

OCTOBER 2019

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# GUIDE THE FUTURE OF TMS: SUBMIT NOMINEES FOR THE 2021 TMS BOARD OF DIRECTORS



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- Presidential Rotation (encompasses three successive one-year positions: Vice President, President, and Past President)
- TMS Director/Chair, Programming

Find complete job descriptions and qualifications for each office, as well as the Nominee Statement Form and nomination instructions, at: www.tms.org/BoardNominations

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For additional information, contact Deborah Hixon, TMS Awards Program Administrator, at hixon@tms.org. MATERIALS SCIENCE & TECHNOLOGY



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#### **About the Cover**

This image, from the authors of "Integrated Simulation Framework for Additively Manufactured Ti-6AI-4V: Melt Pool Dynamics, Microstructure, Solid-State Phase Transformation and Microelastic Response" by Rongpei Shi et al., illustrates laser powder bed fusion metal additive manufacturing with attending laser-metal interaction and solidification grain structure evolution in Ti-6AI-4V. The image was designed by Veronica Chen at Lawrence Livermore National Laboratory (chen108@IInI.gov). Data for the polycrystalline grain structure below the melt pool is provided by Rongpei Shi (shi7@IInI.gov) using cellular automata simulations.

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#### **About JOM:**

The scope of *JOM* (ISSN 1047-4838) encompasses publicizing news about TMS and its members and stakeholder communities while publishing meaningful peer-reviewed materials science and engineering content. That content includes 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 practices. In fulfilling this scope, *JOM* strives to balance the interests of the laboratory and the marketplace by reporting academic, industrial, and government-sponsored work from around the world.

#### **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.

#### **Publishing Information:**

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# in the final analysis

"The more that you read, the more things you will know, the more that you learn, the more places you'll go."

-Dr. Seuss, Oh, the Places You'll Go!

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Number 10

October 2019

The last time that I began one of my columns with a Dr. Seuss quote was exactly 13 years ago: October 2006. I know that I last quoted Dr. Seuss in 2006 not because of my remarkable memory or my diligent indexing of every quote that I've ever used. No, I just typed "Dr. Seuss" in the "Search within this journal" box on *JOM's* SpringerLink site. There was but one result: "In the Final Analysis, James J. Robinson in *JOM* (2006)." Click "Download PDF" and presto—a view into my mind 13 years ago.

*The more things that you read:* SpringerLink is not just my balderdash; the site provides every article from every issue of *JOM*'s 71 volume years—all text searchable and all freely accessible by TMS members. I know that this is a benefit that is accessed frequently as we receive periodic reports on site usage (not showing who downloads the content—we're not Facebook or Google!—just what gets downloaded). During the first half of 2019, readers could access 846 issues of *JOM*. From that library, 8,587 different *JOM* articles were downloaded at least once, and 306,644 total downloads were completed.

The more that you know: While the first half of 2019 saw no downloads of my 2006 Dr. Seuss editorial ( $\circledast$ ), 50 other installments of In the Final Analysis were downloaded ( $\circledast$ ). Much more relevant are the four articles that were downloaded in excess of 2,000 times each:

- August 2013: "Lithium: Sources, Production, Uses, and Recovery Outlook," by Laura Talens Peiró, Gara Villalba Méndez, and Robert U. Ayres (4,118 downloads)
- March 2016: "Overview of Materials Qualification Needs for Metal Additive Manufacturing," by Mohsen Seifi, Ayman Salem, Jack Beuth, Ola Harrysson, and John J. Lewandowski (3,031)
- October 2017: "Review of the Methods for Production of Spherical Ti and Ti Alloy Powder," by Pei Sun, Zhigang Zak Fang, Ying Zhang, and Yang Xia (2,642)
- October 2016: "Current and Prospective Li-Ion Battery Recycling and Recovery Processes," by Joseph Heelan, Eric Gratz, Zhangfeng Zheng, Qiang Wang, Mengyuan Chen, Diran Apelian, and Yan Wang (2,186)

*The more that you learn:* Sorting through the latest usage report, I was intrigued to learn that 9 of the 11 articles in the very first issue of *JOM* (January 1949) were downloaded. The most frequently accessed paper from that issue? "Water—Lowest Cost Industrial Mineral," by Julian Hinds, general manager of the Los Angeles Metropolitan Water District.\* He writes:

Industrialization is raising the standard of living of people everywhere. The common man is demanding and getting more of everything. Perhaps more markedly than most other things, he is consuming more water. A hundred years ago water for domestic use, in all but a few large centers, was lugged from wells in buckets. This still is true in many rural areas, even in the enlightened United States of America, but pumps and pressure systems are rapidly replacing the "old oaken bucket," even on farms and in isolated country homes. Nevertheless, many still fail to see water as a "commodity," in the same sense that coal, lumber, fertilizer, and bread are considered as commodities. Water is too frequently taken for granted.

