multi-camera hands-on videos enabled the class to seamlessly transition to an online course specialization, now available on

Coursera's Additive Manufacturing Specialization,<sup>7</sup> with over 2,500 students in its first year of offering. It had achieved a rating (coincidentally) of 4.8/5.0 at the time of this writing. The videos also serve as training material for undergraduate and graduate researchers who may not have taken the course but wish to access the equipment used in it for their research projects. Over 50 such research students have benefited from the video content developed here. A total of 145 students have taken this course in the past five years. It is estimated that students facilitated more than 270 unique prints over this time. Critically, the course gave all students fundamental hands-on experiences with a wide variety of AM processes, highlighting the unique manufacturing advantages and disadvantages of each technology. Several students would go on to use the knowledge gained from the class to support their senior capstone design prototypes. Future steps include adding more modules and sessions to enable more students to participate and expanding the underlying methodology used in this course to other courses where such an approach may be beneficial.

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## ABOUT THE AUTHORS:



**Cameron Noe** is a Ph.D. student in the Arizona State University (ASU) manufacturing engineering program and a full-time employee of the university in the role of engineering associate. In both roles he works closely with advanced additive manufacturing equipment and processes at the ASU Innovation Hub, a unique makerspace for manufacturing engineering prototypes for student and faculty projects.



**Kyle Brim** is a multimedia developer in the Learning & Teaching Hub at ASU. He handles the creation of 3D assets for faculty members, manages the greenscreen studio and assists in the creation of specialized media such as bio videos for the faculty.



**Ryan Sparks** is currently a Systems Engineering Ph.D. student at ASU studying energy markets, resiliency, and policy. After completing his undergraduate degree, he began working as an associate instructional designer, helping enhance accessibility and improve learning outcomes in engineering courses.



**Nicholas Lindquist** has been a multimedia developer with ASU since 2016, where he manages the green screen video production studios at ASU's Polytechnic and Tempe campuses. He also manages a team of artists who build videos, graphics, animations, interactives, and extended reality experiences for ASU's engineering courses.



**Dhruv Bhate** is an associate professor at ASU in the School of Manufacturing Systems and Networks, where his research group (3DX Research) studies design and mechanics of additive manufacturing (AM) structures and materials.

# Introducing the TMS Mentoring Program

Kaitlin Calva



People are the cornerstone of any organization. Our members are truly why TMS is a success. From committee members to board directors, from meeting attendees to symposia organizers, from guest editors of our publications to you, our *JOM* readers. Every individual who participates in a Society initiative helps to drive forward our mission of promoting the global minerals, metals, and materials science and engineering professions and achieve the goals set forth in the TMS Aspires Strategic Plan.

There are many volunteer roles, such as those mentioned above, that advance these goals. But through a willingness to learn, collaborate, and forge meaningful connections, members possess a greater impact on the future of the Society than they may realize. Mentoring relationships are key in developing the next generation of leaders to guide TMS into the future.

That's why TMS is launching a new **Mentoring Program** in 2025 that will pair experienced mentors willing to commit their time and energy with mentees who are newer to the profession or to TMS. This program will accelerate development pathways of members towards TMS leadership opportunities and reduce the inertia associated with new member engagement.

This initiative provides an opportunity for materials science professionals to expand their networks, gain knowledge and insights, build new skills, and broaden their engagement with TMS.

## MENTOR & MENTEE CHECKLIST

If you are interested in participating in the TMS Mentoring Program in 2025, make sure you meet the following criteria.

