

# JOM THE MAGAZINE

AUGUST 2022

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5700 Corporate Drive  
Suite 750  
Pittsburgh, PA 15237  
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

Lynne Robinson,  
Department Head, Marketing  
and Communications

Kaitlin Calva,  
Magazine Principal Editor

Cheryl M. Geier,  
Senior Graphic Designer

#### Contributing Writers

Ashley-Anne Bohnert,  
Marketing Manager

Megan Enright,  
Marketing and Editorial  
Specialist

Ann Ritchie,  
Technical Communications  
Lead

Kelly Zappas,  
Membership Communications  
Lead

#### Graphics Support

David Rasel,  
Head of Visual  
Communications

Bob Demmler,  
Visual Communications  
Coordinator

#### Advertising

Contact [sales@tms.org](mailto:sales@tms.org)  
for information.

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## ABOUT THE COVER



This issue's cover design represents the themes articulated in this month's feature article series organized and authored by TMS Education Committee members. This thematic group of articles focuses on the importance of communication within materials science and engineering education. Regardless of the career paths that students may choose upon entering the workforce, clear communication to technical and non-technical audiences is a crucial skill needed across industry, academia, and government. The inset graphic with the cover's bottom ribbon connects *JOM: The Magazine* to its technical counterpart, as *JOM: The Journal* debuts the 2023 editorial calendar.



## 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 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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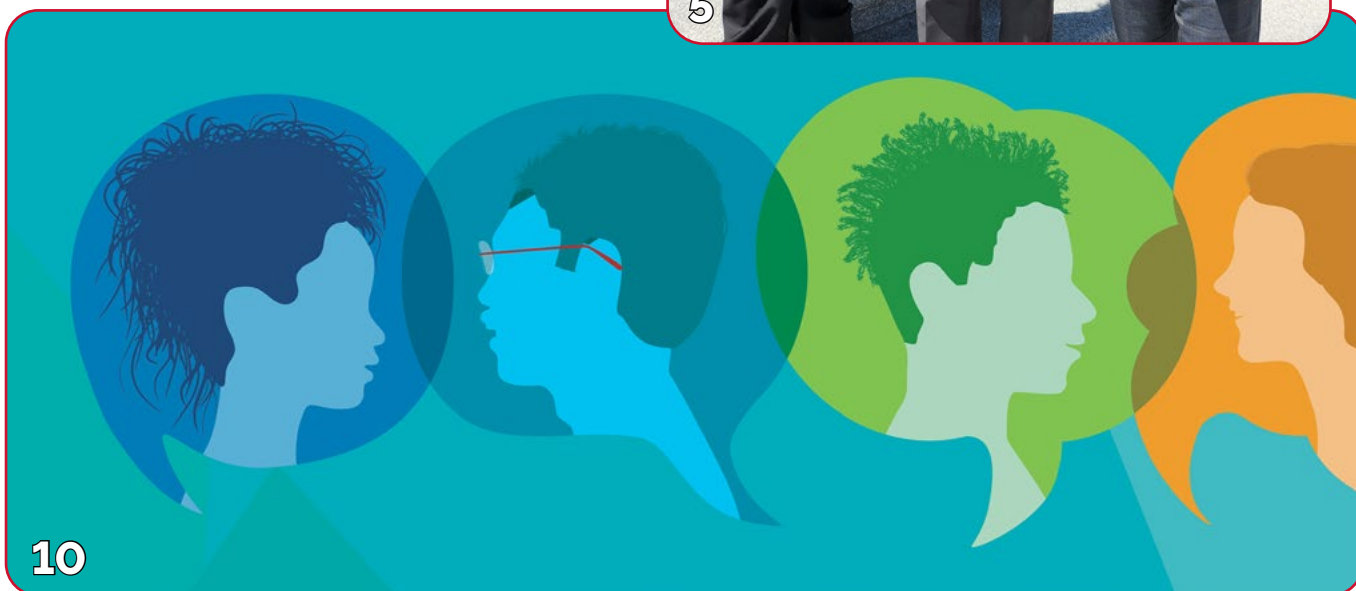
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# IN THE FINAL ANALYSIS

*"To achieve great things, two things are needed: a plan, and not quite enough time."*

—Leonard Bernstein

In the world of TMS, one of the great things that the Society can achieve has an analog in Leonard Bernstein's realm: composing and conducting. In TMS's case, we orchestrate and stage a special performance called the TMS Annual Meeting & Exhibition. Like the Maestro, we always have a plan, and we never have anywhere near enough time to execute that plan. Nevertheless, we are always ready when the baton rises.

The success of our annual event is a year-in-year-out expectation by volunteers, registrants, host facilities, and staff. "Success" is an imprecise word, but it can be made more precise by considering some associated metrics. There are qualitative metrics, such as those that we employ when devising surveys. There are quantitative metrics, such as number of attendees, number of exhibitors, and financial return. Then there are purely anecdotal metrics, such as did we send people home with good memories, did attendees add valuable new connections to their networks, and did participants leave with two or three priceless insights that may fuel future initiatives?

What do we hope the metrics tell us? That the average participant will tell colleagues, co-workers, and peers that traveling to and participating in the event was time well spent. How do we get to such an outcome? Have a good plan, do it right, remain focused, stay flexible, and keep improving. It helps to learn from history as well.

We held TMS2020 in San Diego just days before COVID-19 fully manifested its deplorable self and with many attendees from Asia being unable to attend. TMS2020 was nonetheless our best-attended meeting to date, and the reviews were quite good. Then, the world turned upside down. The pandemic pushed us into the unknown territory of virtual event management in the form of TMS2021 Virtual. Let's just say that it was not entirely what the volunteers and staff wanted to deliver, it was not what our contracted Orlando headquarters hotel wanted us to offer, and it is not what the registrants wanted as an experience. The reviews were generally sympathetic and understanding but decidedly negative. The pandemic continued to impact our decision making for TMS2022, and we held a blended event: in person in Anaheim but with some virtual elements. Attendees were delighted with the in-person experience although the virtual elements didn't click with anywhere near the same levels of enthusiasm.

What comes next? For TMS2023, three years after having our last "normal" meeting in San Diego, we are heading back to that southern California city that has so-often welcomed TMS and enchanted event participants. As with TMS2020, TMS2023 is focused on the in-person experience. I'm sure that you have already received a few TMS e-mails with early promotions about the event. If not, more are on the way! Perhaps you have even submitted an abstract for the technical program. That would not be surprising as we have a record number of symposia planned for TMS2023. In conversations with volunteer leaders, I note their excitement over many of the themes inherent in the programming. Generalizing, I've heard comments about symposia that will explore sustainability and the transition to low-CO<sub>2</sub> and low-waste emissions; materials for the renewable energy transition; artificial intelligence; autonomous practices; materials in extreme environments; improvements to primary metals production to get metal more efficiently out of the door; . . . the list continues at length.

Without being too immodest on behalf of the Society, composing and conducting events is inherent in our organizational DNA, which winds back 152 years—that's many, many generations of volunteers and staff honing a considerable legacy of experience. The next large-scale product of these efforts will be headquartered at the Hilton San Diego Bayfront Hotel, March 19–23: TMS2023. You should be able to begin registering in early September.

Volume 74

Number 8

August 2022



James J. Robinson  
Executive Director

 @JJRoTMS

*"For TMS2023,  
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enchanted event  
participants."*

# JOM TECHNICAL TOPICS

**JOM**  
THE MAGAZINE

*JOM*: The Journal publishes peer-reviewed technical articles covering the full range of minerals, metals, and materials. TMS members receive free electronic access to the full library of TMS journals, including *JOM*. For the full *JOM* Editorial Calendar, visit [www.tms.org/EditorialCalendar](http://www.tms.org/EditorialCalendar).

Review the technical topics included in the current issue of *JOM*: The Journal here, and then go to [www.tms.org/JOM](http://www.tms.org/JOM) to log in and access technical journal articles on the Springer website.

## AUGUST 2022

### Applications of Autonomous Data Collection and Active Learning

**Scope:** Recent advances in data processing and robotics have expanded the possibilities for real-time data feedback to improve in situ monitoring of characterization and manufacturing processes. This special topic focuses on experimental methodologies that employ automatic data collection routines for materials characterization, with an emphasis on utilizing these data to enable closed loop controls. The topic also focuses on automated data collection or experimental design using active or adaptive learning approaches.

**Editor:** Andrew Polonsky, Sandia National Laboratories

**Sponsors:** Advanced Characterization, Testing, and Simulation Committee

### High Temperature Alloys: Manufacturing, Processing, and Repair

**Scope:** High-temperature alloys are crucial for allowing components in power generation and propulsion systems to operate at the highest possible temperatures and in extreme environments, for maximum efficiency. This topic explores advances in manufacturing, processing, and repair of high-temperature alloys, such as Ni- and Co- based superalloys, high entropy alloys, and refractory alloys. Areas of interest include advanced processing methodologies, novel manufacturing techniques, process-microstructure-property relationships, surface modification, repair, welding, and joining techniques.