*The more places you'll go:* The paper serves as an example that even from issue one, *JOM* has been addressing science and technology in a meaningful, articulate, engaging, and enduring fashion. More evidence that the more things change, the more they remain the same. (Only the second time that this cliché has appeared in *JOM*; I get credit for the first one: November 1999.)



James J. Robinson Executive Director

"SpringerLink is not just my balderdash; the site provides every article from every issue of JOM's 71 volume years."

<sup>\*</sup> Is there any film aficionado not thinking Hollis Mulwray from *Chinatown*?



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# TMS Announces New Meeting on Engineering Safety; Congratulations to Two TMS Members

## Introducing: Safety Congress 2020

TMS is excited to announce plans for a new event of its kind—the **Congress** 



-the Congress on Safety in Engineering and Industry (Safety Congress 2020). The inaugural installment of

**Roland Moreau** 

# member news

Share the good news about your professional accomplishments! Contact Kaitlin Calva, JOM Magazine Managing Editor, at kcalva@tms.org. Please note that only news submitted by current TMS members will be considered. the congress, scheduled for June 21–24, 2020, in Philadelphia, Pennsylvania, is sponsored by the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), the Association for Iron & Steel Technology (AIST), the Society for Mining, Metallurgy & Exploration (SME), the Society of Petroleum Engineers (SPE), and TMS. Co-sponsoring societies include the American Institute of Chemical Engineers (AIChE), the American Society of Civil Engineers (ASCE), ASME, and the National Academies of Sciences, Engineering, and Medicine (NAS).

Rather than focusing on one industry or the general topic of safety. Safety Congress 2020 has been designed to cross a wide spectrum of industries and settings-as evidenced by the array of sponsoring and co-sponsoring organizations involved-to give participants the opportunity to learn from others who are addressing similar safety problems, but through different approaches, processes, and best practices. The meeting presents a unique opportunity for attendees to convene with leadership across industries and the breadth of science and engineering disciplines to address shared safety management challenges (including operational, process, and project safety; safety leadership and culture; safety management system design and implementation; and effective use of data metrics to support risk-based decision making).

"I think that one of the greatest potential contributions for Safety Congress 2020

is to allow different industries to learn from each other, foster new networks, and address more effective ways to integrate safety considerations at the university level," said Roland Moreau, congress program chair, 2018 AIME President, and ExxonMobil (retired). "In keeping with its multi-industry approach, Safety Congress 2020 is envisioned to support a broad cross-section of management and safety professionals in expanding their skillsets for the advancement of their organizations—and themselves."

At press time, the following breakout sessions are planned for Safety Congress 2020:

- Management and Systems: covering the role of health, safety, and environment management systems; the integration of safety in regulatory frameworks; addressing funding issues; and more.
- Technology and Techniques: looking at the role of unmanned aircraft systems in enhancing safety; incident investigations; the role of technology and innovation in improving safety performance; and more.
- Human Resources: taking on the topics of leadership development; preparing university students for industry; and more.

Additionally, keynote and plenary topics for the congress include:

- The importance of safety and value of networking across sectors
- The value proposition for safety
- Executing an effective risk management program
- Leading the future of safety by learning from the past

Further program details are still under development, as well as information on registration, professional development opportunities, and networking events. For more information and to sign up for e-mail updates visit www.SafetyCongress.org.



TMS Announces New Meeting on Engineering Safety; Congratulations to Two TMS Members

# Carter and Mathaudhu Honored as Early Career **Scientists**

Congratulations to two TMS members who were named recipients of the Presidential Early Career Awards for Scientists and Engineers (PECASE), the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their independent research careers. Jennifer L.W. Carter, an assistant professor in the Department of Materials Science and Engineering at Case Western Reserve University, and Suveen N. Mathaudhu, associate professor and Materials Science and Engineering Chair at the University of California, Riverside, were both recognized for their achievements in July 2019.

A TMS member since 2007, Carter is the recipient of the 2012 American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) Henry deWitt Smith Scholarship, the 2014 Structural Materials Division (SMD) Young Leaders Professional Development Award, and the 2019 TMS/Federation of European Materials Societies (FEMS)

Young Leaders International Scholar Award. She has been actively involved in several TMS technical and functional committees and is a past chair and current member of the Diversity Committee.

Mathaudhu has participated on many TMS technical committees since he became a member in 2000, serving the Society across the Light Metals, Materials Processing & Manufacturing, and Structural Materials Divisions. In 2015, Mathaudhu received the American Association of Engineering Societies' (AAES) Norm Augustine Award for Outstanding Achievement in Engineering Communications.

The PECASE are coordinated by the U.S. Office of Science and Technology Policy with the participating agencies and departments to recognize individuals who contribute to the advancement of science, technology, education, and math (STEM) education and who demonstrate commitment to community service through scientific leadership, public education, or community outreach.