To qualify as a **Mentor**, applicants must:

- Be a TMS Member with three or more years of experience volunteering within the Society
- Commit to the development of a leadership progression plan for the mentee
- Participate in regular, one-on-one mentoring meetings with their mentee throughout the duration of the program year
- Meet with the mentee at the TMS Annual Meeting and/or Materials Science & Technology (MS&T) conference and be willing to facilitate introductions to TMS members and activities

To qualify as a **Mentee**, applicants must:

- Be an active TMS Member (members at any career stage are eligible)
- Have an interest in actively contributing to the materials professions as a TMS member through participating in various committees, events, and special initiatives
- Meet their mentor in person at the TMS Annual Meeting and/or MS&T, and participate in regular phone or virtual check-ins



## THE BENEFITS OF BEING A MENTOR

Having a mentor comes with a number of obvious benefits for your career: helping to expand your professional network, giving you a resource to turn to with questions and for advice, and providing you with guidance in navigating career decisions. But what about the benefits of *being* a mentor?

Consider these insights from two members of the TMS Mentoring Program Working Group who also served as mentors in the TMS Leadership Development Initiative, the predecessor to the TMS Mentoring Program.



"Mentorship is one of the great force multipliers for progress. By participating in TMS's mentorship program as a mentor, I've been able to see young professionals evolve, assume responsibility, become leaders, and contribute to the society and the field in bold and exciting ways!"

—Jonathan Madison



"Being a mentor was an exceptional experience that also improved how I mentored students and post-docs in my research group."

—Megan Cordill

The TMS Mentoring Program encourages mentor applications from experienced TMS members working in industry, academia, or government. Visit [www.tms.org/Mentorship](http://www.tms.org/Mentorship) to apply for a mentor position.

### HOW DOES THE PROGRAM WORK?

Mentors and mentees will be matched based on application information such as education, professional experience, background, and volunteer experience. The pair will then meet regularly over the course of the program year, including at the TMS 2025 Annual Meeting & Exhibition (TMS2025) kick-off event for all participants. TMS2025 will be held March 23–27 in Las Vegas, Nevada.

What happens next is how real change is made. Together, mentors and mentees will develop and implement personalized Mentee Progression Plans that detail future volunteerism activities with TMS based on the mentees' aspirations. Mentors will assess their mentees' progress over the year and provide guidance for achieving their goals. Consequently, mentees will play a larger role within the Society, adding their voices to the organization.

### HOW DO I APPLY?

Applications are now open for both mentors and mentees for the 2025 program. Application forms are available at [www.tms.org/Mentorship](http://www.tms.org/Mentorship). The deadline to submit your information is September 30, 2024, but don't delay; mentee positions will be filled on a first-come, first-served basis and spots are filling up fast. If the maximum number of mentees has already been reached, you can add your name to a waiting list for next year's program.

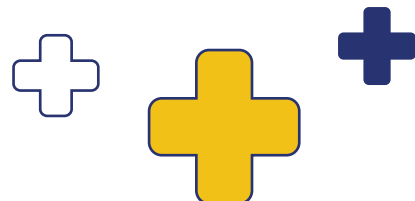
All matches will be made no later than December 15, 2024, and communicated to participants by January 15, 2025.

### QUESTIONS?

If you have questions about the program or are interested in becoming a TMS Mentoring Program Working Group volunteer, contact TMS Membership Program Manager Courtney Hammer at [chammer@tms.org](mailto:chammer@tms.org).

Great things can happen when great people are involved. With the Mentoring Program, TMS will help great people develop even greater skills, experience, and enthusiasm for service within TMS and the minerals, metals, and materials science and engineering professions.

**Kaitlin Calva is an independent contractor providing writing support for TMS and JOM: The Magazine.**



# Something for Everyone at Extraction 2025

Kaitlin Calva



November 16–22, 2025 • Phoenix, Arizona, USA

The **12th International Copper Conference (Copper 2025)** and the **6th International Symposium on Nickel and Cobalt (Ni-Co 2025)** will both be co-located with the Extraction 2025 Meeting & Exhibition. Watch for upcoming issues of *JOM: The Magazine*, which will feature a closer look at these co-located meetings. Learn more about each event and submit your abstract by November 1, 2024 at [www.ExtractionMeeting.org/Extraction2025](http://www.ExtractionMeeting.org/Extraction2025).