**Editor:** Benjamin Adam

**Sponsor:** High Temperature Alloys Committee

### Progress on Recovery of Critical Raw Materials

**Scope:** Computational modeling continues to play an increasingly important role for evaluating and improving metallurgical furnace design and operation. Metallurgical furnaces typically involve complex transport phenomena, multi-phase chemical reactions and phase transformations, which make modeling efforts challenging. This special topic covers original research aimed at developing techniques for high-fidelity simulations of industrial metallurgical furnaces.

**Editors:** Hong Peng, University of Queensland, and Kerstin Forsberg, KTH Royal Institute of Technology

**Sponsor:** Hydrometallurgy and Electrometallurgy Committee and Recycling and Environmental Technologies Committee

### Two-Dimensional (2D) Materials, Devices, and Sensors

**Scope:** This special topic explores magnetic materials which can be used for multifunctional applications in the power and energy sector (energy conversion, energy storage, power generation, etc.). Fundamental and applied research in this area with an emphasis in novel processing, and the interplay between composition-processing-structure-microstructure-property-performance is also featured.

**Editors:** Michael Cai Wang, University of South Florida, and Wenzhuo Wu, Purdue University

**Sponsors:** Nanotechnology Committee

## Contribute to *JOM*: The Journal

Visit [www.tms.org/JOM](http://www.tms.org/JOM) to access author tools that will answer your questions during every step of the manuscript preparation process, from determining the appropriate technical topic for your paper to reading the final product on SpringerLink.

For further information on contributing to *JOM*, contact *JOM* Editor Maureen Byko at [mbbyko@tms.org](mailto:mbbyko@tms.org).



# TMS MEMBER NEWS

## Share the Good News!

Contact Kaitlin Calva, *JOM: The Magazine* Principal Editor, at [kcalva@tms.org](mailto:kcalva@tms.org) to share your professional accomplishments. Please note that only news submitted by current TMS members will be considered.

## TMS Leadership Participates in Congressional Visits

TMS leaders traveled to Washington D.C. to participate in Congressional visits where key legislative priorities for the Society and its members were discussed. On May 10, 2022, **W. Jud Ready**, 2022 TMS President; **Eric N. Brown**, TMS Public & Governmental Affairs (P&GA) Director; and **James J. Robinson**, TMS Executive Director, met with staffers from the offices of Representative Frank Lucas (R-OK), Senator Cynthia Lummis (R-WY), Senator Raphael Warnock (D-GA), and Representative Nikema Williams (D-GA), as well as with staff to the U.S. House of Representatives Committee on Science, Space &

Technology. Additionally, virtual visits were conducted on May 16, 2022, with the offices of Senator Jon Ossoff (D-GA), Representative Matt Cartwright (D-PA), and Representative Conor Lamb (D-PA).

The groups discussed TMS legislative priorities and promoted funding for science and workforce development. Specific conversations on artificial intelligence in materials and the importance of critical materials, as well as other important topics occurred. The Society also expressed its support for the speedy reconciliation of the U.S. Innovation & Competition Act (S.1260) and America COMPETES Act (H.R. 4521) and signing the Bipartisan Innovation Act into law. While they did not attend Congressional visits themselves, TMS thanks P&GA Legislative Subcommittee members Richard Otis, John Howarter, and Michael Titus, for their work in preparing materials in advance of the May meetings.

Learn more about the Society's legislative priorities and advocacy interests at [www.tms.org/PGA](http://www.tms.org/PGA).

Ready wrapped up his trip to Washington D.C. with a visit to TMS headquarters in Pittsburgh, PA. In the first in-person presidential visit to headquarters since 2019, Ready met with TMS staff members throughout the day to discuss current and future projects. Seen here, Ready was presented with a framed copy of the cover of the April/May 2022 issue of *JOM: The Magazine*, which

features an artistic version of his presidential portrait as well as his incoming presidential perspective, by James J. Robinson.



James J. Robinson, TMS Executive Director; Eric N. Brown, TMS Public & Governmental Affairs (P&GA) Director; and Jud Ready, 2022 TMS President, participate in the first in-person Congressional visit for the Society since 2019 in Washington D.C.



TMS Executive Director Jim Robinson, left, presents 2022 TMS President Jud Ready with his presidential portrait on the cover of the April/May 2022 *JOM: The Magazine*.



## TMS Member Named Among 2022 Class of OTC Emerging Leaders

Congratulations to **Thomas Shattuck** who was named to the 2022 Class of Emerging Leaders by the Offshore Technology Conference (OTC). The OTC Emerging Leaders award recognizes professionals with fewer than 10 years of experience in the offshore technology sector who are making key contributions through their field of work, service to the industry, innovation, and focus on safety.

The value of their commitment to the industry is underscored by Leigh Ann Runyan, Executive Director of OTC, who notes that, "The ability to develop new solutions that help overcome the energy industry's most pressing challenges has always been dependent on hard-work, determination, and innovation; this year's Emerging Leaders class is filled with young professionals that understand what's at stake and have the ability to lead our industry into the future."

Thomas Shattuck is a TMS member and third-year law student at the University of Houston Law Center, where he serves as the chief Notes & Comments editor of the *Houston Law Review*. His studies focus on energy, oil and gas, and land-use law. Previously, Shattuck was a research manager for the Deloitte Research Center for Energy & Industrials where he analyzed trends in the global energy markets with a focus on LNG as well as upstream exploration and development. Before Deloitte, he worked as a market researcher covering deepwater and frontier oil and gas projects in North America. Shattuck also has hands-on experience working in the oil and gas industry, where he started his career as a field engineer for a leading oilfield services company in the Gulf of Mexico. He has moderated multiple technical sessions and panels at both OTC and OTC Brasil. He has published over two dozen articles on various topics including offshore oil and gas, the energy transition, and the global natural gas value chain.

TMS is one of 13 professional societies which sponsor the Offshore Technology Conference and



**Thomas Shattuck was named a member of the 2022 class of Emerging Leaders at a dedicated ceremony on Tuesday, May 3, 2022, during the Offshore Technology Conference in Houston, Texas. (Photo by © OTC/Phil McCarten 2022.)**

collaborate to develop a technical program that advances scientific and technical knowledge for addressing offshore resources and environmental matters. As a member of TMS, Thomas Shattuck serves on the OTC-TMS programming subcommittee which proposes and organizes technical programming for the annual conference.

Jud Ready, 2022 TMS President, visited the 2022 conference where he also attended a meeting of the OTC-TMS programming subcommittee. While there, he thanked the members for their contributions to the continuing success of conference and engaged in lively discussions over emerging areas for programming.

TMS members with an interest in offshore technology and organizing technical sessions can learn more about joining the OTC-TMS programming subcommittee by contacting Ashley Bohnert, TMS Marketing Manager, at [abohnert@tms.org](mailto:abohnert@tms.org).



**Jud Ready, 2022 TMS President, attended the Offshore Technology Conference in May 2022 where he met with the TMS members who serve on the OTC-TMS programming subcommittee. Pictured left to right: Carlos Moreira, Jeffrey O'Donnell, Joe Gomes (co-chair), Indranil Roy (chair), Thomas Shattuck, Jud Ready (TMS President), Greg Kusinski (TMS representative, OTC Board of Directors).**

## Taylor D. Sparks Honored by University of Utah



TMS member **Taylor D. Sparks** was honored by the Office of Undergraduate Studies at the University of Utah with the 2022 Professor John G. Francis Prize for Undergraduate Student Mentoring. This prize is awarded to a member of University of Utah's faculty who has shown extraordinary efforts in mentoring students outside

the classroom.

At the University of Utah, Sparks is an associate professor in the Department of Materials Science and Engineering, as well as director of the Materials Characterization Laboratory. Sparks is also the director of the National Science Foundation (NSF) funded

Research Experience in Utah for Sustainable Materials Engineering (ReUSE).

Sparks was selected for this honor as recognition for the wide array of undergraduate mentorship activities he is responsible for, including ReUSE's summer research program, his work on the *Materialism Podcast*, forming and leading a bilingual Spanish/English outreach club, and more. In addition, at least one undergraduate co-author is included in 51% of his publications, 11 of his conference proceedings, and all six of his patents.

A member of TMS since 2014, Sparks recently served as the chair of the organizing committee for the inaugural World Congress on Artificial Intelligence in Materials and Manufacturing 2022 (AIM 2022). He also serves as a member of the TMS Computational Materials Science and Engineering Committee.

## Chelsey Hargather Promoted to Associate Professor



**Chelsey Hargather**, TMS member since 2015, received tenure and a promotion from assistant professor to associate professor in the Materials and Metallurgical Engineering Department at the New Mexico Institute of Mining and Technology (New Mexico Tech). Hargather is one of six New Mexico Tech faculty members

to be approved for tenure and promotion by the New

Mexico Tech Board of Regents in May 2022.