Jennifer L.W. Carter



Suveen N. Mathaudhu

# TMS Board Convenes in Pittsburgh

The TMS Board of Directors gathered at TMS headquarters in Pittsburgh, Pennsylvania, on July 19-21, 2019. for its annual summer board retreat. Front row, left to right: Cindy Belt, Extraction & Processing Division Chair; Alexis Lewis, Membership & Student Development Director: Kevin Hemker. Past President: Jim Foley, TMS President; Mark Stoudt, Materials Processing & Manufacturing Division Chair; and Michele Manuel. Content Development & Dissemination Director. Back row, left to right: Raymundo Arroyave, **Functional Materials Division** Chair; John Howarter, Public & Governmental Affairs Director; Brad Boyce, Programming Director; and Jim Robinson, TMS Secretary/ Executive Director. Not pictured are: Thomas Battle, TMS Vice President; Adrian Deneys, Financial Planning Officer; Chester Van Tyne, Professional Development Director; Daniel Miracle, Structural Materials Division Chair; and Eric Nyberg, Light Metals Division Chair.

# **TMS Welcomes New Members**

The TMS Board of Directors approved professional membership for the following individuals at its July 2019 meeting. Please join us in congratulating and welcoming them to all the privileges and benefits of TMS membership.

- Al Washahi, Mohammed; Sohar Aluminium Company, Oman
- Alansari, Atif; Emirates Global Aluminium, United Arab Emirates
- Aromaa, Jari J.; Aalto University, Finland
- Bjorgvinsson, Sigurjon K.; Alcoa, Iceland
- Budding, Wesley J.R.; Quantillion Technologies, Netherlands

Cani, Alessio; SiderAlloys, Italy

- Chandola, Nitin; University of Florida, United States
- Chen, Pengyu; United States
- Chetty, Jeremy; South Africa
- Chokshi, Atul; Indian Institute of Science, India
- Crouzet, Sylvain; REEL Alesa, France

Deik, David G.; United States

- Demesa, Abayneh; Abo Akademi University, Finland
- Dimou, Sotirios; Mytilineos SA, Greece
- Dionne, Jean-François; Switzerland

Dyroy, Are; Norway

El Khoja, Mahmud; Pyrotek Inc., United States

Etedgi, Cgarli; Kmg, Israel

- Fernandez, Joaquin Fernandez; Alcoa, Spain
- Fernandez Gomez, Hector; Manpowergroup Solutions SLU, Spain
- Gandia, Thomas; REEL Alesa, France
- Ganguly, Partha; United States
- Gilbert, Andre; Stas Inc., Canada
- Girault, Guillaume; REEL Alesa, France
- Glen, Crystal C.; United States
- Gorshunova, Margarita; Hydro Aluminium Rolled Products GmbH, Germany

- Hummel, Kyle R.; Contour Hardening Inc., United States
- Iwa, Mayowa; Danvic Petroleum International, Nigeria
- Karlsen, Morten; Hydro Aluminium, Norway
- Katz, Gary; Katz Water Technologies, United States
- Kiligaridis, Danis; Alumil SA, Greece
- Kirchhofer, Rita; Exponent Inc., United States
- Kolioumpas, Nikolaos; ANOXAL SA, Greece
- Kontaratos, Antonis; ANOXAL SA, Greece
- Lee, Dongrim; Google LLC, United States
- Luan, Jian; Dalian Bihai Enviornmental Protection Equipment Co. Ltd., China
- Makama, Zakari; United States
- Malhotra, Sumit; AES Drilling Fluids, United States
- Mhaskar, Nauman; Weatherford, United States
- Muehlen, Petra; Advancetex International Pty, Germany
- Munger, Steve; STAS Inc., Canada
- Noack, Clinton; United States
- Norton, M. Grant; Washington State University, United States
- Olsen, Havard M.; GE Power Norway, Norway
- Ose, Sivert; GE Power Norway AS, Norway
- Panchal, Nitesh N.; NMT Engineering & Services, India
- Raja, Pavan; Rice University, United States
- Risse, Marcel S.; BSH Home Appliances Corp., Germany
- Romero, Rocio Belen; Alvar Aluminio Argentino S.A.I.C, Argentina
- Schneider, Josephine; Hydro Aluminium Rolled Products GmbH, Germany
- Shaber, Nicholas L.; Wagstaff Inc., United States

