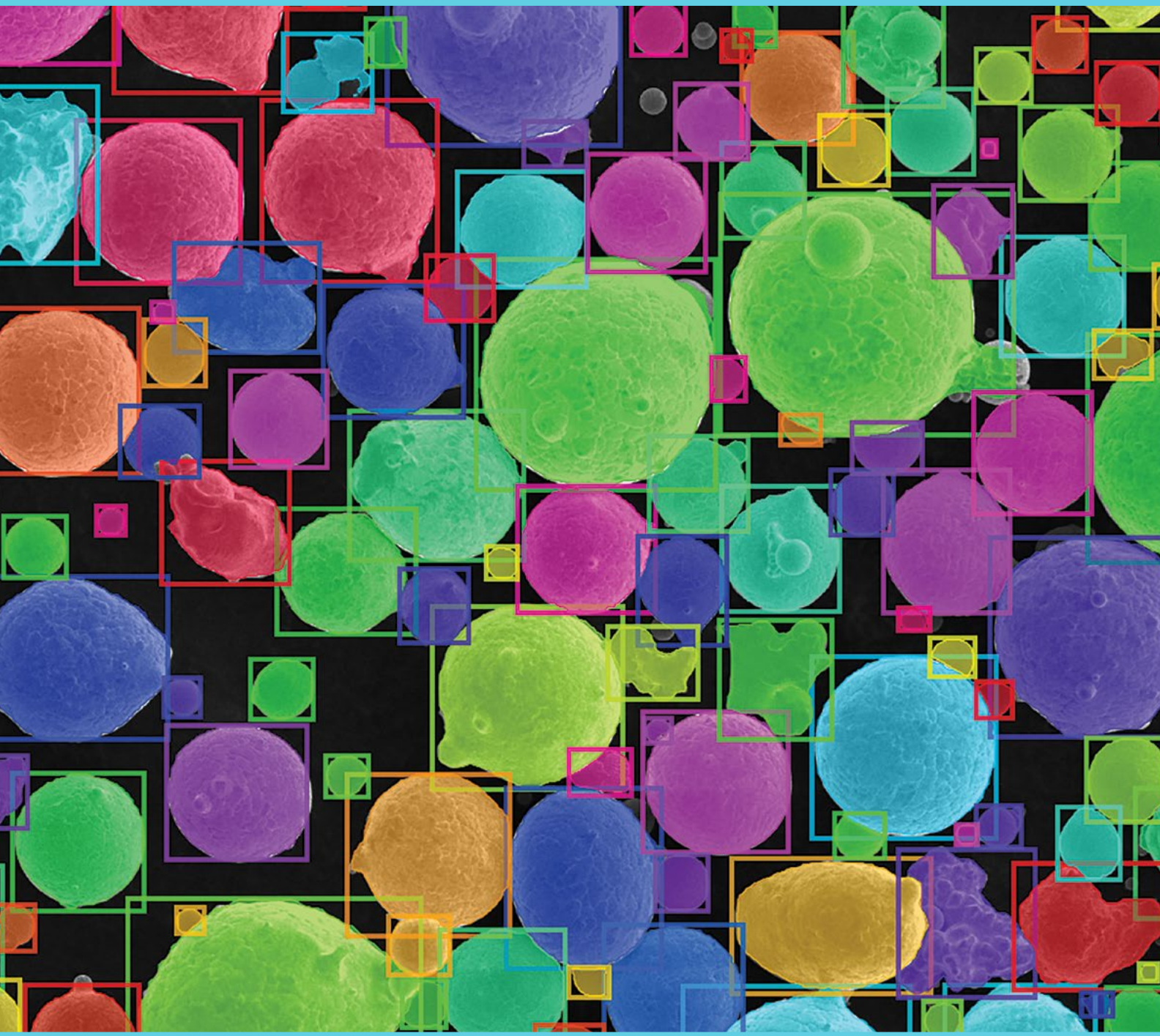
JOM

JULY 2021
jom.tms.org

An official publication of The Minerals, Metals & Materials Society

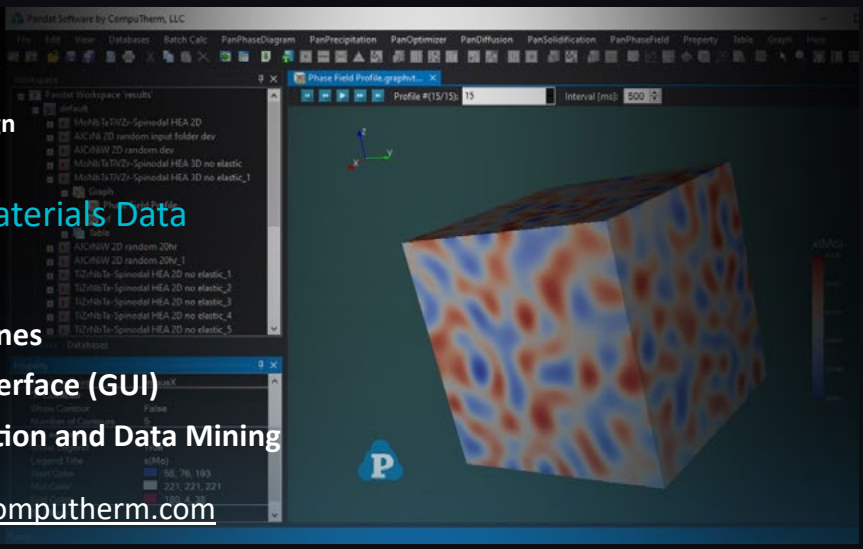


JOM INTRODUCES: The 2022 TMS Board of Directors Nominees

TMS Springer

Pandat Software

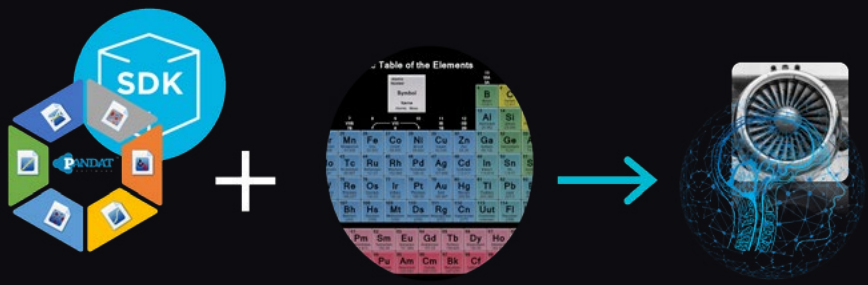
An Integrated Modeling Platform for Materials Design



One Unified Workspace, Numerous Materials Data

- **Cutting Edge Software Technologies**
- **Intelligent and Reliable Simulation Engines**
- **Friendly and Flexible Graphical User Interface (GUI)**
- **Large Scale of High-Throughput Calculation and Data Mining**

Web: www.computherm.com Email: info@computherm.com

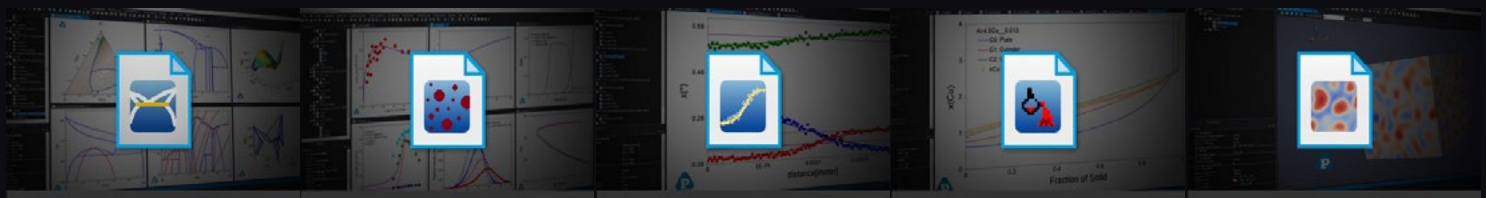


Pandat Software + PanDatabases → ICME & MGI Applications

- Al – based alloys
- Co – based alloys
- Cu – based alloys
- Fe – based alloys
- Mg – based alloys
- Ni – based alloys
- Ti – based alloys
- TiAl – based alloys
- Refractory alloys
- High-entropy alloys
- More…

Pandat Software Modules

Pandat Software adopts modular design and enables users to easily switch between modules and perform various types of simulations in the same workspace.