Six years ago, in a corner of the Westin Ottawa hotel, an experiment took place. For the first time ever, three North American metallurgical societies came together to stage an event that would establish a new legacy and meld new technical programming in one place. More than 800 individuals gathered to share their knowledge and discuss new ideas. Jointly organized by the Metallurgy and Materials Society (MetSoc) of the Canadian Institute of Mining, Metallurgy, and Petroleum (CIM), the Society for Mining, Metallurgy & Exploration (SME), and TMS, the metallurgical community came together in a way it never had before and the experiment—Extraction 2018—was extremely successful.

In fact, a post-event survey revealed a resounding positive impression with more than 90% of respondents indicating interest in a future event. And so MetSoc, SME, and TMS leadership began planning a second installment, with 2025 being the next year that would see an alignment of programming similar to 2018.

*JOM* talked to two members of the organizing committee for Extraction 2025, scheduled for November 16–22 in Phoenix, Arizona, to find out what attendees can expect out of this second iteration.

## ADDRESSING INTERCONNECTED ISSUES

“Extraction 2018 was a great success; however, things are evolving quickly for our industry. For example, copper, nickel, and cobalt will be required in greater amounts if our planet is going to meet its GHG (greenhouse gas) challenges and targets,” said **Nathan Stubina**, PACE Global, who is the conference co-chair representing MetSoc.

A key facet of Extraction 2025 is that it not only addresses the challenges that are facing the industry today, but also that it gives attendees an opportunity to join together and find creative solutions. The issues facing the extractive metallurgy industry are so connected to other sectors across the world, there is a real need to look at the issues in new ways.

“Everybody’s talking about moving from a carbon-based society to a materials-based society, where we use materials for clean energy, clean mobility. It’s going to lead to a high future demand for all kinds of metals, battery materials, copper, aluminum . . . it’s really across many industries,” noted **Christina Meskers**, SINTEF, who is the conference co-chair representing TMS. “Energy efficiency is high on the agenda, but also energy prices and the effect this has

on regional production capacity. That connects to the need to decarbonize, which is a huge endeavor.”

Extraction 2025 is uniquely positioned to tackle the challenges of the industry in a well-rounded manner. That is, thinking about the cause-and-effect nature of each solution as well as each issue, including any ramifications on other parts of the supply chain or society at large. For example, Meskers notes, “digitalization and sensing automation is one of the great trends across the board, but that impacts the metals industry which segues into ethical supply chains. And also biodiversity and the impact on nature by industry. This is linked to sustainable development goals—it’s not only climate change and energy, CO<sub>2</sub> reduction. It’s also, what is the impact? How can we reduce that impact? Can we become nature and climate positive?”

“And then one very important issue is people—people with the right education, the right training, the right skills,” she continued. “We’re looking at a tremendous amount of interconnected issues at the same time.”

## MEET THE CONFERENCE CO-CHAIRS

Extraction 2025 is jointly organized by the Metallurgy and Materials Society (MetSoc) of the Canadian Institute of Mining, Metallurgy, and Petroleum (CIM), the Society for Mining, Metallurgy & Exploration (SME), and TMS.



**Nathan M. Stubina**  
PACE Global, Canada  
MetSoc



**Kimberly Mills**  
Samuel Engineering, USA  
SME



**Christina Meskers**  
SINTEF, Norway  
TMS

## COMBINING TRADITIONAL WITH TOPICAL

"In addition to the always popular Copper and Nickel-Cobalt conferences, Extraction 2025 will have a series of cross-cutting symposia that will touch on crucial topics," said Stubina.

While not entirely new to Extraction, the cross-cutting symposia are at the forefront this time around. "We really want to facilitate that kind of cross-commodity learning," Meskers added.