- Shah, Jiten; PDA LLC, United States
- Shipley, Roch J.; Professional Analysis and Consulting Inc., United States
- Singh, Amarendra Kumar; Indian Institute of Technology Kanpur, India
- Sis, Adem; Trimet Aluminum SE Plant Essen, Germany
- Soederholm Hansen, Magnus; Neatec, Norway
- Soto, Karla; United States
- Spiess, Peter; Hydro Aluminium Rolled Products GmbH, Germany
- Stathopoulos, Pantelis K.; Elvalhalcor SA, Greece
- Steingrimsson, Arnfinnur Aegir; Alcoa, Iceland
- Thibault, Yves; Canmet MINING, Natural Resources Canada, Canada
- Tower, Eric J.; Pyrotek, United States
- Triantafyllou, Anastasios; Mytilinaios SA, Greece
- Tzevelekou, Theofani; ELKEME SA, Greece
- Valciu, Serena; Hydro, Norway
- Vass, Jeanette; United States
- Vrancken, Bey; Lawrence Livermore National Laboratory, United States
- Wang, Zhang; Alcoa, Norway
- Worner, Steven M.; Corval Group, United States
- Woss, Alexander; Hammerer Aluminium Industries, Austria
- Wu, Yongyu; Dalian Bihai Environmental Protection Equipment Co. Ltd., China
- Yousseff, Joumani; Fives Solios, France
- Zakaria, Muzdalifah; Petronas Research, Malaysia
- Zheng, Ruirui; Dalian Bihai Environmental Protection Equipment Co. Ltd., China

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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 Magazine Managing Editor, at kcalva@tms.org for consideration.

# In Case You Missed It: Business News from the Field

#### Finnish Quantum Computing Firm Secures Seed Money

Espoo, Finland: Startup IQM Finland announced that it has raised \$13 million in funding to advance quantum computing and drive adoption of the technology. The funding comes from a variety of sources, including U.S.-based Matadero QED; Finnish companies Tesi, Maki.vcm, and OpenOcean; and German firms MIG Fonds and Vito Ventures. The company, a spinout from Aalto University and the Technical Research Centre of Finland, plans to leverage local research and advancements to bring quantum technology into common use. IQM hopes that advances in quantum computing will have a profound impact on fields such as materials science, pharmaceuticals, and finance.

#### Ongoing Interest in Purchase of British Steel North Lincolnshire, England:

Negotiations are now underway with potential buyers over the purchase of British Steel Ltd., the U.K.'s second-largest steel producer. This follows an announcement



**Brussels, Belgium:** Three organizations have come together to create a cross-sector platform to advance novel approaches to the recycling of wind turbine blades in order to address the future of the 2.5 million tons of composite materials currently used in the wind energy sector. The venture, a collaboration between WindEurope, the European Chemical Industry Council (Cefic), and the European Composites Industry Association (EUCIA), aims to establish an industry standard for wind turbine recycling. This comes as the first generation of wind turbines in Europe approach the end of their operational lives and more than 12,000 wind turbines are expected to be decommissioned within the next five years. (Image courtesy of WindEurope.)

from the U.K. Insolvency Service and British Steel in May 2019 that the company had failed to secure a government lifeline and was entering into liquidation. Since then, the company has continued to operate as normal while it goes through this period of negotiation. British Steel has noted its preference to select a buyer interested in the purchase of the entire company, rather than individual components, and that it is striving for a solution that will preserve the jobs of more than 4,000 direct employees.

## NSF Grant to Boost Supercomputing Capabilities

Pittsburgh, Pennsylvania, USA: The Pittsburgh Supercomputing Center (PSC) will be expanding its capabilities thanks to a \$10 million grant from the National Science Foundation (NSF). The PSC, a joint research center operated by Carnegie Mellon University and the University of Pittsburgh, will use the grant money to deploy Bridges-2, the newest iteration of PSC's Bridges system. The Bridges-2 project is being undertaken in partnership with Hewlett Packard Enterprise and is designed to accelerate discoveries and scientific breakthroughs by assisting with computation-intensive research. The system will be made available for research and educational needs at no cost, and at costrecovery rates for other purposes.

#### Metso and Outotec Announce Merger

Helsinki, Finland: Metso Corporation has announced the merger of its main minerals technology business, Metso Minerals, with Outotec to create a new company: Metso Outotec. Metso is a major equipment and services provider within the mining, aggregates recycling, and process industries, while Outotec develops technologies and services for the mining, metal, energy, and chemical industries with a focus on sustainability. The merger intends to leverage the strengths of each organization with particular focus on their shared sustainability agenda. Metso Flow Control will not be included with the merger but will be listed as a separate entity.



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# What's Your Membership Resolution for 2020?

James C. Foley



James C. Foley

When it comes to professional societies, the more you put into your membership, the more you will get out of it. As we enter membership renewal season here at TMS, I encourage you to consider what you hope to achieve with your TMS membership in the coming year—and what steps you'll take to reach your goal.

When you receive the reminder in your inbox (or your mailbox) to renew for 2020, consider making a new year's resolution of sorts—a new membership year's resolution—that will help you meet one of your professional goals over the next 12 months. Make it a clear, specific goal of how you'll use your membership to further your career, improve your research, or build your network.