PanPhaseDiagram

- stable and meta-stable diagrams
- property contour diagrams
- thermodynamic properties
- chemical driving force

PanPrecipitation

- concurrent nucle-ation, growth and coarsening
- particle size and size distribution
- multi-phase co-precipitation

PanDiffusion

- diffusion couple
- homogenization
- carburization and decarburization
- particle dissolu-tion

PanSolidification

- solidification path
- back-diffusion in the solid
- dendrite arm coarsening
- micro-segregation

PanPhaseField

- direct coupling with CALPHAD
- feasible for multi-component alloys
- open architecture for user's model plugin

JOM

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TMS Springer

About the Cover

It can be challenging for conventional image analysis software to identify individual objects when many objects overlap. That is the case in this SEM micrograph of gas atomized Ni superalloy powder produced for additive manufacturing. To address this challenge, advanced computer vision techniques were applied to locate and segment each individual powder particle, termed 'instance segmentation.' Overlaid on the original image are colored bounding boxes and segmentation masks for each particle, as determined by the computer vision system. (Note that the color of each mask is randomly assigned for visual clarity and does not correspond to particle properties.) After powder particles have been segmented, they can be used as data for subsequent machine learning investigations to correlate particle characteristics, such as surface morphology, with powder flow properties to improve the quality and decrease the cost of feedstock powders for additive manufacturing. See "Instance Segmentation for Direct Measurements of Satellites in Metal Powders and Automated Microstructural Characterization from Image Data" by Elizabeth Holm et al. for details.

July 2021 Guest Editors

Leveraging Materials in Topology Optimization
Invited
Natasha Vermaak, Lehigh University

Machine Learning in Design, Synthesis, and Characterization of Composite Materials
Composite Materials Committee
Nikhil Gupta, New York University
Simona Hunyadi Murph, Savannah River National Laboratory
Ramasis Goswami, Naval Research Laboratory

Materials Recovery for Next-generation Functional Materials
Energy Conversion and Storage Committee
Surojit Gupta, University of North Dakota
Lan (Samantha) Li, Boise State University
Manoj Kumar Mahapatra, University of Alabama-Birmingham

Microstructure Characterization: Descriptors, Data-Intensive Techniques, and Uncertainty Quantification
Materials Characterization Committee, Computational Materials Science and Engineering Committee, ICME Committee
Srikanth Patala, North Carolina State University
Shawn Coleman, Army Research Laboratory
Jacob Bair, Pacific Northwest National Laboratory
Houlong Zhuang, Arizona State University

Phase Transformations during Solid-phase Welding and Processing
Shaping and Forming Committee
Piyush Upadhyay, Pacific Northwest National Laboratory
Arun Devaraj, Pacific Northwest National Laboratory

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:

JOM is an official publication of The Minerals, Metals & Materials Society and is owned by the Society.

TMS has granted Springer the exclusive right and license to produce, publish, archive, translate, and sell *JOM* throughout the world. Publication Frequency: 12 issues per year.

Springer, 233 Spring Street, New York, NY, 10013-1578, USA

JOM articles from 1949 to the present are archived at http://link.springer.com/journal/volumesAndIssues/11837.

Postmaster:

Send address changes to: *JOM*, Springer, 233 Spring Street, New York, NY 10013, USA. Periodicals postage paid at New York, NY and additional mailing offices.

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Number 7
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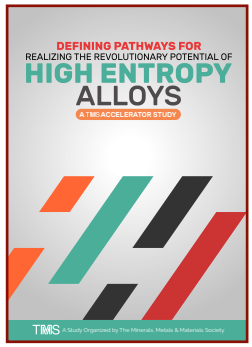
JOM: THE MAGAZINE



JOM: THE JOURNAL

Leveraging Materials in Topology Optimization

Machine Learning in Design, Synthesis, and Characterization of Composite Materials

Materials Recovery Considerations for Design of Next-generation Functional Materials

Microstructure Characterization: Descriptors, Data-Intensive Techniques, and Uncertainty Quantification

Phase Transformations during Solid-phase Welding and Processing

Technical Articles

PLAN TO JOIN US!

AIME–TMS 150th CELEBRATION

TMS 2022
Annual Meeting & Exhibition

SINCE 1871

FEBRUARY 27-MARCH 3, 2022

ANAHEIM, CALIFORNIA, USA

#TMSAnnualMeeting

TMS2022 WILL FEATURE:

DIVERSITY (DMMM4) IN THE MINERALS, METALS, AND MATERIALS PROFESSIONS

TMS FURNACE TAPPING 2022

REWAS 2022 Developing Tomorrow's Technical Cycles

Join us next year in Anaheim, California, for the TMS 2022 Annual Meeting & Exhibition (TMS2022) and continue the celebration of the 150th Anniversary year of TMS and the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME).

TMS BLADESMITHING COMPETITION

Visit the TMS2022 website for updates on meeting plans:

www.tms.org/TMS2022

JOM, Vol. 73, No. 7, 2021
https://doi.org/10.1007/s11837-021-04741-8

in the final analysis

JOM
Volume 73
Number 7
July 2021

"Y'all did great, it's just sadly not nearly as exciting virtually."
—Comment from TMS2021 Virtual Survey

Out of pandemic-driven necessity, TMS took the unprecedented step in March of convening our signature event, the annual meeting and exhibition, as a virtual conference. In a practical sense, we knew it could be done as we had gained first-hand experience with large event virtualization during MS&T20 Virtual the previous October. Still, we had daunting unknowns to confront. MS&T is a smaller meeting than the TMS annual, and MS&T benefits from a division of labor among three partner societies. The TMS annual is a solo affair. So, TMS volunteers and staff had to wonder, can we . . . stand up a representative virtual version of TMS2021 and satisfy attendees, . . . improve those aspects of the MS&T20 Virtual experience that didn't work especially well, . . . add value via virtualization that is not otherwise found in the live experience, . . . and avoid losing our shirts in the process? Finding out the answers would take reinvention of expectations, identification of suitable service providers, increased collaboration by all stakeholders, agreeing to many compromises, assuming greater risk for the Society, and taking an occasional leap of faith. Good times!

What answers did experience (and an attendee survey) provide us? Here's my take.

Can we stand up a representative virtual version of TMS2021 and satisfy attendees? Mixed results here. As good as virtualization has become, there is a spontaneity factor to meeting in person that is very difficult to replicate via e-interface. That asymmetrical interpersonal experience and spontaneity is a tough unicorn to corral, and it remains as elusive as it is desirable. Commensurately, the highest dissatisfaction with the event was registered with roughly 40% of attendees being dissatisfied with the networking, social, and question-and-answer components. Where content counts, however, there were high marks across the board as satisfaction with the quality of the technical program was strong: 83% of survey participants rated the technical program as very or somewhat satisfying. That's consistent with past performance and is the bedrock of our event.

Can we improve those aspects of the MS&T20 Virtual experience that didn't work especially well? The answer here is yes, albeit it incremental rather than dramatic. The exhibition interface was vastly improved, a more engaging networking experience by topic area was deployed, and the Q&A experience was enhanced. Baby steps rather than a quantum leap, but progress was made and learnings acquired for next time, as there will certainly be more next times.

Can we add value via virtualization that is not otherwise found in the live experience? I can only summon anecdotal inputs, but I'll posit that the answer is a strong yes. Among the value additions were volunteer committee meetings that were held "Zoom" style leading up to and following the meeting week. As a result, committee attendance was better than average and new members had more ingress. Plus, no one had to worry about conflicting time slots. Similarly, TMS2021 Virtual was open to registrants for three months, meaning time shifting at will so that no one had to select only one presentation out of four or five concurrent ones. See it all. Another bonus was the ability to pause a presentation, replay it, or fast-forward to a critical point.

Can we avoid losing our shirts in the process? Yes, virtualization is a very different business model. Revenue was down (we cut registration prices and had 3,000 attendees compared to the usual 4,500), but expenses were lower as well. It worked.

While we are all eager to return to meeting in person, I fully anticipate that in-person meetings with virtual elements are destined to become our new normal. There's no reason why we can't enjoy the best of both worlds, and I believe that we will with continued improvement at MS&T21 and TMS2022.

James J. Robinson
Executive Director
@JJRofTMS

"That asymmetrical interpersonal experience and spontaneity is a tough unicorn to corral, and it remains as elusive as it is desirable."