In 2008, Hargather earned a bachelor of science from Virginia Polytechnic Institute and State University, and in 2012, she earned a doctorate from The Pennsylvania State University, both in materials science and engineering. She is a recipient of the 2021 TMS Structural Materials Division (SMD) Young Leaders Professional Development Award and has served on various TMS committees, such as the Young Professionals Committee; the Integrated Computational Materials Engineering (ICME) Committee; the Diversity, Equity, and Inclusion Committee; and more.

## New Partners Join MS&T22



A new programming partner will join the Materials Science & Technology 2022 Technical Meeting and Exhibition (MS&T22): the **Society For Biomaterials** (SFB). This collaboration will enhance the

meeting's programming, which already offers more than 80 symposia in 15 technical tracks. Three new symposia organized by SFB have been added to the MS&T22 symposium lineup:

- Biological Response to Materials and Material's Response to Biological Environments
- Biomaterial Applications
- Biomaterial Applications in Today's Industry: Development, Translation & Commercialization

In addition to the TMS Fall Meeting, MS&T22

will feature the American Ceramic Society's 124th Annual Meeting and the Association for Iron & Steel Technology's Steel Properties and Applications event, offering members an opportunity to network with groups doing research in related fields. New this year, MS&T22 will also feature two co-located commercial exhibitions:

- **The Advanced Materials Show USA**, showcasing the very latest in high-performance materials technology for applications including aerospace, automotive, electronics, energy, and medical technology
- **The Nanotechnology Show**, focused on the development and integration of nanotechnology within a range of applications including chemicals, life sciences, pharmaceutical, energy, electronics, automotive, and aerospace

MS&T22 will be held October 9-12 in Pittsburgh, Pennsylvania. For registration information, technical program details, or to learn about the MS&T organizing societies and partners, visit [www.matscitech.org/MST22](http://www.matscitech.org/MST22).



## TMS Members Awarded at CMSC 2022

Three TMS members were honored at the 33rd Canadian Materials Science Conference (CMSC 2022) with the following awards. All three awardees presented at CMSC 2022 at the University of Toronto in June 2022. Congratulations to the recipients!

### D.K.C. MacDonald Memorial Lecturer

*Chosen by the CMSC Chair, the recipient of this award provides a lecture on an important focus to the conference.*



#### Donald R. Sadoway

Professor of Materials Chemistry, Massachusetts Institute of Technology  
**Presentation:** "Electrochemical Pathways Towards Deep Decarbonization and Profitable Sustainability"

Donald R. Sadoway has been a member of TMS since 1978 and was a member of

the 2021 class of TMS Fellows. Sadoway is also a recipient of the 2013 Extraction & Processing Division (EPD) Distinguished Lecturer Award and the 2014 Educator Award. He has volunteered on a variety of TMS committees including, the Student Affairs Committee, the Reactive Metals Committee, and the Education Committee, as well as on the Light Metals Division Council. At the TMS 2022 Annual Meeting & Exhibition, the first Sadoway Materials Innovation and Advocacy Award recipient was awarded. This award was endowed by Sadoway's students, friends, and colleagues to honor his influence on them, the Massachusetts Institute of Technology (MIT) Department of Materials Science and Engineering, and the global materials science community.



### Welcome to Our New Material Advantage Chapters

The TMS Board of Directors have approved a new Material Advantage chapter charter for:

**Sri Sivasubramanihi Nadar**  
College of Engineering,  
Tamil Nadu, India

*Welcome to the Material Advantage and TMS family!*

### Metal Chemistry Award

*This award recognizes outstanding contributions to metallurgical chemistry.*



#### Joseph McDermid

Professor, McMaster University

**Presentation:** "Towards Managing Advanced Steel Surface Chemistries in Continuous Annealing and Galvanizing"

A TMS member since 2004, Joseph McDermid has been a frequent attendee of TMS

annual meetings. He received a bachelor's degree in metallurgical and materials engineering in 1985 from Queen's University and a Ph.D. in metallurgical engineering in 1992 from McGill University and has been working at McMaster University for over 16 years. Previously, from 1992 to 2003, he was a senior scientist at Noranda Technology Centre. McDermid also served as editor-in-chief of the *Canadian Metallurgical Quarterly* from 2013 to 2021.

### Metal Physics Award

*This award was conceived to recognize achievements in fundamental physics of importance to the understanding of metals as materials. Since its first awardee in 1977, this award has been bestowed for excellence in a broader range of research achievement, including advancement in non-metallic materials.*



#### Scott X. Mao

Professor, University of Pittsburgh

**Presentation:** "Atomistic Processes of Deformation in Nanocrystals with In-Situ High Resolution Transmission Electron Microscope"

Scott X. Mao has been a member of TMS since

1993. He has served on various TMS committees, including the Mechanical Behavior of Materials Committee, the Structural Materials Committee, and the Nanomechanical Behavior Committee. Mao earned his Ph.D. from Tohoku University in 1988 and has worked at MIT, Harvard University, and the University of Calgary. Currently, Mao is the John Swanson Endowed Professor in the Department of Mechanical Engineering and Materials Science at the University of Pittsburgh.



## Considering PE Licensure? TMS Can Help

TMS offers resources that can help you prepare now for the Metallurgical and Materials Engineering PE Licensing Exam in October, including our August online review course and our PE study guide PDF. The U.S.-based Principles and Practice of Engineering (PE) licensing exam identifies individuals who can practice professional engineering in such a manner that will safeguard life, health, and property and promote the public welfare.



For the third year in a row, TMS is offering an online format for the **TMS Metallurgical and Materials Engineering Professional Engineer (PE) Licensing Exam Review Course**, the only review course focused specifically on the Metallurgical and Materials Engineering PE Licensing Exam. Live online instruction is scheduled for August 1–3 and 8–10, 2022, with recordings available to participants through October 31, 2022, to help them better prepare for the National Council of Examiners for Engineering and Surveying (NCEES) exam. Learn more about the curriculum at [www.tms.org/PEReview2022](http://www.tms.org/PEReview2022). If you are interested in registering for this program and accessing course materials after the course start date, please contact TMS Meeting Services at [mtgserv@tms.org](mailto:mtgserv@tms.org) or 1-724-776-9000.

TMS offers the **Study Guide for Principles and Practice of Engineering (PE) Exam-Metallurgical and Materials Engineering, 2022 Revised Edition**, which contains sample problems and solutions relating to the Metallurgical and Materials Engineering PE exam. The PE exam will be administered in computer-based format for the first time in October 2022. This revised edition of the study guide reflects the transition to this computer-based format and changes to exam management. Exam specifications have not changed, and the problems in this guide are designed to acquaint the reader with typical examinations given by the NCEES. The guide, free for TMS members and \$39.00 for non-members, can be found at [www.tms.org/PE](http://www.tms.org/PE).

The TMS Professional Registration Committee originated the PE Metallurgical and Materials exam and maintained it for more than 20 years. In 2021, the responsibility for exam development transitioned from TMS to NCEES. TMS continues to offer study aids to assist members in preparing for the exam. Learn more at the TMS Professional Engineering Registration website, [www.tms.org/PE](http://www.tms.org/PE).

## In Memoriam

TMS offers condolences to the friends, family, and colleagues of the following members:

**Joseph L. Anjier** passed away in July 2020. A TMS member since 1981, Anjier was a long-time member of the TMS Aluminum Committee and a previous member of the Light Metals Division Council. In 1960, Anjier graduated from Colorado School of Mines with a degree in petroleum refining engineering, and in 1977, he earned a master of business administration from Louisiana State University. After completing active duty as a first lieutenant in the Army Corp of Engineers, Anjier went on to work for Aerojet-General Corp. as a materials engineer. In 1964, he began working for Kaiser Aluminum as a chemical engineer and continued to work for Kaiser Aluminum and its affiliates for 38 years. After retiring from Kaiser Aluminum in 2002, he formed the engineering consulting company, JA Engineering Services LLC.

**Richard J. Arsenault**, a TMS member since 1961, passed away in April 2022. Arsenault received a bachelor's degree in materials science in 1957 from Michigan Technical University and a Ph.D. from Northwestern University in 1962. He worked as a research metallurgist at Oak Ridge National Laboratory before accepting a faculty position at the University of Maryland. Arsenault also served as a member of the Air Force Scientific Advisory Board. He served on a variety of TMS committees, including the Composite Materials Committee, the Nuclear Materials Committee, the Honors and Professional Recognition Committee, and the Mechanical Behavior of Materials Committee. Arsenault was a member of 1998 class of TMS Fellows and a recipient of the Alexander Scott Distinguished Service Award.

**Curtis M. Jackson**, a TMS member since 1952, passed away in December 2021. Jackson earned a bachelor of science degree in metallurgical engineering from New York University, graduating in 1954. After graduating, he began working in research management for Battelle Memorial Institute, for which he would work for 36 years. In 1959 and 1966, he received an M.S. and a Ph.D., respectively, in metallurgical engineering from The Ohio State University. He served as the chairman of the North Central Region of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME).