Designed to create a dialogue on common interest topics, the cross-cutting symposia will provide forward-looking, multi-disciplinary, and societal perspectives. Planned sessions at press time included:

- **Industry 4.0:** Digital Twins, Machine Learning, Artificial Intelligence, Process Control, Sensors/Measurement
- **Strategies for Decarbonization:** Energy & Materials Efficiency, Green Energy & Industrial Electrification, Low-Carbon Fuels & Feedstocks, Carbon Capture and Utilization
- **Recycling and the Circular Economy:** EV Batteries, Residues, Reprocessing, LCA, E-waste, Catalysts, Slag Valorization
- **Responsible Mining/Processing:** Health & Safety, Environment, Tailings, Transportation/Haulage, Automation, ISL/ISR, Water Usage, Indigenous Community
- **Economics and Markets:** Responsible Sourcing, Policy, Critical Minerals, By-products, Project Financing, Green Investments

"This event will be a combination of the traditional, with sessions on hydrometallurgy, pyrometallurgy, mineral processing, etc., while adding more topical sessions, such as black mass recycling, digital twins, decarbonization, etc.," Stubina offered. "There will be something for everyone."

Agreeing with her colleague, Meskers noted that most of the industry challenges on Extraction 2025's agenda were also on the agenda in 2018. The sophomore event will extend beyond what might typically be discussed at a technical meeting, she explained. "We're trying to shake things up a bit in creating a platform and putting certain topics on the agenda and having some space to discuss and bring in new insights as well."

The health and safety-related sessions, for instance, will delve into responsibility issues in addition to the more "classic" concerns. "Let's talk about relationships with indigenous communities—as new mines are developed, is there social acceptance from indigenous communities? What's the perspective of the community at large about having new mining or metallurgical projects closer to where they live? That's not a common topic at a metallurgical conference," she pointed out.

Additionally, the markets and economics sessions will go beyond relaying the current state of affairs to explore the dynamics at play between economics, policy, and financing. With each solution presented, more questions arise surrounding feasibility, timelines, budgets, and more.

"We already mentioned decarbonization and digitalization, the need to be responsible, to be more circular. Well, that all requires investments. Where is the money coming from to finance the transition? How are we going to realize the transition in a short time? Do we have enough people?" Meskers asked, providing a few sample queries.

In addition to technical sessions and panel discussions covering new technologies and the multitude of considerations that accompany them, Extraction 2025 organizers are planning short courses. "We want to work on that knowledge gap—to train the younger professionals in our industry but also have courses that address new topics," Meskers stated.

### CONVENING THE GLOBAL COMMUNITY

*"Learning from each other's experiences is really the idea behind these cross-cutting topics."*

—Christina Meskers,  
SINTEF, Norway

Extraction 2025 will offer a variety of opportunities for participants to network more formally and have discussions among themselves throughout the week. "Learning from each other's experiences is really the idea behind these cross-cutting topics," Meskers said. The collaborative nature of the event is an invaluable benefit for all attendees. By uniting the unique programming of three metallurgical organizations, attendees will get an experience like none other.

Extraction aims to bring the community together to address questions and approach challenges in a more holistic and sustainable way. The organizing team hopes to go a step further than combining industrial and theoretical insights by addressing the applied side of things and including players from all points of the supply chain.

"Everyone has an important role to play," Meskers stated. Including a variety of voices in the conversation is an essential element of solving some of the big issues facing the industry today. "It's these outside perspectives that can challenge our thinking about the issues," she explained.

"We are really convening the global community. There's going to be great networking, lots of highly relevant technical content, an opportunity to meet talent or bring junior colleagues to help build their network, and just to learn a lot from each other from across commodities on a lot of different topics," Meskers said.

"This is a can't-miss event and will bring delegates from around the world," Stubina added. "It is so important to attend these types of events and to listen and to learn from others. It's your chance to discuss and learn about the technologies that are important to you. If you only attend one event in 2025, this is the one that needs to be on your radar."

*"It's your chance to discuss and learn about the technologies that are important to you. If you only attend one event in 2025, this is the one that needs to be on your radar."*

—Nathan Stubina,  
PACE Global, Canada

"You will see your entire network in one place, and you will get lots of important and new ideas to think about," Meskers said. "You're going to see all your old friends and new friends in one place, and that's what I really like about Extraction."