Nothing coming to you? Let me offer a couple of suggestions to get you thinking:

#### Reach out to TMS members who live near you to initiate an informal gathering.

Did you know that you can search the online TMS membership directory by location? Use this tool to help you connect with other members in your community. E-mail a small group of members who live near you and propose an informal meeting at a restaurant or coffee shop to begin building a network of colleagues and collaborators close to home. Pick a date and location, search the directory, and hit send on an e-mail. Maybe a half-hour's work could grow into a valuable network of local colleagues. The membership directory is found at members.tms.org and is available only to members.

# Pick a technical committee and attend a meeting.

Maybe you haven't been a member for very long or maybe putting yourself forward for a position just isn't in your nature. Regardless, I encourage you to take this one simple—and pretty painless-step toward venturing off the sidelines and into the thick of TMS activities. Joining a committee is a great way to meaningfully connect with other members of the Society. And because technical committees are divided into technology areas, you'll be connecting with people who share your interests. If you want to see big results from your TMS membership, joining a committee is an easy way to get started. If you'll be with us at the TMS 2020 Annual Meeting & Exhibition (TMS2020), plan to join us at an in-person committee meeting. (Meeting schedules will be posted on the TMS2020 website early next year.) If you can't travel to San Diego next year, contact volunteer@tms.org and ask to be added to a committee roster. A complete list of technical committees can be found at www.tms.org/Committees.

What's Your Membership Resolution for 2020?

#### Apply for an award that both boosts your resume and provides practical experience.

This one's for our young professionals: take a look at our awards designed specifically for early career professionals. A whole list of them is available at awards .tms.org and they cover a lot of territory. Many of them are part recognition and part learning opportunity, so if you're shy about putting your name up for an award, don't be. TMS wants you to succeed-and we want to give you something that not only looks good on your resume but actually enhances your skills, as well. You'll find awards that allow you to deliver featured lectures at our annual meeting, to travel to international conferences to present your work, to organize your own symposia, to participate in leadership development training, and to learn more about the inner workings of TMS, to name a few. Pick an award, mark the submission deadline on your calendar, and make it a professional priority to apply.

# Show someone how much their work means.

Make this the year that you show your long-term mentor how much he or she means by nominating them for a TMS award—or maybe there's a promising junior colleague who you think could benefit from some welldeserved recognition. Most TMS awards nominations for the 2021 cycle are due April 1, 2020. Write that date on your calendar and set deadlines to complete the nomination form and gather letters of reference by that time. It's the kind of thing that can make you feel proud to be a TMS member.

# Share your expertise for the greater good.

If you have the qualifications, consider volunteering as an ABET evaluator or as a member of the TMS Professional Registration Committee for licensed professional engineers (PE). Both are excellent ways to give back to your profession by helping to set standards at university programs and for professional licensure. Learn more at www.tms.org/PD. Other opportunities include participating in our diversity and inclusion and STEM (science, technology, engineering, and math) outreach initiatives. Explore the Outreach section of www.tms.org to learn how you can contribute.

These are just a few ideas to get you thinking about how you can use your TMS membership in the coming year. So when you see those dues renewal messages in your mailbox, be sure to renew your membership for 2020, but don't forget to write down one specific way you'll *use* your membership in the coming year to benefit yourself, your organization, and your profession.

I look forward to seeing these resolutions bear fruit.

**JOIM** themagazine "TMS wants you to succeed—and we want to give you something that not only looks good on your resume but actually enhances your skills, as well."

# Give Us a Word Is Back!

Influential. Friendly. Reliable. These are just a few of the words TMS members used to describe their Society when we asked them to give us one word that defines TMS. The artwork shown here, created a few years ago, summarizes the generous responses we received from our members.

Think there's a word that's missing? Let us know on social media! Write down your word, snap a photo of yourself (with your word), and share it with us using **#TMSmembers.** 

Feel free to be creative. Whether you write it on a whiteboard, in sidewalk chalk, or tattoo it on your arm, we'd like to hear what TMS means to you.

Perhaps *your* membership resolution could be as simple as sharing one word . . .



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# **TMS meeting headlines**

View all upcoming meetings online at www.tms.org/Meetings.