**TMS also offers condolences to the friends, family, and colleagues of the following members who passed away.**

Gustaf Frederic Bolling

Alfred A. Hendrickson

John M. Boxall

James A. Holmquist

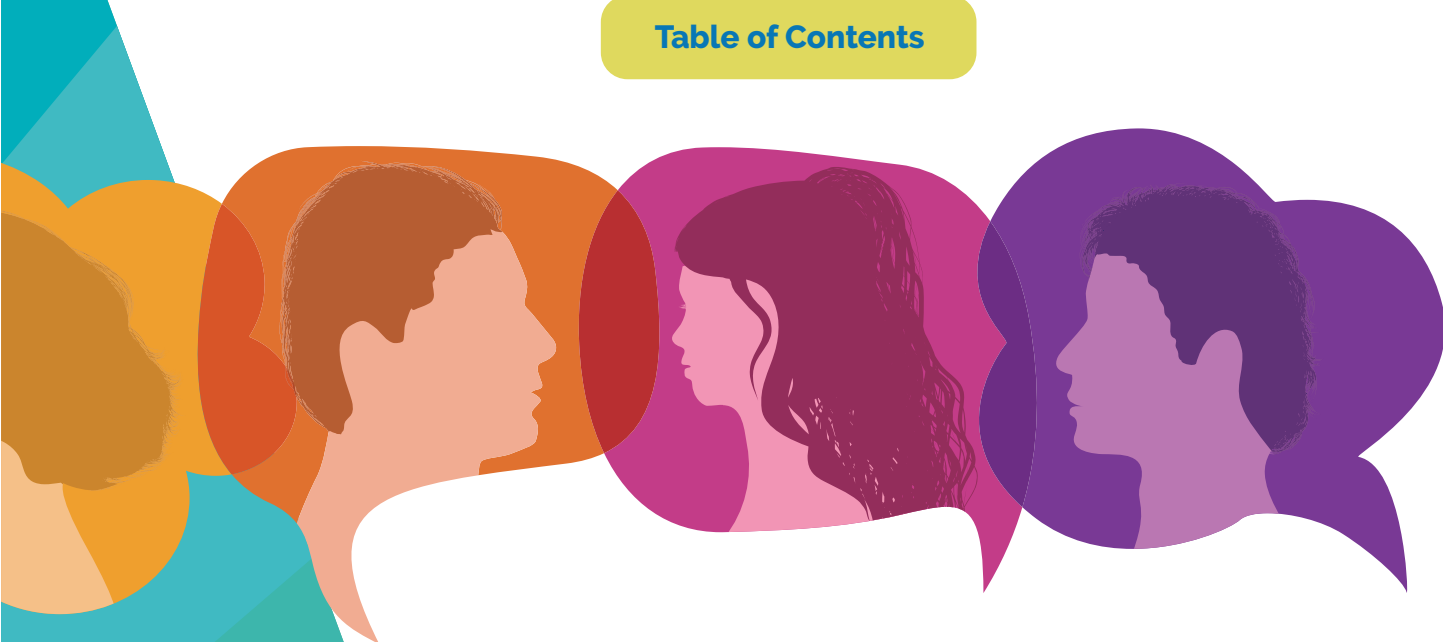
Jesse A. Smith



# TRANSLATING TECHNICAL COMMUNICATION FROM THE CLASSROOM TO INDUSTRY

Kaitlin Tyler





**Technical communication is important. In this digital age, the ways we can communicate have dramatically expanded. The COVID-19 pandemic has altered the workplace landscape, with many more people working entirely remotely and therefore relying much more on written and virtual communication in their day-to-day work lives.**



*"Translating Technical Communication from the Classroom to Industry,"* serves as an introduction to a thematic group of articles in the August 2022 issue of *JOM: The Magazine* focusing on communication as a key skill for materials science and engineering students, regardless of their career paths. The article package is a feature series developed by the TMS Education Committee. For additional information, contact Kaitlin Calva, *JOM: The Magazine* Principal Editor.

As professionals and educators, we know that technical communication is not something that can just be learned on the job. It is so crucial it is included in many accreditation requirements, such as ABET. I thought I understood the need for clear communication as I went through graduate school, but it was not until moving to industry that I truly began to appreciate the impact that communication, especially written, can have in the workplace. Clear communication can be the difference between a simple e-mail thread and multiple hour-long meetings. It can be the difference between getting a project green-lit and having a really good idea be ignored because of a misunderstanding. It can also be the difference between quickly resolving confusion between colleagues and having some difficult conversations.

The TMS Education Committee is focused on helping prepare future professionals in the field of



materials. Therefore, communication is a continual topic of interest. As a Society with many members in academia, our focus often leans towards academic writing, such as grant proposals. But for this year's contribution to *JOM: The Magazine*, we wanted to highlight the great work three of our TMS members are doing to prepare their students for a variety of technical communication, no matter what career path they choose.

The first article is written by TMS member Gregg Janowski of the University of Alabama at Birmingham. Here, he shares his wisdom on how setting expectations in the classroom for both e-mails and reports can lead to increased professionalism in student technical writing skills. It can be challenging to not act as editor when students run into problems during these types of assignments but showcasing the errors and providing an explanation goes a long way.

In the second article, TMS member Elvin Beach

**"...I hope that we, as a community, will continue to adapt to give our students the best chance at conveying their thoughts clearly and effectively at the start of their careers."**

**—Kaitlin Tyler**



**"...it was not until moving to industry that I truly began to appreciate the impact that communication, especially written, can have in the workplace."**

**—Kaitlin Tyler**

and his colleague Nicholas Hoffman from The Ohio State University have shared their collaborative work on improving students' technical writing through various workshops and writing prompts. This has led to demystifying the technical writing process and goals for further technical writing integration across the curriculum.

Finally, TMS member Tim Chambers from the University of Arizona shares some unique communication assignments, such as press releases, online symposia, and infographics, from his laboratory courses. His emphasis on feedback and revision and working with industry partners to understand what his students need to know for their careers is a take on lab communication that I wish I could have experienced as a student.

As you read about how teaching technical communication is changing in response to our students' needs, I hope you can think about your own journey with technical writing. If you are an educator, think about how your students engage with technical communication in your courses. As an undergraduate student about 15 years ago, I was told by many people "you don't need to speak or write well, you are going to be an engineer!" I am glad to see that this phrase is no longer relevant, and I hope that we, as a community, will continue to adapt to give our students the best chance at conveying their thoughts clearly and effectively at the start of their careers.

**Kaitlin Tyler** is an academic development specialist at Ansys. Her work focuses on resource creation to support software integration in the classroom with a specific interest in introductory materials courses. She is the *JOM* Liaison for the TMS Education Committee and is a member of the TMS Diversity, Equity, and Inclusion Committee.

# PREPARING STUDENTS FOR COMMUNICATING IN THE PROFESSIONAL WORLD

Gregg M. Janowski



## One of our educational responsibilities is to ensure that our graduates can write professionally,

which is part of the Engineering Accreditation Commission (EAC)/ABET Criteria 3(3), "an ability to communicate effectively to a range of audiences."<sup>1</sup> Two aspects of written communications that I have emphasized are e-mail and laboratory reports with an eye to the post-university world.

E-mail is the primary way that businesses and universities communicate in a "written" form. E-mail is the successor to the memorandum (and follows its format) and has yet to be supplanted by Slack (a messaging app for business) or text messages. Most instructors have received e-mails that do not meet the expectations for professional communications. How do we make it better? Here are some things that I have used successfully:

- \* In the introductory freshman class, take the time to present expectations for e-mail, including greeting, grammar, spelling, meaningful subject, and a signature block. Engineering students are usually very good at following a structured format.

- \* Include the expectations in the course syllabus, including that students are responsible for reading your e-mails. Rules are much easier to enforce when they are clearly stated.

- \* Return e-mails that do not meet the standard. Students forget and test boundaries.

Laboratory reports are another area where universities often do not mirror everyday engineering practice.

Our traditional manuscript format of introduction, materials/procedure, results, discussion, conclusions, and references is not commonly used outside of journal publications and academia. The literature review that is part of the introduction is also a very tempting target for plagiarism.