### STAY TUNED FOR MORE

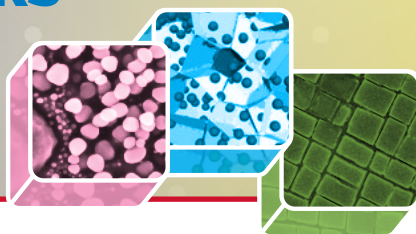
More details will be added to the website as events are confirmed for the conference. This includes, but is not limited to, poster sessions, networking events, industry tours, and short courses.

In the meantime, start preparing your work to participate in Extraction 2025. Visit [www.ExtractionMeeting.org/Extraction2025](http://www.ExtractionMeeting.org/Extraction2025) to find abstract guidelines and to submit an abstract for the Extraction 2025 cross-cutting symposia, the 12th International Copper Conference (Copper 2025), and the 6th International Symposium on Nickel and Cobalt (Ni-Co 2025). Abstracts for oral and poster presentations must be submitted by **November 1, 2024**.

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# SUPERALLOYS 2024 MARKS 15<sup>TH</sup> SYMPOSIUM IN 56 YEARS

Kelly Zappas



Once every four years, the International Symposium on Superalloys brings together members of the global superalloy community—including academics, supply chain representatives, and product-users—at the Seven Springs Mountain Resort in Champion, Pennsylvania. First held in 1968, this series is the longest-running symposium devoted to the topic and is considered *the* reference conference in the field of superalloys, according to **Jonathan Cormier** of ISAE-ENSMA & Institut Pprime in France, who will serve as chair of the 15th International Symposium on Superalloys (Superalloys 2024), to be held September 8–12.

A strong technical program and intentional networking opportunities are the two main reasons Cormier would encourage colleagues to attend the conference.

"There is a highly selective process for oral and poster presentations as well as a careful reviewing process of proceedings by experts, like for journal articles," said Cormier. "Such selection and reviewing processes ensure a very high technical quality for this conference."

The conference is also unique for its networking opportunities, Cormier continued, noting that free afternoons, a welcome reception, banquet, networking mixer, and barbecue are all built into the schedule to allow plenty of time to engage with fellow attendees.

"As an attendee since 2008, I have been able to develop unique collaborations with other academics or with industrial partners during each event," said Cormier. "This is also a wonderful opportunity to meet every major player in the supply chain, from aerospace propulsion and power generation to national labs and universities."

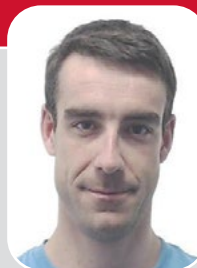
This year's event will be the first held in person since 2016. (The 2020 installment of the symposium was postponed and then held virtually in 2021.)

"I am looking forward to a great attendance from the different industrial sectors and a good balance between academia, national labs, and industry, especially considering that it has now been eight years since the last edition held in person in Seven Springs," said Cormier. "As the chair of the conference, I'd like each attendee to have a unique experience in terms of technical quality as well as for networking opportunities."

# SUPERALLOYS 2024

										B	C	N
										Al	Si	P
Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	
Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	
	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg		

## ORGANIZERS



### CONFERENCE CHAIR:

**Jonathan Cormier**,  
ISAE-ENSMA & Institut Pprime,  
France

### ORGANIZERS:

- **Ian Edmonds**, Rolls Royce, UK
- **Stephane Forsik**, Carpenter Technology, USA
- **Paraskevas Kontis**, Norwegian University of Science and Technology, Norway
- **Corey O'Connell**, Special Metals, USA
- **Timothy Smith**, NASA Glenn Research Center, USA
- **Akane Suzuki**, GE Aerospace Research, USA
- **Sammy Tin (Past Chair)**, University of Arizona, USA
- **Jian Zhang**, Institute of Metals Research, China

## KEYNOTE SPEAKER



**Steve Gregson**, a senior engineering fellow in the Engineering for Services Department at Rolls-Royce, will deliver the keynote presentation at Superalloys 2024. In his position at Rolls-

Royce, Gregson supports services across the global business including civil aerospace, defense, and power systems businesses. He has more than 35 years of experience at the company, split between product development and in-service support.