# Other Meetings of Note

**OTC Asia 2020** March 24–27, 2020 Kuala Lumpur, Malaysia

Offshore Technology Conference (OTC) 2020 May 4–7, 2020 Houston, Texas, USA

The 11th International Conference on Molten Slags, Fluxes and Salts (Molten 2020) May 25–29, 2020 Seoul, South Korea

The 13th International Conference on the Technology of Plasticity (ICTP 2020) July 26–31, 2020 Columbus, Ohio, USA

The 14th International Symposium on Superalloys (Superalloys 2020) September 13–17, 2020 Seven Springs, Pennsylvania, USA

Materials Science & Technology 2020 (MS&T20) October 4–8, 2020 Pittsburgh, Pennsylvania, USA

TMS 2021 Annual Meeting & Exhibition (TMS2021) March 14–18, 2021

Orlando, Florida, USA



November 17–20, 2019 Hyatt at Olive 8 Seattle, Washington, USA www.tms.org/HEA2019

The World Congress on High Entropy Alloys (HEA 2019) will feature the following all-conference plenary speakers: *Chain Tsuan Liu*, City University of Hong Kong; *Dierk Raabe*, Max-Planck-Institut für Eisenforschung GmbH; and *Oleg Senkov*, U.S. Air Force Research Laboratory.

THE WORLD COMES HERE



149<sup>th</sup> Annual Meeting & Exhibition February 23–27, 2020 San Diego Convention Center and Marriott Marquis & Marina San Diego, California, USA Discount Registration Deadline: January 17, 2020 www.tms.org/TMS2020

- If you missed the deadline to submit an abstract for the TMS 2020 Annual Meeting & Exhibition (TMS2020), don't miss this chance to share your work! Abstracts are being accepted for the TMS2020 General Poster Session, now through December 3, 2019.
- TMS2020 is also home to the 3rd International Symposium on Electrometallurgy, a forum for the international metallurgical community to discuss innovative approaches to reduce energy consumption during electrolysis of metals.
- Reserve a space for your company or organization in the Exhibit Hall or become a conference sponsor. View floor plans, a list of sponsorship opportunities, and more on the Exhibitors & Sponsors section of the TMS2020 website.



June 21–24, 2020 Philadelphia Marriott Downtown Philadelphia, Pennsylvania, USA www.SafetyCongress.org

- The Congress on Safety in Engineering and Industry 2020 (Safety Congress 2020) is a unique, collaborative conference experience that convenes leadership from across industries and disciplines to address shared safety management challenges.
- Be among the first to know about program updates, special events, and when registration opens by signing up to receive e-mail updates on the Safety Congress 2020 website.

The 5th International Congress on



3D Materials Science 2020 June 28–July 1, 2020 Hyatt Regency Washington on Capitol Hill Washington, D.C., USA Abstract Submission Deadline: November 8, 2019 www.tms.org/3DMS2020

- Join key researchers and established professionals in the field of 3D materials science as they assess the current stateof-the-art and roadmap crucial areas for future research at the 5th International Congress on 3D Materials Science.
- The following technical topics will be covered during the congress: methods for materials simulation and modeling; 3D data processing and reconstruction algorithms; process-structure-property relationships in 3D; materials dynamics in 3D; new characterization methods; machine learning; and more. Visit the congress website to submit your abstract in one of these topics by November 8.

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# Penn Engineering

# FACULTY POSITIONS

# Materials Science and Engineering University of Pennsylvania, Philadelphia, PA

The Department of Materials Science and Engineering within School of Engineering and Applied Science at the University of Pennsylvania seeks outstanding applicants for tenure-track assistant professorships. Applicants for tenured associate and full professorships will also be considered. The department is interested in candidates with expertise in any aspect of materials science and engineering.

Deadline for applications is **November 1, 2019.** 

Applications must be submitted online

https://apply.interfolio.com/65160 and additional instructions are available at

https://mse.seas.upenn.edu/open-faculty-positions/.

The University of Pennsylvania values diversity and seeks talented students, faculty and staff from diverse backgrounds. The University of Pennsylvania is an equal opportunity and affirmative action employer. Candidates are considered for employment without regard to race, color, sex, sexual orientation, gender identity, religion, creed, national or ethnic origin, citizenship status, age, disability, veteran status or any other legally protected class.

Whether you are seeking a new job opportunity or needing to fill an open position, the JOM Job Board provides companies, academic institutions, and other organizations with a valuable resource to post and search for job openings. For \$125 per column inch, your ad can be posted, searched, and viewed by thousands of qualified candidates. Questions on placing a JOM classified advertisement?

## Contact:

Doug Shymoniak, Advertising & Sales Specialist

E-mail: sales@tms.org or dshymoniak@tms.org

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# call for papers

*JOM* is seeking contributions on the following topics for 2020. For the full Editorial Calendar, along with author instructions, visit www.tms.org/EditorialCalendar.



### **April 2020:** Manuscript Deadline: November 1, 2019

#### Topic: Aluminum and Magnesium: New Alloys and Applications

**Scope:** This topic covers the development of new alloys, optimization of commercial alloys, additions for structure modification, and improvement of mechanical and functional properties, as well as new applications of aluminum and magnesium alloys. Papers are invited that contain essentially new data based on advanced characterization and analysis techniques as well as thermodynamic analysis and testing for properties.