When I began teaching undergraduate materials characterization, I appropriated the memorandum



report style I had learned as a co-op student in the 1980s, which consists of:

### Transmittal Documentation

*In the style of a memorandum, the informal report should begin with the name of the person to whom the report is being submitted, the name of the person submitting the report, the date of submission, and a meaningful subject line describing the content of the report.*

TO: Recipient's Name

FROM: Your Name (or names of all group members)

DATE: Date of Submission

SUBJECT: Meaningful Report Title

### Body (4 Pages or Less)

*The theory of the phenomenon being studied is summarized and the goals or objectives of the experiment are presented. A brief discussion of the experimental procedure should also be included, citing standards as appropriate. Tables and figures which present your experimentally measured data are introduced. A discussion of experimental results should follow with the conclusions drawn from the experiment.*

### Figures and Tables

*Figures and tables may be presented either (1) in the text after the first reference to the figure or table or (2) together after the references, with tables before figures and in numerical order. All figures (graphs, charts, drawings, diagrams, and photographs) have captions below the figure. Labels for figures must contain the figure number in the order of its reference in the text and a descriptive title. Labels for tables are placed above and must contain the table number in the order of its reference in the text and a descriptive title.*

### Calculations and Analyses

*Any detailed calculations used during the analysis of data, including statistical analyses, should be documented and attached to the report. The reader should be able to understand the purpose and implications of the laboratory exercise by reading only the summary, but detailed calculations should be provided for further consideration.*

### References

*Handouts, papers, books, or websites that have been used throughout the laboratory exercise should be referenced at the end of your report. There are many acceptable methods for proper reference citation. First and foremost, any document should use only one citation method.*

This format leads to shorter reports and makes the students focus on the most important aspects. Grading can be made simpler and more consistent by using a rubric that is known to the students (a topic of many good books).

The format of a report is a good first step in teaching professional communications, but good writing is not



**Gregg M. Janowski** is a professor of mechanical and materials engineering as well as Associate Dean of Academic Affairs and Graduate Programs at the University of Alabama at Birmingham. A TMS member since 1983, he is past chair of the TMS Accreditation Committee and is a member of the Engineering Accreditation Commission's Executive Committee.

easy to teach. As an instructor and grader, I found it hard to resist the temptation to act as an editor, which is very time consuming, especially for large classes. The red pen or, in a learning management system (LMS), the red comment box, does not appear to be an effective way to teach the nuances of grammar and usage. My compromise is to put a box around a paragraph and make corrections to show what an edited version would be, and then refer students to the university writing center for one-on-one help.

My final method to improving reports is to have students either submit drafts or allow them to resubmit corrected versions to recapture lost points. When students incorporate your suggestions and corrections, it becomes part of their learning experience rather than just part of their grade. As one of my mentors said, "There are few good writers, but many more good rewriters."

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# WORKSHOPS AND FOCUSED PROMPTS: STRATEGIES FOR INTEGRATING TECHNICAL WRITING IN UNDERGRADUATE MSE COURSES

Elvin Beach and  
Nicholas Hoffman



## Background

In Spring 2021, the Department of Materials Science and Engineering (MSE) at The Ohio State University (OSU) began running a Structure and Materials Characterization Laboratory course that incorporated a writing workshop model to better serve students in achieving their academic and career goals. The course, taught by a team of instructors from the English and MSE Departments, includes bi-weekly workshops and writing prompts, which offer a template for instructors and curriculum designers at other institutions with the goal of improving students' technical writing through experiential learning. This article details some lessons learned from integrating technical writing and communications pedagogy in this course with the goal of building more robust, comprehensive technical writing programs across departments.

## Program Overview

The MSE program at OSU currently serves over 160 undergraduates who progress to careers in

industry, government, and academia. The educational objectives of the MSE program include placing graduates in technical, scientific, or business positions relevant to their experience, or aiding them in entering post-graduate or professional degree programs. To achieve these goals, the program acknowledges the "ability to communicate effectively with a range of audiences" as a foundational learning outcome.<sup>a,1</sup>

The Structure and Materials Characterization Laboratory is a foundational course for all MSE majors. It also represents the department's most comprehensive attempt to date at integrating writing pedagogy in a laboratory setting. Students attend bi-weekly writing workshops alongside traditional, hands-on laboratory sessions. Graduate teaching associates (GTAs) from the OSU English Department direct synchronous writing workshops and develop writing prompts emphasizing critical thinking, career development, and effective communication across media. Alongside traditional laboratory reports, these writing assignments are central to the successful completion of the course.

<sup>a</sup>The OSU MSE program maintains an updated list of program objectives and learning outcomes in fulfillment of its ABET accreditation criteria online at [mse.osu.edu/academics/undergraduate-degrees/abet-accreditation-mse-we-programs](https://mse.osu.edu/academics/undergraduate-degrees/abet-accreditation-mse-we-programs).<sup>1</sup>

The following sections detail the two main strategies successfully employed for this course, namely (1) the inclusion of dedicated writing spaces for students to workshop their writing and share their experience, and (2) the introduction of engaging, manageable writing assignments that supplement students' coursework and encourage them to consider their career aspirations.

## Creating Dedicated Writing Spaces

Graduate teaching associates from the English graduate program are employed not just as external graders, leaving disembodied comments on writing mechanics; instead, they serve as active instructors with a presence and relationship with course participants. GTAs lead discussion-based workshops, delivering presentations and facilitating open discussion. Workshop topics cover a range of strategies for crafting effective pieces of writing (within and beyond the academy) while reinforcing the applicability of strong writing skills to

**"Students noted that the workshop environment demystified the technical writing process."**

**—Elvin Beach and Nicholas Hoffman**

future career success (see Table I).

The semester begins with a thorough overview of software, including tips and tricks for using Microsoft Office. In past workshops, students mentioned how useful it was to learn these formatting tools early on in their undergraduate careers. Meanwhile, GTAs introduce students to a style guide developed specifically for the department.<sup>b,2</sup> Early workshop topics progress from "lower-order" writing concerns (such as grammar and style) to "higher-order" concerns (including organization and tone). Special attention is paid to the proper formatting and communication of statistical data. An entire workshop is dedicated to working with secondary literature beyond simply hunting for sources that reinforce the writer's contentions. The final two workshops focus on writing beyond the academy and producing writing for non-technical audiences, such as the public, journalists, and industry supervisors.

Responses in student evaluations showed that the workshop topics progressed at a manageable pace, supplemented the syllabus, and created rapport

**Table I. Writing Workshop Topics**

Weeks	Theme	Subtopics
1 / 2	Organization and Structure of a Technical Report	Introduction to <i>MSE Writing &amp; Style Guide</i> How to create a template How to work with images, tables, and figures in Word Overview of other course software
3 / 4	Concision and Clarity	Overview of the "writing process" Tips for concise writing Problem words and the passive voice Identifying and avoiding plagiarism
5 / 6	Editorial Best Practices	Effective outlining Paragraph organization Peer review
8 / 9	Engaging with Scholarship	Navigating university library resources Ethos and authoritative writing Assessing secondary literature
10 / 11	Writing for Diverse Audiences	Media and the (dis)information pipeline Writing and the accessibility of ideas Readers as stakeholders Multimodal presentations
13 / 14	Applied Technical Writing	Writing and career development Writing an executive summary

**Table I.** This table outlines the specific themes and subtopics that materials science and engineering (MSE) students cover during writing workshops at The Ohio State University.

<sup>b</sup>The *MSE Writing & Style Guide* is an open-access project, available online at [writingmse.pressbooks.com](http://writingmse.pressbooks.com).<sup>2</sup>

**Table II. Writing Prompt Examples**

Weeks	Prompt	Details
1 / 2	Format like a Winner	Students took a published MSE article and formatted it within the department template, submitting it as if it were a laboratory report. Students worked with an article that recently won the Ig Nobel Prize for materials science.
3 / 4	How-To Origami	Students were split into groups, each assigned a separate video tutorial on folding a simple origami figure. Students were asked to craft a concise list of written instructions for folding the figure. In workshop, members from each group paired up and tried to replicate their partners' figures.
5 / 6	Peer Review in Practice	Students individually reviewed a mock abstract. In workshop, students discussed common concerns found in their feedback and strategies for delivering that feedback.
8 / 9	Flash Review of Scholarship	Students were asked to complete a short review of scholarship on the topic of "superalloys." Students were assessed on their ability to access the assigned articles, synthesize information, organize their review, and maintain <i>their own academic voice</i> when discussing others' research.
10 / 11	The Engineer-Translator	Students were directed to the research activities of an MSE faculty member who had been featured prominently in the national news. Their assignment was to produce three short responses for three separate audiences: (1) a slide outlining the scholar's work for an academic conference; (2) a recorded response to a job interview question regarding the scholar's work; and (3) an e-mail response to a journalist asking for more information about this scholar's work.
13 / 14	Crafting an Executive Summary	Students were asked to write their own executive summary. Writing as a research & development specialist for a fictional laboratory, students were tasked with communicating complex data to a non-specialist and providing objective feedback.

**Table II.** Workshops at The Ohio State University provide students with writing prompts, such as those detailed here, that emulate real-world assignments and projects that students may experience throughout their academic and professional careers.

between GTAs, MSE faculty, and undergraduates. Students noted that the workshop environment demystified the technical writing process.

### Crafting Effective Writing Assignments

Discipline-specific writing exercises, such as the traditional lab report and reviews of scholarship, especially when they are not scaffolded, can pose a challenge for undergraduates' attention and confidence. This course opted for shorter laboratory reports for the three experiments conducted over the semester. Meanwhile, students were tasked with completing short writing prompts between each writing workshop. Table II includes example writing prompts from the course.