Gregson's featured talk, "Sustainability and Lifecycle Management of Nickel Superalloy Gas Turbine Components," will present a framework for optimizing product offerings while simultaneously working towards a sustainable future.



## TECHNICAL PROGRAM

The Superalloys 2024 technical program will cover topics traditionally explored in this conference series—alloy development, processing, mechanical behavior, coatings, environmental degradation—but it will also highlight technologies contributing to improved processability, affordability, life prediction, and performance of superalloys.

"In addition to the traditional themes of the conference, there will be a special focus this year on the repair and refurbishment of components made of superalloys, with a special session focusing on advanced repairing techniques, as well as a special short course given by Professor Pedraza (La Rochelle University, France), who used to work with a maintenance shop and who is still highly connected to MRO (Maintenance Repair Overhaul) activities," said Cormier. "The Keynote presentation given by Dr. Gregson from Rolls Royce will also introduce some key challenges regarding MRO services for end-users as well as challenges regarding the use of some key chemical elements of superalloys and the need for advanced lifing methodologies."

Presentations delivered at the conference will be published as part of the Superalloys conference proceedings series. Attendees will receive electronic access to a PDF ebook of the proceedings. You can search and view papers from past installments of the symposium at no charge through the online Superalloys proceedings archive at [www.tms.org/SuperalloysArchive](http://www.tms.org/SuperalloysArchive).

## SYMPOSIUM VENUE AND TOUR

Superalloys 2024 will be held at the Seven Springs Mountain Resort in Champion, Pennsylvania, located approximately 75 miles (120 kilometers) from the Pittsburgh International Airport. Due to the remote nature of the conference venue, attendees are encouraged to stay at the Seven Springs Mountain Resort, where all technical programming and social events will take place. Shuttle transportation is available from the airport to the hotel.

When booked through the conference website, nightly per person room rates at Seven Springs will include daily breakfasts and dinners, featuring a symposium banquet on Tuesday and a symposium barbeque on Wednesday. (Guests staying off-property will need to purchase tickets separately to attend the Symposium Awards Reception, Banquet, and/or Barbeque.) Reserve your room by August 8 at [www.tms.org/Superalloys2024](http://www.tms.org/Superalloys2024).

An optional tour of Fallingwater, a house designed in 1935 by American architect Frank Lloyd Wright, can be added to any conference registration, as well. The deadline to register for the tour is July 15.

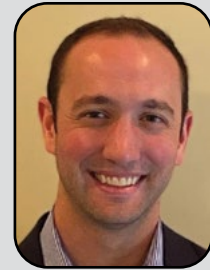
## SHORT COURSES

Two short courses will be offered on Sunday, September 8, in conjunction with Superalloys 2024. Each course will last for an hour and a half and is led by expert instructors. You can sign up for one or both courses when you register for the conference. The offerings and instructors are:

### Advanced Characterization Methods to Understand Deformation Mechanisms in Superalloys



**Paraskevas Kontis**  
Norwegian University of  
Science and Technology  
(NTNU)



**Tim Smith**  
NASA

### Repair Operations of Engine-Run Turbine Airfoils and Future Challenges in Superalloy Materials



**Fernando Pedraza**  
La Rochelle  
University

## HOW TO REGISTER

Visit [www.tms.org/Superalloys2024](http://www.tms.org/Superalloys2024) to register for the symposium as soon as possible. The deadline to register at the discounted early registration rate is July 15; after that date, rates will increase. During the registration process, you will be able to sign up for Sunday's short courses, purchase tickets to Tuesday's Fallingwater tour, reserve shuttle transportation from the airport to the hotel, and pre-order print copies of the conference proceedings.