Editor: Dmitry Eskin Sponsors: Aluminum Committee

#### **Topic: Biologically Induced Corrosion**

**Scope:** Papers in all areas of biologically induced or influenced corrosion are welcome. Examples include microbially induced corrosion, corrosion in biomedical devices, etc.

Editor: Vilupanur Ravi

Sponsors: Corrosion and Environmental Effects Committee

**Topic: Characterization of Advanced Biomaterials** 

**Scope:** Papers are invited on advances in processing or relevant property measurement of novel biomaterials, particularly those on synthesis, processing, and characterization. Of interest are multifunctional nanomaterials and modified mineral-based biomaterials with unique combinations of desirable mechanical performance, biocompatibility, and bioactivity for clinical applications. **Editors:** Zhiwei Peng, Rajiv Soman, and Yunus Eren Kalay **Sponsors:** Materials Characterization Committee

Topic: Hydrogen Effects on Material Performance

**Scope:** Numerous energy generation and transportation systems constructed of high-performance metal alloys are routinely exposed to hydrogen. The integrity of these systems is often challenged by a variety of hydrogen degradation modes. The hydrogen-material interactions that ultimately lead to degradation occur across multiple length scales. Therefore, of particular interest for this special topic are

studies involving multiscale experimental and theoretical methods for probing hydrogen-materials interactions in complex materials systems.

**Editors:** Janelle Wharry and Samantha Lawrence **Sponsors:** Nanomechanical Materials Behavior Committee

#### May 2020: Manuscript Deadline: December 1, 2019

#### Topic: Advancing Development and Application of Superalloys

**Scope:** This topic focuses on the current advances in the development and application of Ni- and Co-based superalloys. Areas of interest may include (but are not limited to): alloy development, advanced processing, deformation behavior, structure-property relationships, long-term stability, environmental damage, and joining.

Editor: Martin Detrois

Sponsors: High Temperature Alloys Committee

#### Topic: Emerging Mechanisms for Enhanced Plasticity in Magnesium

**Scope:** This topic covers emerging methods that overcome this limitation. The scope is inherently multi-scale, ranging from fundamental mechanisms at the atomic/crystal defect level, up to large-scale production techniques. Optimizing mechanical properties via microstructure and crystallographic texture modification are considered; chemistry control and alloying, casting, powder-based strategies, as well as thermomechanical processing, are addressed. **Editors:** Petra Maier and Jishnu J. Bhattacharyya **Sponsors:** Magnesium Committee

**Topic: Heat Transfer Utilization in Pyrometallurgy Scope:** This topic covers some of the fundamentals and applications of heat transfer in pyrometallurgy. In particular, this topic aims to highlight how the knowledge and investigation of heat transfer modes drive furnace design and operation. Included are practical applications to industrial furnaces, with an emphasis on furnace heat management and heat utilization for process optimization. **Editors:** Camille Fleuriault and Joseph Grogan **Sponsors:** Pyrometallurgy Committee

#### Topic: In-Situ Characterization Techniques for Investigating Nuclear Materials

**Scope:** For this topic, we are soliciting papers on insitu experimental techniques at all length scales probing mechanical, chemical, thermal, or electrical responses, as well as irradiation damage. Papers that include modeling and simulation are welcome, though computational-only papers will not be accepted.

**Editors:** Clarissa Yablinsky, Peter Hosemann, David Frazer, and Shradha Agarwal

Sponsors: Nuclear Materials Committee

#### June 2020

#### Manuscript Deadline: January 1, 2020

#### Topic: Advanced Characterization of Interfaces and Thin Films

**Scope:** This topic focuses on the advanced characterization of materials interfaces at atomic and nanoscales in metal, alloys, ceramics, and polymers by various in-situ and exsitu experimental techniques, such as x-ray and neutron diffraction, scanning electron microscopy, transmission electron microscopy, and atomic force microscopy. This topic also involves the understanding of materials interfaces by theoretical modeling approaches that allow the study of these processes on the atomic and molecular level.

**Editors:** Ritesh Sachan, Manuel Roldan Gutierrez, and Amit Pandey

Sponsors: Thin Films and Interfaces Committee

#### Topic: Electrochemical Energy Conversion and Storage

**Scope:** Papers are sought on topics related to, but not restricted to: solid oxide and proton exchange membrane fuel cells, electrolyzers, batteries for energy storage, and hydrogen storage. Papers can address issues related to electrode, electrolyte, and interconnection materials; electrochemical processes at electrodes and electrolyte interfaces; catalysts and catalytic mechanisms; infiltration to enhance catalytic activity and reduce poisoning effects; durability issues; and advances in characterization and modeling techniques. **Editors:** Soumendra N. Basu and Partha P. Mukherjee **Sponsors:** Energy Conversion and Storage

**Topic: Metal and Polymer Matrix Composites** 

**Scope:** This topic will cover recent progress in metal and polymer matrix composites, including: fiber-reinforced composites; natural fiber reinforced composites; solid and hollow particle reinforced composites; nanocomposites; fabrication methods and surface modification of microand nanoscale reinforcements; development of processing methods for composite materials; and modeling and simulation.