**"The diversity of the prompts (and their humor) encouraged participation among workshop participants who may have been reticent to discuss writing."**

**—Elvin Beach and Nicholas Hoffman**

Student evaluations underscored how the shorter prompts kept them engaged throughout the semester. The targeted quality of each prompt allowed students and instructors to focus on specific technical writing skills, such as concision or communication in the workplace. The diversity of the prompts (and their humor) encouraged participation among workshop participants who may have been reticent to discuss writing.

### Lessons Learned and Future Directions

As the MSE Department considers the creation of a dedicated technical writing curriculum, there are opportunities for further collaboration and engagement with wider university resources.<sup>c,3</sup> The Ohio State University houses its own Writing Across

<sup>c</sup>The department draws inspiration from Christine Burgoyne's development of the Engineering Communications Program (ECP) at Virginia Polytechnic Institute and State University, as reported in the August 2017 *JOM* article, "Developing Communications Skills in the Next Generation of Engineers."<sup>3</sup>



the Curriculum (WAC) Program. It is worth pursuing open communication between individual departments and WAC personnel to ascertain how to leverage the available resources and further integrate technical writing pedagogy into the MSE curriculum.

Given the increasingly global character of the university, it is equally imperative to explore methods for better assisting English language learners (ELLs) with their writing development. The students in MSE courses represent a cross-section of the diverse, multi-lingual student body at OSU. There are opportunities to better direct ELLs to university writing resources specific to their needs and craft supplemental assignments to aid with the retention of English writing mechanics. Any future technical writing program specifically tailored to MSE undergraduates must include resources—or perhaps a dedicated course—for ELLs.

## Acknowledgements

The authors owe a debt of gratitude to David Phillips, professor of practice in OSU's Welding Engineering Program. Phillips has been an early and steadfast proponent of integrating technical writing into the engineering curriculum and laid the groundwork for collaboration with the OSU English Department. The authors would also like to acknowledge the contributions of the OSU English Department and the GTAs that continue to bring enthusiasm and technical writing expertise to the MSE classroom.

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**Elvin Beach** is an associate professor of practice in the Department of Materials Science & Engineering at The Ohio State University. He focuses on providing meaningful laboratory experiences and technical writing training for undergraduate students. As a member of TMS, Beach is a participant in the TMS Education Committee.



**Nicholas Hoffman** is a doctoral candidate in English literature at The Ohio State University (OSU). He has worked as a graduate teaching associate and technical writing instructor for various courses at OSU, including Junior Laboratories 1 and 2, Structure and Characterization Laboratory, and Welding Laboratory. In 2022, he received OSU's Graduate Associate Teaching Award for his service across the English and MSE departments.



# BROADENING THE TECHNICAL COMMUNICATION WE TEACH

Timothy Chambers

## Introduction

A key feature of the field of materials science and engineering (MSE) is its breadth, which is exemplified in the broad careers pursued by our students in both industry and academia. To succeed in these careers, students will need to be technically prepared and possess robust interpersonal and communication skillsets. Engaging stakeholders at all levels, including the general public, is expected of technical professionals now more than ever. Accordingly, as instructors we need to teach our students forms of technical communication beyond traditional journal articles and conference talks.

In developing new technical communication curriculum for my advanced MSE lab courses at the University of Michigan, I have relied on STEM education research literature to inform the content and pedagogy. Two guiding principles I recommend to anyone looking to update their course content are as follows.

- \* **Principle 1:** Efficient development of new skills requires high-quality feedback combined with practice opportunities.<sup>1</sup> In this context, that means specific, actionable, timely instructor responses to students' communication deliverables coupled to assignments requiring students to act on that feedback.

- \* **Principle 2:** Creative freedom in assignments can increase student engagement, motivation, and performance. Humans in general (of which students are, in fact, a subset!) are motivated to seek agency—a sense of control over their actions and surroundings. Giving students creative agency in assignments gives them a sense of ownership that leads to greater investment in and effort toward the final product.<sup>2</sup>

## Examples in Implementation

Two examples of these principles fleshed out in implementation are provided in Table I below. For context, these assignments are part of the second semester of an advanced lab for MSE majors at the University of Michigan. The course focuses on soft and functional materials with consideration of environmental and economic impacts of materials engineering being a theme throughout the projects.

### Example 1: Corporate Press Release

Students are given a scenario in which their role is a technical lead at a large company that produces and sells virgin and recycled polymer stock to manufacturers. Their company has drawn significant negative public attention for its business and

Table I. Learning Outcomes

Press Release	Online Poster Fair
Communication with a non-technical public audience	Engaging a diverse audience that combines specialists and non-specialists
Consideration of environment and economics in technical decisions	Differences between in-person and online technical presentation
Combining multiple representations of data	Verbal dialogue on engineering topics
Writing and presenting in a team	Technology for virtual events
Defending a decision-making process	Poster design & presentation skills

Table I. This table lists the major learning outcomes from two assignments, writing a press release and participating in an online poster fair, during the University of Michigan's advanced lab course.

environmental practices and so they are tasked with creating and delivering a press release that addresses public concerns. They are expected to combine their experimental data from lab with literature information and market research to communicate effectively with a general public audience.

Following Principle 1, students submit a draft which is then graded and returned a week before the final product is due. Following Principle 2, students bring their own polymer specimens to lab to analyze and create their own details about the scenario such as what region their company operates in and what polymers it produces.

### **Example 2: Online Poster Fair**

It is increasingly clear that online work is here to stay in some ways, and so we should teach our students to communicate effectively online as well as in-person. During the pandemic, we converted our traditional final project poster fair to an online event. In this project, students reverse-engineer a consumer product of their choice and create a poster presentation detailing their results.

Following Principle 1, students submit their posters to instructors the week before the fair to receive feedback and perform revisions. They also have the opportunity to do a practice run with real-time verbal feedback before the day of the fair. Following Principle 2, students submit their own project topics and are tasked with organizing and running the poster fair itself. Students have control over the platform, recruiting strategy, technological implementation, and nearly all other logistics in addition to the content, per se, of their projects.

## **Lessons Learned**

Of course, any curricular innovation is going to require iteration and there will be bumps and bruises along the way. I'd like to share a few specific lessons learned from the "error" part of trial and error in implementing these and other communication assignments, to complement the previously stated principles and examples.

- \* When developing new course content for

teaching technical communication skills, engaging with industry partners and advisory boards can be a great source of information on what skills students need to be competitive after graduation. It's also easier to sell students on the importance of an assignment when you can tell them how it teaches skills that were specified as in-need by a company that hires your alumni.

- \* Providing students with anonymized examples of graded work from past semesters is invaluable. Because these assignments teach skills, formats, and genres that are often new to students, they have little context for what high-quality deliverables look like. Not only can these examples help students calibrate and get robust feedback, but they also help students appreciate exactly what is expected of them.
- \* There is no right answer when it comes to assigning projects as individual or group work. A solo project and a group project are just qualitatively different experiences with different pros/cons and learning outcomes. Choose whichever best suits the logistical constraints and desired outcomes of your course and student population as best you can.

I've found it very rewarding to engage students with a broad range of technical communication assignments, and really appreciate the creative effort that students bring when challenged with learning a new style of writing or presenting. I believe we need to teach our students to engage with a diverse range of audiences so they can succeed professionally and personally as they work to take on the scientific and engineering challenges of tomorrow. I hope this article has given you some ideas about how you can implement these ideas in your own classes.

## **Acknowledgements**

The author would like to thank Katsuyo Thornton and Emmanuelle Marquis of the University of Michigan for their collaboration on teaching this course and Michigan's Center for Research on Learning and Teaching in Engineering for human and financial support of course development initiatives.

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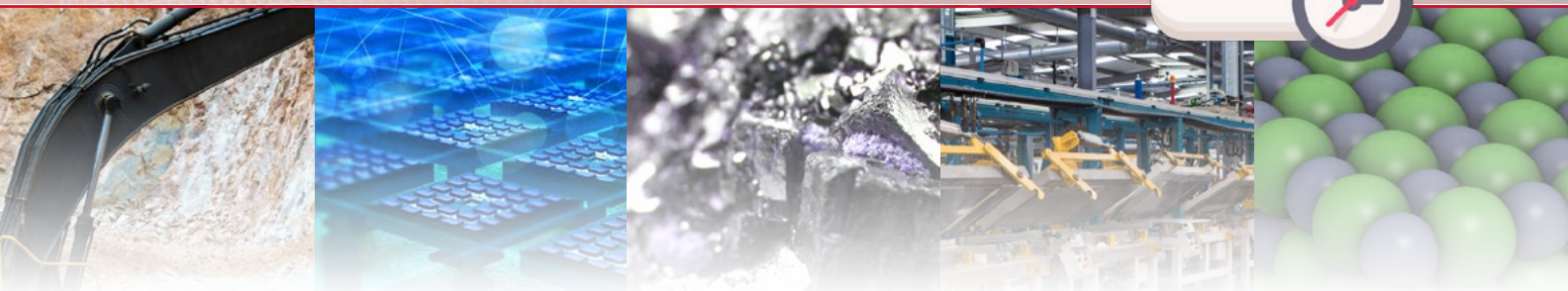
**Timothy Chambers** is a lecturer at the University of Michigan, where he conducts research on STEM education. Within TMS, Chambers is a member of the TMS Education Committee.