JOM, Vol. 73, No. 7, 2021
https://doi.org/10.1007/s11837-021-04742-7

NCEES Records Program Adds New Option; Announcing New TMS Accelerator Report on High Entropy Alloys

NCEES Announces Option for Military Families Seeking Comity Licensure

The National Council of Examiners for Engineering and Surveying (NCEES), a nonprofit organization dedicated to advancing professional licensure for engineers and surveyors, announced that it has added a new option to the NCEES Records program to assist military families with the comity licensure process. Active-duty military and their spouses are eligible to transmit their NCEES Record to a state licensing board at no charge when military orders require them to relocate to that state. TMS works with NCEES in developing the test employed to register professional metallurgical and materials engineers in the United States.

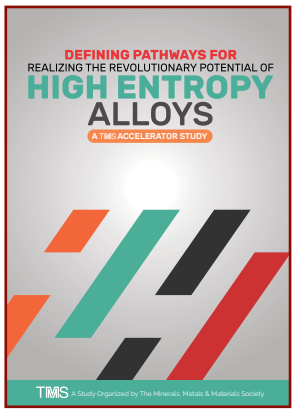
The NCEES Records program is designed for currently licensed engineers and surveyors who are looking for an easier and faster way to complete the comity licensure process in another U.S. state or territory. Once established, an individual's Record includes most—if not all—of the materials needed to apply for comity licensure in all 50 states, the District of Columbia, Guam, the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands.

Active-duty military and their spouses who are interested in learning more about the NCEES Records program or how to use it when they are restationed in a new state or territory can visit ncees.org/records or e-mail military@ncees.org.

TMS members interested in learning more about the professional engineer licensing process and the Metallurgical and Materials Engineering Principles & Practice of Engineering (PE) Licensing Exam can visit www.tms.org/PE. All TMS members preparing for the exam can access the PE Study Guide at no cost and sign up for updates on the 2021 Professional Engineer Licensing Exam Review Course.

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.



TMS to Debut New Study on HEAs

Identifying priority areas in the research and development of high entropy alloys (HEAs) is the focus of *Defining Pathways for Realizing the Revolutionary Potential of High Entropy Alloys*. Led by TMS and funded by the Defense Advanced Research Projects Agency (DARPA) via the U.S. Air Force Research Laboratory (AFRL), this new science and technology accelerator study is slated for release in conjunction with the 2nd World Congress on High Entropy Alloys (HEA 2021), scheduled for December 5–8, 2021.

Defining Pathways will examine the extensive work being performed in the emerging field of HEAs with the goal of providing science and technology pathways to accelerate realization of the wide-reaching potential of HEAs in some key application areas and alloy categories. The report will address the following milestones:

- Scope and prioritize the application (and alloy) domains of most promise for HEAs for defense-related applications.
- For the identified high-priority areas, perform a deep dive to identify in depth key gaps, barriers, needs, and enablers of the next stage of HEA research in these domains.
- Provide concrete recommendations and specific action plans critical to accelerating the reserach, development, and implementations of HEAs in these high priority areas.

The study is being conducted by a team of 15 experts, chaired by Dan Miracle, AFRL. Visit www.tms.org/HEAPathways to sign up to receive updates on *Defining Pathways*, including a notification when the free report is available. For more programming and registration details on the HEA 2021 congress, visit www.tms.org/HEA2021.

JOM, Vol. 73, No. 7, 2021
https://doi.org/10.1007/s11837-021-04743-6

JOM themagazine

In Case You Missed It:

Business News from the Field

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.

New Partnership Targets Hydrogen

Houston, Texas, USA: Baker Hughes is collaborating with distributed energy firm Bloom Energy on the potential commercialization and deployment of integrated, low-carbon power-generation and hydrogen solutions to advance the energy transition. The collaboration will launch pilot projects over the next two to three years, with subsequent plans of fully commercializing and scaling applications, products, and solutions. The focus will initially be on integrated power solutions leveraging Bloom's solid oxide fuel cell (SOFC) technology and Baker Hughes' lightweight gas-turbine technology. Bloom's low-emissions SOFCs and Baker Hughes' NovaLT gas turbines, which can run on up to 100% hydrogen, along with heat-recovery turbines, can create resilient microgrids for large-scale applications.

BEAMIT Solidifies AM Leadership

Fornovo di Taro, Italy: The BEAMIT Group acquired British-based 3T Additive Manufacturing from AM GLOBAL Holding, positioning it as one of the world's most advanced and integrated additive manufacturing service providers. Based in Italy, BEAMIT already ranked among the largest metal additive manufacturing service providers, when it added 3T, which is considered among the top 10 metal additive manufacturing service providers for a number of metrics. BEAMIT will continue a process of integration and industrialization of the value chain of additive technology for mass production of high-end components for the most complex and demanding industrial sectors.

London, U.K.: British manufacturer Liberty Powder Metals earned two quality certifications to enable its expansion into the aerospace sector: EN 9100 is the internationally recognized Quality Management System for the aerospace industry; ISO 9001 is the equivalent system for general industry. The certifications cover the manufacture, processing, and testing of metallic alloy powders for near net shape and additive manufacturing applications. Liberty's atomizer produces a range of stainless steel and nickel superalloy powders that enable 3D printing of precision components. (Photo credit: Liberty Powder Metals)

Habaş Engages SMS for Mill Upgrades

Instanbul, Turkey: Habaş A.S., a Turkish steel producer, awarded SMS Group a contract to expand the hot strip mill at the company's Aliağa plant near Izmir. The project will increase the SMS-built mill's annual capacity to 4.5 million metric tons. The upgrade will include the installation of a second roughing stand with attached edger and a third downcoiler. Commissioning is scheduled for early 2023.

New Technique Extracts Metals

Exeter, U.K.: An international research team devised a proof of concept of a new method to extract metals using a targeted electric field for in situ recovery. The study demonstrates the application of an electric field to control the movement of an acid within a low permeability copper-bearing ore deposit to selectively dissolve and recover the metal in situ. The team of experts from the University of Western Australia, Commonwealth Scientific and Industrial Research Organisation, Technical University of Denmark, and the University of Exeter believes the new technique is transformative to the mining industry for its non-invasive nature.

Pandora Picks Lab-Grown Diamonds

Copenhagen, Denmark: Major jewelry retailer Pandora announced the launch of a new lab-grown diamond jewelry collection, available first in the U.K. and then globally starting in 2022. The company is transitioning to the use of lab-grown diamonds only, which can cost 30% to 40% less than mined diamonds, in the hopes of attracting new customers with lower prices. Analysts from Bain & Company reported double-digit growth in the production of lab-grown diamonds in 2019 and 2020, while rough diamond production has continued to drop since peaking in 2017.

JOM, Vol. 73, No. 7, 2021
https://doi.org/10.1007/s11837-021-04744-5

TMS Presents the 2022 Board of Directors Nominees

Kelly Zappas

The individuals highlighted in the following pages have been nominated to fill the following open positions on the TMS Board of Directors: Vice President/President/Past President (the three-year Presidential Rotation); Membership & Student Development Director; and three technical division chair positions.

These candidates, if elected by the TMS membership, will be installed at the conclusion of the TMS 2022 Annual Meeting & Exhibition (TMS2022), scheduled for February 27–March 3, 2022, in Anaheim, California.

Additional nominations for these positions may be submitted for Board consideration by any 25 TMS members by August 15, 2021. Nominations for qualified individuals should be sent to James J. Robinson, TMS Executive Director, at robinson@tms.org, and should include the nominee's name, biography, and written consent to serve if elected.

If additional candidates are proposed, a majority vote of TMS members will determine who fills the position. If no new nominations are received, the individuals named in this article will be automatically elected on August 16, 2021.

Many board leaders began as members of a TMS technical committee. If you aspire to Society leadership, find out more about how you can get involved today. Visit the TMS Divisions & Committees web pages at www.tms.org/Committees to choose the technical committee that best matches your interests and contact the chair about becoming a member. Committee membership is open exclusively to TMS members.

The nominees for the open positions on the 2022–2025 TMS Board of Directors are:

Vice President
Brad L. Boyce
Sandia National Laboratories

Brad L. Boyce is a distinguished member of the technical staff at Sandia National Laboratories. Boyce received a B.S. degree from Michigan Technological University in 1996 in metallurgical engineering and M.S. and Ph.D. degrees in 1998 and 2001 from the University of California, Berkeley.