Make your plans now and join your colleagues in September for Superalloys 2024.

# TMS MEETING HEADLINES

Meeting information is current as of April 30, 2024. For the most recent updates on TMS-sponsored events, visit [www.tms.org/Meetings](http://www.tms.org/Meetings).

## 15th International Symposium on Superalloys (Superalloys 2024)



September 8–12, 2024  
 Champion, Pennsylvania,  
 USA

**Discount Registration Deadline: July 15, 2024**

**Housing Deadline: August 8, 2024**

Superalloys 2024 will be located at the Seven Springs Mountain Resort, in the heart of the Allegheny Mountains. Due to the remote nature of the conference venue, staying at the conference location will provide convenient access to technical session rooms and social functions.

[www.tms.org/Superalloys2024](http://www.tms.org/Superalloys2024)

## TMS Fall Meeting 2024 at Materials Science & Technology (MS&T24)



October 6–9, 2024  
 Pittsburgh, Pennsylvania,  
 USA

**Make Plans to Attend**

TMS presents robust programming, networking and social activities, and professional development events tailored to its members' interests within the broader structure of the MS&T conference series, giving members an opportunity to experience both their TMS community and the resources of all the MS&T partnering societies.

[www.tms.org/TMSFall2024](http://www.tms.org/TMSFall2024)

## TMS Specialty Congress 2025



June 15–19, 2025  
 Anaheim, California,  
 USA

**Abstract Submission Deadline: October 30, 2024**

The TMS Specialty Congress annually convenes the Society's recurring specialty meetings into one, synergistic event with a single registration fee. This enables attendees to explore their particular technical interest in-depth, while also having access to cross-disciplinary learning and collaboration opportunities.

[www.tms.org/SpecialtyCongress2025](http://www.tms.org/SpecialtyCongress2025)

## OTHER MEETINGS OF NOTE



**TMS 2025 Annual Meeting & Exhibition (TMS2025)**

March 23–27, 2025  
 Las Vegas, Nevada, USA

[www.tms.org/TMS2025](http://www.tms.org/TMS2025)



**Extraction 2025 Meeting & Exhibition (Extraction 2025)**

November 16–22, 2025  
 Phoenix, Arizona, USA

[www.extractionmeeting.org/Extraction2025](http://www.extractionmeeting.org/Extraction2025)



**TMS 2026 Annual Meeting & Exhibition (TMS2026)**

March 15–19, 2026  
 San Diego, California, USA

[www.tms.org/TMS2026](http://www.tms.org/TMS2026)

## CO-SPONSORED MEETINGS

**4th International Symposium on Electrometallurgy - part of the 63rd Conference of Metallurgists (COM 2024)**

August 19–22, 2024  
 Halifax, Nova Scotia,  
 Canada

*Co-organized by TMS*

**Solidification and Casting of Aluminium Alloys: From Basics to Technology**

September 2–6, 2024  
 Brunel University, London,  
 United Kingdom

*Co-sponsored by TMS*

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# THE WORLD COMES HERE.

# TMS 2025

## 154<sup>th</sup> Annual Meeting & Exhibition

**March 23–27, 2025**

MGM Grand Las Vegas Hotel & Casino

Las Vegas, Nevada, USA

#TMSAnnualMeeting | [www.tms.org/TMS2025](http://www.tms.org/TMS2025)



## TIME IS RUNNING OUT!

### SUBMIT YOUR ABSTRACT TODAY

Act now to present your work at the TMS 2025 Annual Meeting & Exhibition (TMS2025) in Las Vegas. This year's technical program consists of **more than 100 symposia** in 11 topic tracks. Choose the one that most closely matches your interests!

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- Biomaterials
- Data-Driven and Computational Materials Design
- Electronic, Magnetic, and Energy Materials
- Light Metals
- Materials Degradation and Degradation by Design
- Materials Synthesis and Processing
- Mechanics of Materials
- Nuclear Materials
- Special Topics

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