JOM

# 2023 EDITORIAL CALENDAR: Evolving to Serve Our Community

Maureen Byko



The 2023 editorial calendar for *JOM: The Journal* is complete, with more options than ever for authors to submit their work. In keeping with *JOM* tradition, the calendar will feature special topics developed by TMS technical committees. Currently, 38 special topics are planned by 30 technical committees—a strong representation of the interests of TMS members, well suited for *JOM*'s materials-focused audience.

## JOM EDITORIAL CALENDAR HIGHLIGHTS

Among the special topics on the editorial calendar, each of TMS's five technical divisions are well represented. The following topics are some examples from committees within each division. View the full calendar at [www.tms.org/EditorialCalendar](http://www.tms.org/EditorialCalendar), where visitors can search by topic, committee sponsor, or Guest Editor name.

### Extraction & Processing Division

- Reprocessing and Recycling of Tailings from Metallurgical Process: Recycling and Environmental Technologies Committee; Energy Committee; Process Technology and Modeling Committee
- Pyrometallurgical Techniques Towards Emissions Reductions: Pyrometallurgy Committee

### Functional Materials Division

- Silicon Photonics: Thin Films and Interfaces Committee
- Advanced Technology for Electronic Packaging and Interconnection Materials: Electronic Packaging and Interconnection Materials Committee

### Light Metals Division

- Influence of Processing on Microstructure and Properties of Mg Alloys: Magnesium Committee
- Solid-state Processing of Light Alloys: Aluminum Committee

### Materials Processing & Manufacturing Division

- ICME Approaches to Sustainable Use of Critical Metals: ICME Committee
- Advances and Applications of Machine Learning in Materials Research: Computational Materials Science & Engineering Committee

### Structural Materials Division

- Powder Materials and Processing for Extreme Environments: Powder Materials Committee
- Advances in Grain Refinement during Solidification: Solidification Committee

**NEW SUBMISSION OPTION: TECHNICAL ARTICLES**

Our priority in *JOM* is to publish quality articles, but sometimes an otherwise valuable contribution will not fit neatly into any special topic on the calendar. In the past, such manuscripts would have been rejected as "out of scope." To create a more welcoming environment for authors, a monthly "Technical Articles" topic has been added for 2023. This category is open to high-quality submissions that align with *JOM*'s overall scope but might not fit the narrower focus of the planned topics.

**The journal's scope states: "The Journal section of *JOM* publishes peer-reviewed technical articles covering the full range of minerals, metals, and materials. This content encompasses groundbreaking laboratory discoveries, the effective transition of science into technology, innovative industrial and manufacturing developments, resource and supply chain issues, improvement and innovation in processing and fabrication, and life cycle and sustainability practice."**

With its most recent (2021) Impact Factor of 2.597, *JOM* is a highly desirable publication destination. We encourage you to add to the voices published in 2023.

**BECOME A *JOM* PEER REVIEWER**

*JOM* is seeking peer reviewers who:

- Have published articles in their specialty areas
- Are currently practicing in the area(s) they want to review
- Have experience reviewing scientific manuscripts

This is an opportunity to read about current work in your field while sharing your expertise with the materials community. Send your responses, along with a CV, to Maureen Byko, Editor of *JOM* at [mbyko@tms.org](mailto:mbyko@tms.org).

**NEW TOPICS INVITED FOR 2023–2024**

Although the 2023 editorial calendar offers a wealth of relevant, timely topics, there is still room for more. *JOM* is seeking TMS members to organize small collections of articles, particularly in emerging and developing research areas.

These compact topics could comprise as few as five manuscripts. Consider developing a topic around your own work and inviting colleagues and other prominent researchers in this area to contribute.

A few quick reminders:

- All *JOM* submissions must be thoroughly peer reviewed. The topic organizer is responsible for securing two reviews for each manuscript.
- Topic organizers can submit their own work, but the review and decision process must be handled by another expert in the subject area.
- Topics should be submitted via the Topic Submission Form at [www.tms.org/topicsubmission](http://www.tms.org/topicsubmission). This form includes the submission deadline for each month to help you set a realistic publication target.
- The new topic should not conflict with any on the existing editorial calendar.
- For these invited topics, TMS technical committee sponsorship is welcomed, but not required.

**HOW TO PUBLISH IN *JOM***

Follow these steps to submit a manuscript to *JOM*:

1. Visit the full calendar at [www.tms.org/EditorialCalendar](http://www.tms.org/EditorialCalendar).
2. Search by keyword for a topic that fits your expertise and visit the topic's "Details" page for more information. If no topics are appropriate, plan to submit as a Technical Article.
3. Prepare your manuscript according to the *JOM* Instructions for Authors document, found at [www.tms.org/portal/PUBLICATIONS/Journals/JOM/](http://www.tms.org/portal/PUBLICATIONS/Journals/JOM/).
4. Submit your manuscript through Editorial Manager at [www.editorialmanager.com/JOMJ](http://www.editorialmanager.com/JOMJ).

**We look forward to hearing from you.**



*In Case You Missed It:*

# BUSINESS NEWS FROM THE FIELD

**JOM**  
THE MAGAZINE

Do you have business or industry news of interest to the minerals, metals, and materials community?

Submit your announcement or press release to Kaitlin Calva, *JOM: The Magazine* Principal Editor, at kcalva@tms.org for consideration.



**Stockholm, Sweden:** The Ministers of Foreign Affairs of Germany and Norway, Annalena Baerbock and Anniken Huitfeldt, visited sustainable battery materials producer Vianode, an Elkem company, in Kristiansand, Norway. Vianode developed a range of synthetic graphite products for batteries with unique performance characteristics and produced with low CO<sub>2</sub> emissions. The site is an industrial pilot plant established to prepare the basis for evaluating full-scale production. A potential first full-scale plant for Vianode will produce graphite for more than one million electric vehicles per year. (Photo Credit: ELKEM)

## Prusa Looks to Expand to U.S. with Printed Solid

**Prague, Austria:** Prusa Research is acquiring Printed Solid Inc., a Delaware-based 3D-printer reseller. Prusa's i3 system has become one of the leading FDM-based desktop 3D printers, offering a low cost, small footprint, and easy modifications. Printed Solid was founded in 2013 as a retailer of 3D-printing materials and parts. Three years later, the company acquired Ranlaser and has since made its own printer safety enclosures. Purchasing the reseller will give Prusa a channel for extending sales to the U.S.

## Piedmont to Restart Mining Operations

**Belmont, North Carolina, USA:** Piedmont Lithium Inc., a developer of lithium resources, announced its partner Sayona Mining published a prefeasibility study for the restart of spodumene operations at the North American Lithium Project in Quebec, Canada. The study contemplates average annual production of approximately 168,000 tonnes per year of 6% spodumene concentrate over a mine life of 27 years. Following the positive results of the study, the partners expect to proceed with full capital expenditure authorization. Operations could recommence in the first half of 2023.



**Vancouver, British Columbia, Canada:** Vancouver-based First Majestic Silver Corp. agreed to sell La Guitarra Silver Mine in Mexico's Temascaltepec mining district to Sierra Madre Gold & Silver Ltd. for US\$35 million. The La Guitarra Silver Mine is a past producing silver and gold operation that was placed under care and maintenance by First Majestic in August 2018. Sierra Madre is a mineral exploration company currently focused on the acquisition, exploration, and development of the Tepic and La Tigra Properties in Nayarit, Mexico. Sierra Madre has an experienced management team that had previously operated the La Guitarra mine from 2006 to 2009. (Photo Credit: First Majestic Silver)

## Sales Rise for Risen Energy Solar Modules

**Ningbo, China:** Risen Energy Company Ltd., a Chinese solar module manufacturer, signed contracts to supply 2GW 210 series solar modules with high strength alloy steel frames to projects across Spain and in the Hainan and Guangxi provinces. The use of the high strength alloy steel frame technology helps to reduce carbon emissions and energy consumption. The module not only enhances stability, but also leverages the self-healing zinc-aluminum-magnesium alloy coating that offers excellent corrosion resistance and outstanding performance.

## Develop Acquires Zinc-Copper Mine

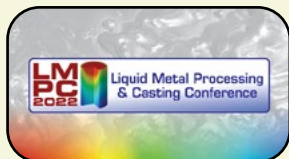
**West Perth, Australia:** Develop Global Limited acquired the Woodlawn zinc-copper mine in New South Wales by purchasing all shares from Heron Resources Ltd. Develop paid the upfront consideration of AUS\$30 million to Heron's secured and unsecured creditors. Develop Managing Director Bill Beament said completion of the Woodlawn acquisition was a pivotal point in the company's growth plan that "is an outstanding deal which has delivered Develop a world-scale project complete with an underground mine and processing infrastructure."