He joined the technical staff at Sandia in 2001, where his research interests lie in micromechanisms of deformation and failure. He was promoted to principal member of the technical staff in 2005 and received the distinguished appointment in 2015. In 2017, Boyce also joined the Center for Integrated Nanotechnologies in the in-situ characterization and nanomechanics thrust.

He has published over 140 peer-reviewed articles and holds five U.S. patents on topics such as microsystems reliability, nanoindentation, fracture in structural alloys, weld metallurgy, and fatigue mechanisms. Boyce is a past recipient of the Hertz Foundation Fellowship, the TMS Brimacombe Medal, the TMS Structural Materials Division Young Leaders Professional Development Award, and the Marcus A. Grossman Young Author Award.

Over the past 20 years, he has served in numerous volunteer capacities for TMS. He has organized or co-organized 10 technical symposia and has served as a topic editor for *JOM*, as well as a key reader for *Metallurgical and Materials Transactions.* In addition, he has chaired the TMS Mechanical Behavior of Materials Committee and the Programming Committee. He has served on the TMS Board of Directors, the TMS Foundation Board of Trustees, and on numerous other committees, both technical and functional.

Outside of TMS, he has also been substantially involved in several other societies. His vision for TMS includes staying true to TMS's core strengths while also being innovative, especially in light of the global pandemic, as constraints on travel continue to evolve.

"[Boyce's] vision for TMS includes staying true to TMS's core strengths while also being innovative, especially in light of the global pandemic, as constraints on travel continue to evolve."

Membership & Student Development Director

Viola L. Acoff

The University of Alabama

Viola L. Acoff is the associate dean for undergraduate and graduate programs in the College of Engineering at The University of Alabama (UA). She is also a full professor of metallurgical engineering and has been on the UA faculty since 1994.

Acoff received her B.S., M.S., and Ph.D. in materials engineering from the University of Alabama at Birmingham. Her areas of expertise are additive manufacturing, welding metallurgy, physical metallurgy, and materials characterization. She has been awarded more than $13 million in research grants, including a National Science Foundation (NSF) CAREER Award.

She has more than 25 years of experience in increasing the number of STEM degrees awarded to students from groups underrepresented in the STEM fields. Since 2015, Acoff has led the Alabama Louis Stokes Alliance for Minority Participation Program, which is a statewide effort funded by a $5 million grant from the NSF. Acoff has published over 80 peer-reviewed papers and given over 100 talks on her research on every continent except Antarctica.

Acoff has served for more than 25 years in various volunteer aspects of TMS. This includes organizing symposia for technical and functional committees, serving on the Nominating Committee and on the TMS Foundation Board of Trustees. Acoff was also named the inaugural recipient of the TMS Ellen Swallow Richards Diversity Award. In August 2020, she was appointed to chair the TMS Public & Governmental Affairs Sub-Committee on Racial Justice. She has also been active with ASM International and the American Welding Society.

Her vision for TMS is for the Society to enhance the programs and activities that are currently in place for membership and student development, with emphasis on groups that are underrepresented in our field, so that the Society can be prepared to address the changing demographics that lie ahead in the United States.

"[Acoff's] vision for TMS is for the Society to enhance the programs and activities that are currently in place for membership and student development, with emphasis on groups that are underrepresented in our field…"

Light Metals Division Chair

Edward Williams

Arconic Technology Center

Eddie Williams is manager of the Molten Metal Group at the Arconic Technology Center. He is responsible for research and development and global Arconic plant support work pertaining to aluminum ingot plant technology, including ingot casting, solidification technology, recycling, melting, metal treatment, and continuous casting. Prior to becoming manager, Williams worked in a variety of roles in aluminum casting technology, including aluminum recycling, continuous casting, molten metal treatment, and capital expenditure (capex) project engineering.

He came to Alcoa in 2000 with the acquisition of Reynolds Metals Company, where he had been working as a research engineer in Casting Technology since 1994. He worked at the Alcoa Technical Center (ATC) for two years in casthouse R&D before transferring to the Warrick ingot plant in 2002. There he worked as a project engineer, installing capital equipment and making process improvements in the cast house. He transferred back to ATC into the R&D organization in 2005 and then managed the Casting Technology Division starting in 2011. Since 2015, he has supported the Arconic global casthouse network and the R&D organization.

Williams has been a member of TMS since 1999, with nine publications in *Light Metals*. He was a Cast Shop session chair in 2009, full Cast Shop symposium chair in 2014, and chair of the Aluminum Committee and *Light Metals 2016* editor in 2016. He was a recipient of the 2000 TMS Light Metals Award for his paper entitled, "Removal of Alkali Metals from Aluminum."

Williams completed his B.S. and then M.S. degrees in mechanical engineering from Virginia Polytechnic Institute and State University in 1992 and 1994.

Materials Processing & Manufacturing Division Chair

Paul Mason

Thermo-Calc Software Inc.

Paul Mason graduated in 1989 from South Bank University in London, U.K., with a B.Sc. (Hons) degree in physical sciences and scientific computing. Upon graduation, he joined the Atomic Energy Research Establishment at Harwell and worked on materials R&D issues with applications to civil nuclear power, particularly at high temperatures. Mason began his career as an experimentalist and then transitioned into the modeling realm where he began to apply computational thermodynamics as a predictive tool for materials behavior as well as managing multi-disciplinary programs that combined modeling and experimental work.

Throughout his career, Mason has been a passionate advocate for the use of computational tools in materials design and engineering and their ability to drive innovation and productivity in the materials industry. In 2004, Mason was appointed president of Thermo-Calc Software Inc. when Swedish based Thermo-Calc Software AB started a U.S. subsidiary to serve the North American region.

Mason has been a member of TMS since 2003. He has served on the Computational Materials Science and Engineering Committee since 2008 and has been a member of the Integrated Computational Materials Engineering (ICME) Committee since its inception in 2009. He served as chair of the ICME Committee from 2014 to 2016 and was also chair of the organizing committee for the 4th World Congress on ICME in 2017.

Mason has been a member of the TMS Materials Processing & Manufacturing Division (MPMD) since 2012. He has served on both the Public & Governmental Affairs Committee and the Industrial Advisory Committee.

Additionally, Mason has been a member of the editorial board for *Integrating Materials and Manufacturing Innovation* (*IMMI*) since 2011, represented TMS at a Congressional visit, has been a team member on three TMS ICME-related projects, and has served as an instructor in several TMS-related short courses.

"Throughout his career, Mason has been a passionate advocate for the use of computational tools in materials design and engineering and their ability to drive innovation and productivity in the materials industry."

Structural Materials Division Chair

Suveen Mathaudhu

Colorado School of Mines

Suveen Mathaudhu is a professor in the Metallurgical and Materials Engineering Department at the Colorado School of Mines. Via a joint appointment, he also serves as a chief scientist at the U.S. Department of Energy's Pacific Northwest National Laboratory.

Mathaudhu has been a member of TMS since 2000 and currently serves as the vice-chair of the Structural Materials Division (SMD). He has served as chair of the Light Metals Division's Magnesium Committee and SMD's Mechanical Behavior of Materials Committee, serving terms on the respective councils in both roles. He has been an active member on many other technical committees and co-programmed dozens of symposia. Other service has included participation in the Content Development and Dissemination Committee, Programming Committee, and ASM/TMS Distinguished Lecture Selection Committee. He was also advisor to the Materials Explorers Committee.

Mathaudhu's career trajectory has spanned diverse roles, with his primary areas of interest centering around powder and deformation processing of metallic alloys and composite materials with foci on nanocrystalline materials, lightweight alloys and refractory metals, materials science education and outreach, and advocacy for diversity and inclusion in STEM. Prior to Colorado School of Mines, Mathaudhu was a professor and chair of the MSE Program at the University of California, Riverside (2014–2021); a program manager at the U.S. Army Research Office, Materials Science Division (2010–2014); and a postdoc and then materials engineer at the U.S. Army Research Laboratory, Weapons and Materials Research Directorate (2006–2010).

Some recognitions Mathaudhu has earned include the 2015 American Association of Engineering Societies Norm Augustine Award for Outstanding Achievement in Engineering Communication; 2015 ASM Fellow; 2016 National Science Foundation CAREER Grant; 2019 Presidential Early Career Award for Scientists and Engineers Award; and 2021 TMS Brimacombe Medal. Mathaudhu received his B.S.E. from Walla Walla University, and his M.S. and Ph.D. degrees from Texas A&M University, all in mechanical engineering.