Editors: Nikhil Gupta and Tomoko Sano Sponsors: Composite Materials Committee

#### Topic: Quantum Materials for Energy-Efficient Computing

**Scope:** Quantum materials hold great potential for becoming crucial components of future generations of computers. This

special topic covers various state-of-the-art computational techniques, such as density-functional theory calculations that provide deeper understanding of quantum materials and accelerate their discovery.

**Editors:** Houlong Zhuang, Shawn Coleman, Srikanth Patala, Jacob Bair, and Sugata Chowdhury

**Sponsors:** Computational Materials Science and Engineering Committee

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#### **July 2020** Manuscript Deadline: February 1, 2020

#### **Topic: Characterization of Amorphous Materials**

**Scope:** This topic will include, but is not limited to, characterization of amorphous solids and possibly liquids using advanced analytical techniques such as electron microscopy, x-ray radiation, thermal analyses, spectroscopy, atom probe tomography, etc. Particular emphasis will be paid to lesser-known characterization techniques used for amorphous materials.

**Editors:** Yunus Eren Kalay, Rajiv Soman, and Zhiwei Peng **Sponsors:** Materials Characterization Committee

#### Topic: Machine Learning Applications in Advanced Manufacturing Processes

**Scope:** This special topic focuses on reducing waste, energy usage and carbon emissions, and spurring innovation in materials development and production. Advances in digital manufacturing, process control, predictive maintenance, and automation can be realized by integration of data analytics and validated models to ensure product quality, optimize operations, enhance productivity, and improve efficiency. **Editors:** Donna Guillen, Judy Schneider, and Srikanth Patala **Sponsors:**Energy; Additive Manufacturing Committee; Computational Materials Science and Engineering Committee

**Topic: Recycling Silicon and Silicon Compounds Scope:** Silicon and silicon compound recycling is needed for a cleaner and greener environment. These materials can be reused in the manufacturing of solar cells and panels and other industries such as electronic industries. The scope of this special topic is concerned with recycling of all types of silicon, silicon products, and silicon compounds including silicon wafers, silicon poly chunk, IC grade, ingots, IC flakes, etc. **Editor:** Shadia Ikhmayies

**Sponsors:**Recycling and Environmental Technologies Committee

#### Topic: Thermodynamic Modeling of Sustainable Non-Ferrous Metals Production

**Scope:** Papers covering experimental investigations, thermodynamic modeling, metallurgical process optimization, resource efficiency and environmental issues, particularly those pertaining to non-ferrous metallurgical processes, are invited. Manuscripts intended for a broad readership and review papers are especially encouraged.

**Editors:** Fiseha Tesfaye, Allie Anderson, and Mingming Zhang

**Sponsors:** Process Technology and Modeling Committee; and Recycling and Environmental Technologies Committee

# **REGISTRATION OPENS IN OCTOBER!**

THE WORLD COMES HERE TMS 2020 149<sup>th</sup> Annual Meeting & Exhibition



February 23-27, 2020 • San Diego, California, USA #TMSAnnualMeeting

# WHAT CAN YOU EXPECT AT THE TMS 2020 ANNUAL MEETING & EXHIBITION?



Comprehensive Coverage:

We're building one of our most extensive technical programs yet for 2020, with more than 4,000 presentations planned at more than 85 symposia.



Two Events for the Price of One:

The 9th International Symposium on Lead and Zinc Processing 2020 will be co-located with TMS2020, giving you access to both events with your registration.



A Global Meeting Place:

Scientists and engineers from around the world will travel to TMS2020 to deliver updates on their latest work, to learn from their peers, and to engage with their international colleagues.



Learn more at: www.tms.org/TMS2020

# Thermo-Calc Software

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- ✓ **Base decisions** on scientifically supported models
- ✓ Accelerate materials development while reducing risk
- Troubleshoot issues during materials processing

# Software packages:

- Thermo-Calc for thermodynamics and phase equilibria in multicomponent systems
- Diffusion module (DICTRA) for time dependent transformations and homogenization
- Precipitation module (TC-PRISMA) for concurrent nucleation, growth, coarsening and dissolution of precipitates
- Software development kits for linking to your own software codes
- Over 40 Databases for a broad range of materials including steel, nickel, aluminum, titanium, HEA, copper, magnesium, oxides, and aqueous solutions

# Learn how Thermo-Calc can help @ www.thermocalc.com





Variation in solidus temperature over 1000 compositions within alloy 718 specification

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