# TMS MEETING HEADLINES

Meeting dates and locations are current as of June 24, 2022.

For the most recent updates on TMS-sponsored events, visit [www.tms.org/Meetings](http://www.tms.org/Meetings).



## 2022 Liquid Metal Processing & Casting Conference (LMPC 2022)

September 18–21, 2022  
Philadelphia, Pennsylvania, USA

**Housing Deadline: August 26, 2022**

LMPC 2022 will convene experts from both industry and academia to specifically discuss the latest advances in primary and secondary melt processing including vacuum induction melting (VIM), vacuum arc remelting (VAR), electroslag refining (ESR), and electron beam cold hearth remelting (EBCHR).

[www.tms.org/LMPC2022](http://www.tms.org/LMPC2022)



## Materials Science & Technology 2022 (MS&T22)

October 9–12, 2022  
Pittsburgh, Pennsylvania, USA

**Advance Registration and Housing Deadlines:**

**September 15, 2022**

Beginning this year, MS&T will co-locate with two exhibitions: The Advanced Materials Show and The Nanotechnology Show. Learn more about these new event partners and organizing societies on the MS&T website today.

[www.matscitech.org/MST22](http://www.matscitech.org/MST22)



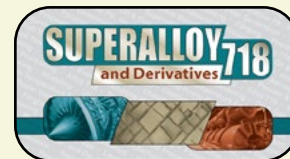
## TMS 2023 Annual Meeting & Exhibition (TMS2023)

March 19–23, 2023  
San Diego, California, USA

**Discount Registration Deadline: January 31, 2023**

The TMS Annual Meeting & Exhibition returns to its most popular destination in 2023—San Diego, California. Make plans now to join your colleagues from around the world for five days of technical programming, networking activities, awards ceremonies, exhibit events, and more.

[www.tms.org/TMS2023](http://www.tms.org/TMS2023)



## Superalloy 718 & Derivatives 2023

May 14–17, 2023  
Pittsburgh, Pennsylvania, USA

**Manuscript Deadline: September 16, 2022**

Forge new connections for future collaborations and learn about the latest developments in alloys, processes, applications, and modeling. New to the Superalloy 718 & Derivatives conference? Contact [programming@tms.org](mailto:programming@tms.org) to learn how to participate.

[www.tms.org/Superalloy718-2023](http://www.tms.org/Superalloy718-2023)

## Other Meetings of Note



## Materials Science & Technology 2023 (MS&T23)

October 1–5, 2023  
Columbus, Ohio, USA  
[www.matscitech.org](http://www.matscitech.org)



## TMS 2024 Annual Meeting & Exhibition (TMS2024)

March 3–7, 2024  
Orlando, Florida, USA  
[www.tms.org/TMS2024](http://www.tms.org/TMS2024)



## TMS 2025 Annual Meeting & Exhibition (TMS2025)

March 23–27, 2025  
Las Vegas, Nevada, USA  
[www.tms.org/TMS2025](http://www.tms.org/TMS2025)

## COPPER-COBRE 2022 (Copper 2022)

November 13–17, 2022  
Santiago, Chile  
**Co-sponsored by TMS**

## OTC Brasil 2023

October 24–26, 2023  
Rio de Janeiro, Brazil  
**Co-sponsored by TMS**

## Materials in Nuclear Energy Systems (MINES 2023)

December 10–14, 2023  
New Orleans, Louisiana, USA

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**TMS 2023**  
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**TMS 2023**  
152<sup>nd</sup> Annual Meeting & Exhibition

**MARCH 19–23, 2023**

**SAN DIEGO, CALIFORNIA, USA**

**#TMSANNUALMEETING**

**MARK YOUR CALENDAR  
WITH THESE KEY DATES:**

**October 2022:** Registration Opens

**January 31, 2023:** Registration Deadline

**February 23, 2023:** Housing Deadline

**March 19–23, 2023:** Conference Dates

**[www.tms.org/TMS2023](http://www.tms.org/TMS2023)**



# Thermo-Calc Software

Empowering Metallurgists, Process Engineers and Researchers

## Do you rely on handbook data?

## What if the materials data you need doesn't exist?

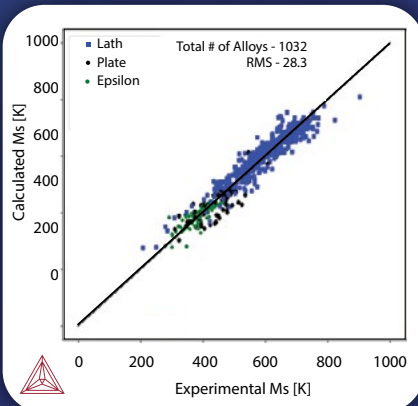
### With Thermo-Calc you can:

- ✓ **Calculate** phase-based properties as a function of composition, temperature and time
- ✓ **Fill in** data gaps without resorting to costly, time-consuming experiments
- ✓ **Predict** how actual vs nominal chemistries will affect property data
- ✓ **Base Decisions** on scientifically supported models
- ✓ **Accelerate** materials development while reducing risk
- ✓ **Troubleshoot** issues during materials processing

## Over 40 Thermodynamic and Kinetic Databases

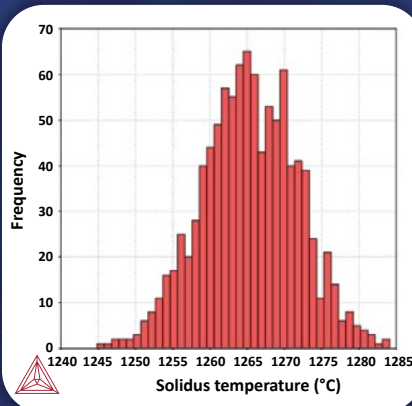
Choose from an extensive selection of thermodynamic and mobility databases in a range of materials, including:

### Steel and Fe-Alloys



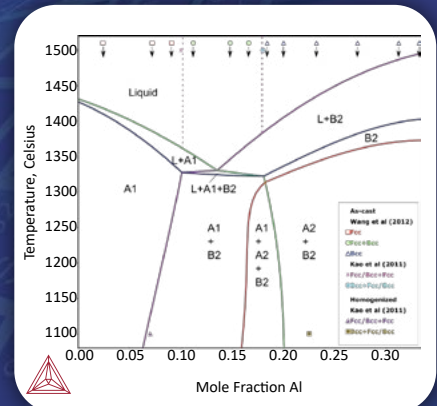
Comparison of calculated and experimental Ms temperatures for a wide range of steels

### Nickel



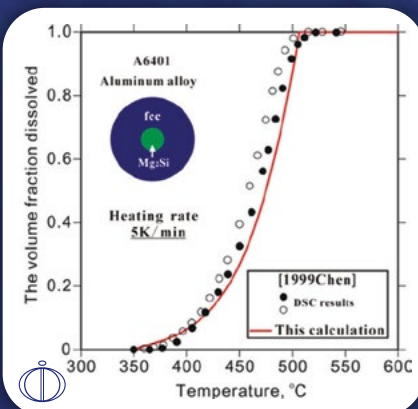
Variation in solidus temperature over 1000 compositions within alloy 718 specification

### High Entropy Alloys



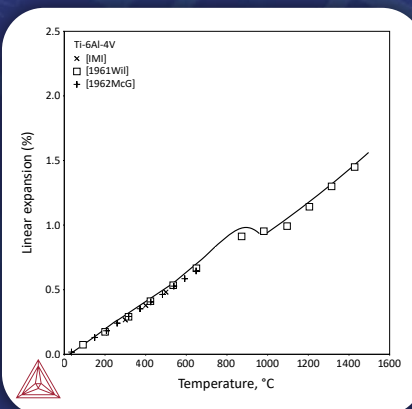
Calculated phase diagram along the composition line of CoCrFeNi-Al

### Al Alloys



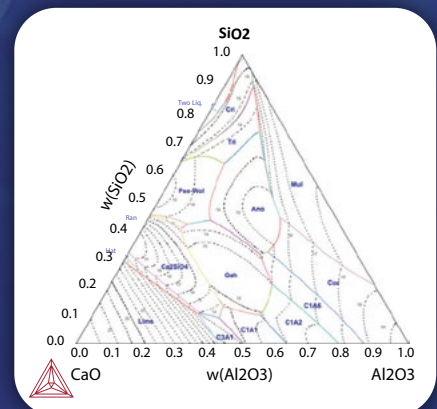
Dissolution of Mg<sub>2</sub>Si precipitate in Alloy A6401

### Ti and TiAl Alloys



Linear expansion vs Temperature for Ti-6Al-4V

### Oxides



Ternary liquidus projection in oxide systems