2021 TMS Board of Directors

The current members of the TMS Board of Directors, installed at the conclusion of the TMS 2021 Virtual Annual Meeting & Exhibition in March, are:

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Division Leader, Los Alamos National Laboratory

Vice President
W. Jud Ready
Principal Research Engineer, Georgia Institute of Technology

Past President
Thomas Battle
Extractive Metallurgy Consultant

Financial Planning Officer
Charles H. Ward
Chief of the Manufacturing and Industrial Technologies Division, U.S. Air Force Research Laboratory's Materials and Manufacturing Directorate

TMS Secretary (non-voting)
James J. Robinson
Executive Director, TMS

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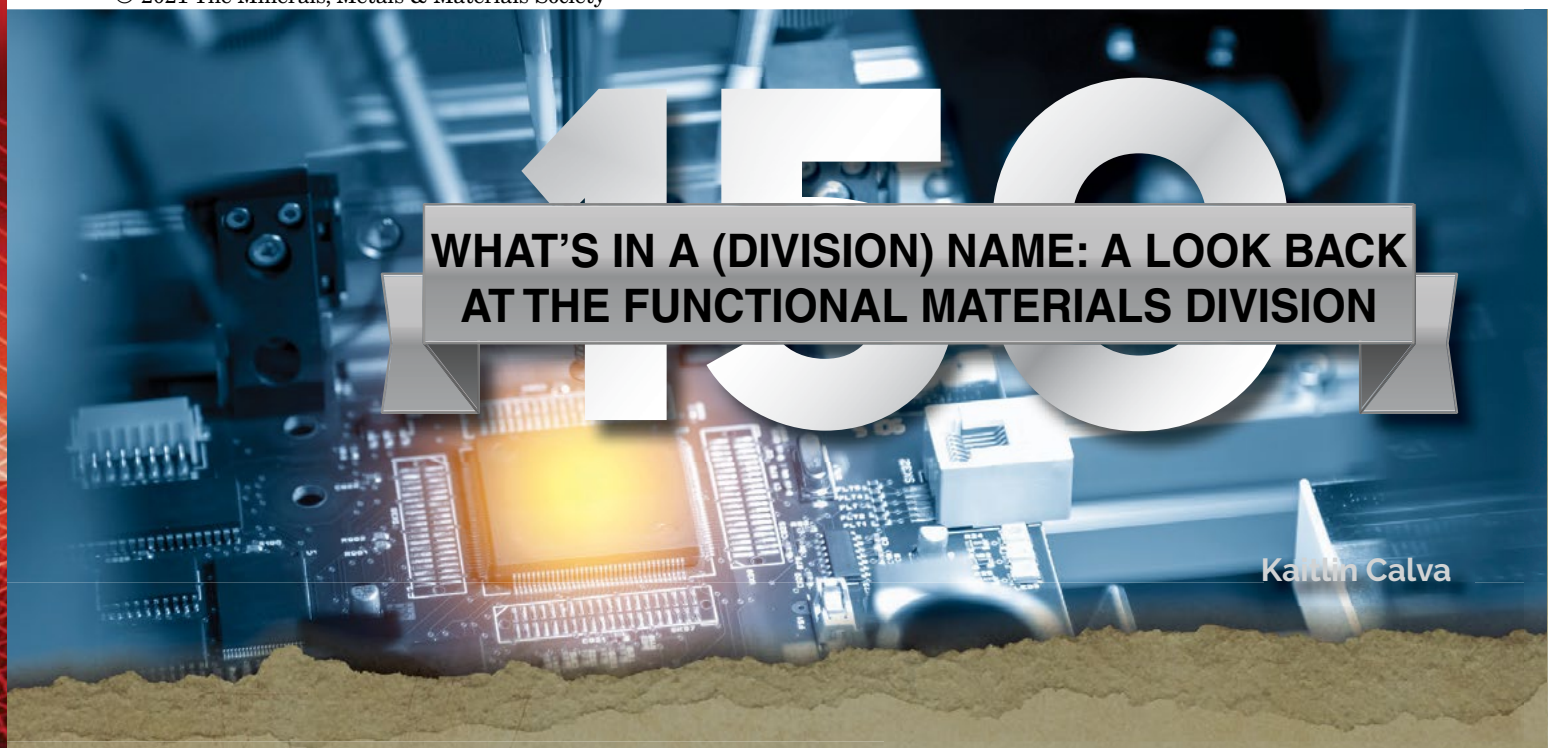
Paul Ohodnicki
Associate Professor, University of Pittsburgh

Light Metals Division Director/Chair
Eric Nyberg
Technology Development Manager, Tungsten Heavy Powder & Parts

Materials Processing & Manufacturing Division Director/Chair
Mark R. Stoudt
Materials Research Engineer, National Institute of Standards and Technology

Structural Materials Division
Daniel Miracle
Senior Scientist, Air Force Research Laboratory

JOM, Vol. 73, No. 7, 2021
https://doi.org/10.1007/s11837-021-04745-4



WHAT'S IN A (DIVISION) NAME: A LOOK BACK AT THE FUNCTIONAL MATERIALS DIVISION

Kaitlin Calva

TO continue the celebration of TMS's shared history with the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), this month *JOM* dives into the history of the Functional Materials Division (FMD)—formerly, the Electronic, Magnetic, and Photonic Materials Division (FMD).

"What's in A (Division) Name: A Look Back at the Functional Materials Division," is the third article in a feature series highlighting the 150th anniversary of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) and TMS. The first article appeared in the March 2021 issue of *JOM*, with additional articles scheduled throughout 2021 and into 2022.

For more information, contact Kaitlin Calva, *JOM* Magazine Managing Editor, at kcalva@tms.org.

According to past EMPMD chair Srinivas Chada in a 2014 editorial for *JOM*, the change from EMPMD to FMD was an important and prudent one not intended to confuse members, but rather to bring the division into focus within the Society. "All the divisions are named to best represent the technical, strategic, and tactical goals of all the committees within each of them," Chada said, noting the broad range of FMD committees.[1] "I have always maintained that while our division is the smallest among the five at TMS, it is one of the most diverse. Our division membership, as a group, felt we needed a name that aptly represents this diversity, as well as the technical focus of all eight of its committees."[1]

"On a lighter note, EMPMD is a mouthful and we wanted something that rolled off the tongue easily," he joked.[1]

After investigation by an ad hoc committee, polling among the division membership, and

The Electronic, Magnetic and Photonic Materials Division (EMPMD)

Division Chairman:
Gilbert Y. Chin
AT&T Bell Laboratories

Encompassed Committees (tentative):
Chemistry and Physics of Materials
Electronic and Photonic Device Materials *(formerly Electronic Device Materials)*
Electronic Materials
Magnetic Materials *(new)*
Packaging/Interconnection Materials *(new)*
Superconducting Materials *(new, in cooperation with the SMD)*

Scope Statement:
The Electronic, Magnetic and Photonic Materials Division (EMPMD) covers the synthesis/processing, structure, properties and performance of electronic, photonic, magnetic and superconducting materials as well as the materials used in packaging and interconnection for device structures (e.g., metals, ceramics, glasses, semiconductors and polymers). The EMPMD will carry out its mission and foster the goals of TMS through programming, publications and continuing education. It will also coordinate its activities with those of the society's other technical divisions as well as those of other organizations, both domestic and international.

To best execute its mission, the EMPMD has already approved the formation of three new committees which will cover magnetic materials, superconducting materials (in cooperation with SMD) and packaging/interconnection materials. The division's technical committees will be responsible for programming at the yearly Electronic Materials Conference and the annual and fall meetings of TMS. During the meetings, the EMPMD expects to utilize continuing education programs, such as short courses and tutorial lectures, to assist in the professional development of its members.

The division is also pursuing additional publishing opportunities to complement those available through *Journal of Metals*, *Metallurgical Transactions* and conference proceedings. Specifically, the bimonthly periodical *Journal of Electronic Materials* (JEM) is being considered for monthly publication. Further, JEM may also have its scope widened to accommodate a broader-based technical content.

The above excerpt from the September 1988 issue of *JOM*, shows the initial plan and direction for the EMPMD.[2]

discussion within the Board of Directors, the EMPMD officially became the FMD on February 16, 2014. Here, *JOM* shares interviews of several FMD members and TMS leaders on the impact of the FMD as well as personal memories about the division and the Society.

***JOM*: Could you share a few words about how you first got involved in TMS?**

Carol A. Handwerker: As a postdoc working in the Metallurgy Division at the National Bureau of Standards, I worked with John Cahn, John Manning, Bill Boettinger, and Peter Voorhees. They taught me that TMS was THE professional society for metallurgists and materials scientists to address problems with rigorous analysis and deep insights. It was where we would find kindred spirits.

Zi-Kui Liu: I was introduced to TMS by the late professor Austin Chang after I joined his group in 1996 and was selected for the EMPMD Young Leaders Professional Development Award in 1998. I have attended every TMS annual meeting since then.

Robert D. Shull: I joined TMS as a joint TMS/ASM International member when I was an undergraduate student at the Massachusetts Institute of Technology, but really didn't know what it was all about. I joined because it was an opportunity for students and professors to meet informally outside of the classroom. It wasn't until later that I realized how beneficial belonging to a professional society, like TMS, was in terms of meeting others working in your field, obtaining access to the technical experts, and providing up-to-date technical information in your area. You can only learn so much by reading a paper; when you meet the person who wrote the paper, and that person introduces you to other people, you benefit immensely.

> "You can only learn so much by reading a paper; when you meet the person who wrote the paper, and that person introduces you to other people, you benefit immensely."
>
> —Robert Shull

***JOM*: Can you briefly describe the value of the FMD to TMS members, or some of its key contributions to TMS and/or the materials community?**

Handwerker: The FMD and TMS provide a place for leading materials scientists and metallurgists in microelectronics and bring academia and industry researchers together to solve problems. It's also a training ground for students and a home for senior members of TMS who are committed to welcoming students and postdocs as full-fledged members of the community.

Liu: As one of the five technical divisions, the FMD plays a central role in connecting the technical committees to the overall value proposition of the Society. It collects members' inputs through technical committees in terms of symposia, *JOM* topic issues, and future directions of materials research, development, and new technologies.

Shull: I found TMS provided venues for professional and leadership development. That enabled me to grow in different ways, ultimately with my serving TMS as the EMPMD chair and later as its president. Even though I also belong to three other societies, I always make certain I attend the TMS annual meeting because of its emphasis on the science behind structure-property relationships, its responsiveness to member-suggested improvements, and the professionalism of the TMS staff.

***JOM*: In your opinion, what are some key events for the FMD over the years? What is the significance of this in relation to the FMD today?**

Handwerker: The Electronic Packaging and Interconnection Materials Committee's workshop in Advanced Microelectronics Packaging, Interconnection Technology, and Pb-free Solders provides insights into new technologies and identifies R&D needs for the future. It continues to be an important draw to the annual meeting, where it is typically held.

Meet the FMD Interviewees

Carol A. Handwerker
Schuhmann Professor of Materials Engineering, Purdue University
2018 TMS Fellow

Zi-Kui Liu
Dorothy Pate Enright Professor of Materials Science and Engineering, Pennsylvania State University
Past EMPMD Chair

Robert D. Shull
NIST Fellow (Retired), National Institute of Standards and Technology
2007 TMS President, past EMPMD chair, and 2013 TMS Fellow

AN EARLY LOOK AT THE FMD

Originally created as the Electronic, Magnetic, and Photonic Materials Division (EMPMD), the EMPMD's initial scope statement declares that it "covers the synthesis/processing, structure, properties, and performance of electronics, photonic, magnetic and superconducting materials as well as the materials used in packaging and interconnection for device structures (e.g., metals, ceramics, glasses, semiconductor and polymers)."[2] The first committees for the division were:

- Chemistry and Physics of Materials
- Electronic and Photonic Device Materials
- Electronic Materials
- Magnetic Materials
- Packaging/Interconnection Materials
- Superconducting Materials

For a look at the current FMD committees and to get involved in the division's activities, visit **www.tms.org/Committees.**

Gilbert Y. Chin, pictured above, was selected to serve as the first EMPMD Chair in 1988. After his passing in 1991, the division raised funds through the TMS Foundation to establish the EMPMD Gilbert Chin Scholarship in his honor, with the first award conferred in 1997.

Liu: When I was the division chair, I initiated the discussion of name change of the division to better reflect what the division did, the development of the field, and in relation to other divisions. It was great to see that the name was changed by the next division leadership. I think that the name covers better the research fields supported by the division as reflected by the creation of the Energy Conversion and Storage Committee that broadens the impact of TMS in the materials community.

> "...I initiated the discussion of name change of the division to better reflect what the division did, the development of the field, and in relation to other divisions."
>
> —Zi-Kui Liu

Shull: Since TMS was originally The Metallurgical Society of AIME, its principal materials of interest were metals, and metals were primarily viewed as structural materials. As a consequence, the majority of its membership focused on structural properties in the beginning. However, the electronic, magnetic, and photonic properties (i.e., the functional properties) became recognized as being important and unique much later in time, and TMS began to attract practitioners in those areas. The FMD, and its

Zi-Kui Liu (left) transitions leadership of the EMPMD (soon to be the FMD) to Srinivas Chada at a division council meeting held during the TMS 2011 Annual Meeting & Exhibition in San Diego, California.

A meeting of past TMS presidents, including Robert Shull (front row, third from left), at the TMS 2017 Annual Meeting & Exhibition held in San Diego, California. Pictured past presidents and their years of service in the front row are: Diran Apelian (2008); Brajendra Mishra (2006); Shull (2007); Patrice Turchi (2015); Garry Warren (2011); and Tresa Pollock (2005). Back row: Hani Henein (2014); George T. "Rusty" Gray III (2010); John E. Allison (2002); Dan J. Thoma (2003); and J. Wayne Jones (1999).

former EMPMD, have provided an important venue for those practitioners to interact. This was particularly timely because this class of materials has become one of the fastest developing areas in the past 30 years.

***JOM*: Describe your favorite memory associated with TMS and/or the FMD.**

Handwerker: One of my favorite memories was holding the Workshop on Data and Modeling Needs for Pb-Free Solders, organized by TMS, the National Science Foundation (NSF), National Institute of Standards and Technology (NIST), and International Electronics Manufacturing Initiative (iNEMI), where the community came together to create a roadmap for future R&D to fill critical knowledge gaps. Also, having Bill Nix come to my student's talk, ask her questions, and discuss it with her afterwards.

Liu: I have been a member of TMS for over 20 years and attended all TMS annual meetings in this time period. As the FMD chair, I served on the TMS Board of Directors. I think that this structure of TMS is the key for TMS's continued success in programming, technical committees, member involvements, and new and innovative symposia.

Shull: A favorite memory of mine was when the membership of the EMPMD had enough confidence in me to vote me in as its chair in 2001. I am sure my activities in the EMPMD were responsible for my later election as the

Carol Handwerker (right) receives the TMS Fellow Award from past president David H. DeYoung at the 2018 TMS Annual Meeting & Exhibition in Phoenix, Arizona.

2007 TMS President. As president of TMS, I was happiest at helping create the TMS/Materials Research Society (MRS) Congressional Fellowship and initiating the movement to create partnerships with other materials societies, like the American Ceramic Society (ACerS), MRS, the Chinese Society for Metals (CSM), and the Brazilian Metallurgical, Materials, and Mining Association (ABM).

***JOM*: What do you see as the future direction of the FMD in TMS?**

Handwerker: The FMD represents a strong, committed, international community and will continue to address cutting-edge scientific challenges.

> "The FMD represents a strong, committed, international community and will continue to address cutting-edge scientific challenges."
>
> — Carol Handwerker

Liu: Functional materials will play more and more important roles in society and humanity with the ever-increasing demands in improving quality of life. Seeing new methodologies in discovering, designing, and manufacturing functional materials with emergent behaviors could be the leading role that the FMD can play in TMS.

> "Functional materials will play more and more important roles in society and humanity with the ever-increasing demands in improving quality of life."
>
> — Zi-Kui Liu

Shull: I think the FMD is destined to become a major part of the TMS membership in the future since the new technologies depend so importantly on these material properties. Computers and the technologies that depend on them would not exist without utilizing these material properties. Similarly, new products and capabilities will become feasible now that one understands the physics of these properties. The whole world of nanotechnology has opened up vast areas for exploration by making it possible to manipulate these properties by manipulating sizes. And now that one can manipulate the magnetic properties of a material through the application of electrical voltages, whole new classes of devices can be created. As a consequence, the number of people working in the functional property area will increase, and TMS is the natural societal home for these people.

***JOM*: Is there anything else you would like to add?**

Handwerker: I feel grateful to TMS and the FMD for creating and sustaining such a welcoming community of scholars in an area of such global importance.

Liu: I would like to thank every volunteer with the FMD for their contributions, and I am looking forward to the continued success of the division and TMS.

Shull: I wish TMS and AIME a happy 150th birthday!

End Notes

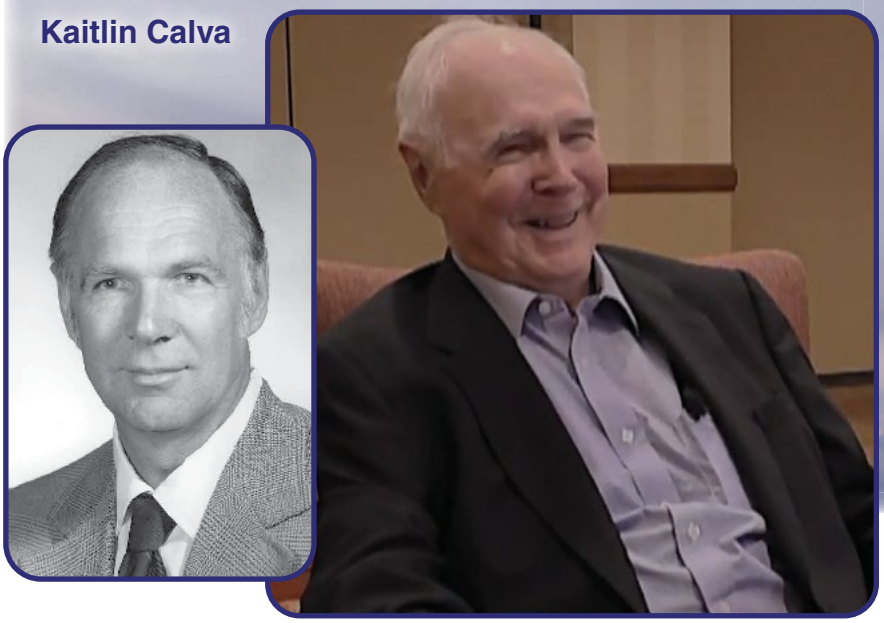
1. "TMS Board Motions, Minutes, and Musings," *JOM*, 66, 681 (2014).

2. "News," *Journal of Metals*, 40, 49 (1988).

JOM, Vol. 73, No. 7, 2021
https://doi.org/10.1007/s11837-021-04746-3

Commemorating A President: In Honor of Harold Paxton

Kaitlin Calva



"Harry Paxton had distinguished careers in both industry and academia. He was a tremendous scientist, engineer, leader, teacher, and mentor and he will be missed."

—Tresa M. Pollock, Alcoa Distinguished Professor of Materials, University of California, Santa Barbara, 2005 TMS President, and past CMU faculty member

On left: Harold W. Paxton's 1976 TMS presidential portrait. On right: A still from Paxton's 2018 interview for AIME's Oral Histories collection.[1] (Photo credit: AIME)

"I did what I wanted to do and somebody was willing to pay me for it."[1] This was the attitude that Harold W. Paxton carried throughout his career. In his oral history recording for the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), Paxton recalled early memories about his time teaching at Carnegie Institute of Technology, now Carnegie Mellon University (CMU): "Eventually I became fairly competent in this area and never regretted a moment of it. It's just been 50 some years of fun."[1] Paxton, a past president of both TMS and AIME, passed away on March 8, 2021.

Born on February 6, 1927, in Goldsboro, England, Paxton was raised on the family farm, but learned quickly he did not much care for farm work. After excelling at the local village school and grammar school, he earned his B.Sc. and M.Sc. from the University of Manchester in 1947 and 1948, respectively, and went on to the University of Birmingham to study metallurgy and earned his Ph.D. in 1952. He then applied for and received a scholarship, as part of the Marshall Aid after World War II, to study in the United States. Paxton had hoped to attend the Massachusetts Institute of Technology (MIT) or the University of Chicago but was told he would be sent to Purdue University instead. However, on his arrival in the U.S., he was asked if he would like to attend CMU instead—and he accepted. "I went to Carnegie Tech just on a roll of the dice.…That's how I became associated with Carnegie Tech for 50 some years."[1]

Although the scholarship program only lasted for one year and Paxton returned to England, his CMU colleagues were insistent that he return as a faculty member. In 1953, Paxton began his tenure as an assistant professor of metallurgical engineering. Eventually, he would go on to become the head of the Department of Metallurgy and Materials Science and director of the Metals Research Laboratory in 1966. During this time, Paxton was also a visiting professor at Imperial College in London (1962–63) and MIT (1970).

The career that followed was unique in that Paxton worked in all three sectors—academia, government, and industry. A brief hiatus from CMU led Paxton to work for two years as the first director of the Division of Materials Research at the National Science Foundation (NSF) from 1971 to 1973. After the NSF, he was brought on as the vice president of research at the U.S. Steel Corporation in 1974 and later went on to be the vice president of corporate research and technology assessment, staying at U.S. Steel until 1986.

Throughout his career, Paxton maintained active involvement in several professional societies, including TMS and AIME. In fact, he originally joined TMS in 1951 when it was still a division of AIME. When asked about his Society involvement and leadership in his AIME oral history interview, he said: "I got put on committees, and I ended up being chairman because I don't like being anything else than chairman because then you control the agenda. And I just kept moving up I guess."[1] Move up, indeed, as Paxton held the role of TMS president in 1976. He then went on to serve as AIME President in 1982—a

Paxton (right) is officially installed as the 1982 AIME President with the passing of the gavel from Robert H. Merrill (left) at the 111th AIME Annual Meeting, held in Dallas, Texas, February 14–18, 1982.

crucial time for the Institute, as the four member societies were on a path to becoming separately incorporated in 1984. Paxton's leadership during this period helped put a plan in place for the Institute and constituent societies that is still in structure today.

The success of his career led to many accolades, including 1975 TMS Fellow; 1978 ASM International Edward DeMille Campbell Memorial Lecturer; 1978 inductee into the National Academy of Engineering; 1980 Fellow of the American Association for the Advancement of Science (AAAS); 1985 Honorary Member of the Iron and Steel Institute of Japan; 1990 Harold Moore Lecturer to the Institute of Metals in London; and 1992 AIME Honorary Member among many others. Paxton authored many technical papers, presenting his work at conferences around the world, and co-authored the book, *Alloying Elements in Steel* (1966), with E.C. Bain.

Paxton (front row seated, far left) is pictured with the 1983 AIME Board of Directors at a meeting in Dallas, Texas.

Paxton (second from left) helped welcome members of the Chinese Society of Metals on a 1985 tour of the U.S. that included a stop in Pittsburgh, Pennsylvania, to visit TMS headquarters and several local research labs and technical facilities.

In 1996, Paxton retired from CMU as the U.S. Steel University Professor (emeritus) of Metallurgy and Materials Science and moved to Arizona with his wife, Ann, but remained an active philanthropist. Paxton was a longtime supporter of the TMS Foundation, becoming a member of the Silver Society for lifetime giving in 2015. Locally, he was involved in his community as a board member of the Community Performance and Art Center as well as the Community Advisory Board of Arizona Public Media.

Paxton will be greatly missed by the materials science and engineering community.

"Harry Paxton was on my thesis defense committee and I kept in touch with him after that as well. He was always extremely kind and supportive of me personally, both during my thesis defense and as my career moved forward. More specifically and technically, one part of my Ph.D. thesis and subsequent research used, as a building block, the seminal work by Heckel and Paxton on the cementite phase in steels."

—George Spanos, TMS Director of New Initiatives, Science, and Engineering, and CMU alumnus

End Notes

1. "Harry Paxton: Steelmaking Research at Carnegie Mellon – 50 Some Years of Fun," interview by Michele Lawrie-Munro, American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), April 30, 2019, video, 43:01, https://www.youtube.com/watch?v=Q8PIVQEbwNw.

JOM, Vol. 73, No. 7, 2021
https://doi.org/10.1007/s11837-021-04747-2

JOM themagazine

TMS meeting headlines

TMS is committed to your safety during the pandemic. Meeting dates and locations are current as of May 10, 2021. For the most recent updates on TMS-sponsored events, visit www.tms.org/Meetings.

Other Meetings of Note

Offshore Technology Conference (OTC) 2021
August 16–19, 2021
Houston, Texas, USA

14th International Symposium on Superalloys (Superalloys 2021)
September 12–16, 2021
Virtual Event

Materials in Nuclear Energy Systems (MiNES 2021)
September 19–23, 2021
Pittsburgh, Pennsylvania, USA

Congress on Safety in Engineering and Industry 2021 (Safety Congress 2021)
November 1–3, 2021
Fort Worth, Texas, USA

TMS Materials Innovation Briefing: Focus on Pittsburgh
November 10, 2021
Cranberry Township, Pennsylvania, USA

2nd World Congress on High Entropy Alloys (HEA 2021)
December 5–8, 2021
Charlotte, North Carolina, USA

TMS 2022 Annual Meeting & Exhibition (TMS2022)
February 27–March 3, 2022
Anaheim, California, USA

OTC Asia 2022
March 22–25, 2022
Kuala Lumpur, Malaysia

TMS ICME MANUFACTURING DESIGN MATERIALS

November 14–18, 2021
Lake Tahoe, Nevada, USA
Discount Registration Deadline: October 1, 2021
www.tms.org/ICME2021

- The 6th World Congress on Integrated Computational Materials Engineering (ICME 2021) convenes leading researchers and practitioners to share the latest knowledge and advances in the discipline. This congress is the recognized hub of interaction among software developers and process engineers along the entire production chain, as well as for materials scientists and engineers developing new materials.
- The plenary speakers include *Bita Ghaffari*, Ford Motor Company; *Louis Hector*, GM Global Technical Center; *Andrea Rovinelli*, Argonne National Laboratory; and *Kandler Smith*, National Renewable Energy Laboratory. Visit the ICME 2021 website to learn more about the program and register.

MS&T21

October 17–21, 2021
Columbus, Ohio, USA
Save the Date!
www.matscitech.org/MST21

- Plan now to attend Materials Science & Technology 2021 (MS&T21) for three meetings in one: the TMS Fall Meeting; the American Ceramic Society's 123rd Annual Meeting; and the Association for Iron & Steel Technology's Steel Properties & Applications event.
- The TMS Fall Meeting at MS&T21 will explore the intersections of development, synthesis, and application with more than 25 symposia in 11 topic areas. Visit the website for more details on the technical program and registration updates.

TMS AIM First World Congress on Artificial Intelligence in Materials & Manufacturing 2022

April 3–6, 2022
Pittsburgh, Pennsylvania, USA
Submit an Abstract by September 3, 2021
www.tms.org/AIM2022

- The inaugural TMS World Congress on Artificial Intelligence in Materials and Manufacturing (AIM 2022) is the first event of its kind to focus on the role of artificial intelligence in materials science and engineering and related manufacturing processes.
- The goal of AIM 2022 is to convene stakeholders from academia, industry, and government to address key issues and identify future pathways.
- Abstracts are being considered now for inclusion in the technical program. Visit the website for submission instructions and to share your work today.

AM BENCH 2022 | ADDITIVE MANUFACTURING BENCHMARKS

August 15–18, 2022
Bethesda, Maryland, USA
Share Your Work
www.tms.org/AMBench2022

- The second Additive Manufacturing Benchmarks (AM-Bench 2022) conference provides a continuing series of controlled benchmark measurements, in conjunction with a conference series, with the primary goal of enabling modelers to test their simulations against rigorous, highly controlled additive manufacturing benchmark test data.
- Separate from the benchmark tests, the conference will also include technical sessions with a focus on additive manufacturing modeling, measurement, and characterization. Abstracts are due by January 7, 2022.

JOM, Vol. 73, No. 7, 2021
https://doi.org/10.1007/s11837-021-04748-1

call for papers

***JOM* is seeking contributions on the following topics for 2022. For the full Editorial Calendar, along with author instructions, visit www.tms.org/EditorialCalendar.**

January 2022

Manuscript Deadline: August 1, 2021

Topic: 4IR in Extractive Metallurgy

Scope: With the advent of the fourth industrial revolution, advanced digital technologies that facilitate engineering, design, optimization, and management are becoming increasingly pervasive across a wide range of industries. In extractive metallurgy, large processing plants often combine many unit operations together into highly complex and interdependent flowsheets, making them a rich field for potential application of 4IR technologies. This topic will explore past, present, and future research and development into the use of 4IR in the extractive metallurgy.
Editors: Chris Aldrich, Quinn Reynolds, and M. Akbar Rhamdhani
Sponsor: Pyrometallurgy Committee

Topic: Advanced Functional and Structural Thin Films and Coatings

Scope: This special topic encompasses all aspects of advanced thin films and nanomaterials for modern optical, photonic, and electronic devices with applications in photovoltaics, sensing, and display technologies. It also addresses coating technologies and surface structuring for tools, as well as multifunctional biomaterials, innovative approaches to new concepts, and applications.
Editors: Ramana Chintalapalle, Adele Carrado, Gerald Ferblantier, Karine Mougin, and Heinz Palkowski
Sponsor: Thin Films and Interfaces Committee

Topic: New and Novel Laboratory and Pilot Techniques for Pyrometallurgy

Scope: Laboratory and pilot testing is critical for advancing our understanding of pyrometallurgical processes. Due to advances in analytical techniques and our understanding of pyrometallurgy, laboratory, and pilot testing is advancing as well. This topic focuses on describing new and novel piloting and laboratory techniques, illustrating their use and the advances that have been made.
Editors: Stuart Nicol and Will Hanneman
Sponsor: Pyrometallurgy Committee

Topic: Technology Metals in the Circular Economy of Cities

Scope: The need for technology metals such as precious metals, rare earths, and minor metals (Sb, Co, etc.) will continue to increase. However, the recycling rate of these metals is inadequate. This special topic focuses on innovative recycling technologies that would improve recovery rate of these technology metals from municipal waste streams (MWSs). Manuscripts that address waste treatment and life cycle assessments pertaining to the (potential) recovery of technology metals from MWSs are welcome.
Editors: Fiseha Tesfaye, Joseph Hamuyuni, Chukwunwike Iloeje, and Alexandra Anderson
Sponsors: Recycling and Environmental Technologies Committee, Energy Committee, and Process Technology and Modeling Committee

February 2022

Manuscript Deadline: September 1, 2021

Topic: Artificial Intelligence and Machine Learning in Energy Storage and Conversion Materials

Scope: Artificial intelligence (AI) and machine learning (ML) have emerged as important tools for material scientists aimed at finding optimum solutions to complex scientific dilemmas. This special topic invites papers from industry, academia, and national labs that focus on AI and ML advances in field of materials design, characterization, and applications for energy storage and conversion.
Editors: Simona Hunyadi Murph and Surojit Gupta
Sponsor: Energy Conversion and Storage Committee

Topic: Bauxite to Aluminum: Automation, Data Analytics and New Processes

Scope: This topic covers automation and data analytics, fostered by developments and implementations of Industry 4.0, and also new processes or engineering technologies used throughout the primary aluminum production chain, from bauxite to aluminum. Papers are invited focusing on novel developments aiming to improve those processes, or on scientific/innovative approaches within these areas.
Editors: Jayson Tessier and Hong Peng
Sponsor: Aluminum Committee

Topic: Characterization of Waste-Derived Materials

Scope: Papers are invited on the latest achievements in exploration of novel value-added materials derived from various wastes. In particular, papers on characterization and modification for those originated from mineral/metallurgical/material processing are welcome. Of interest are multifunctional slag/tailing-based materials with unique combinations of desirable thermo-mechanical-chemical performance for sustainable industrial and municipal applications.
Editors: Zhiwei Peng, Yunus Eren Kalay, Rajiv Soman, and Jian Li
Sponsor: Materials Characterization Committee

Topic: Exploring the Relationships Between Plastic Deformation and Heat

Scope: This topic will exlore experimental, computational, and theoretical methods to understand heat generation and heat transfer in materials, through the interactions between phonons, electrons, and dislocations. Manuscripts are invited that examine factors (composition, microstructure, etc.) that determine the fraction of work converted into heat, mechanisms of converting deformation to heat, role of "phonon radiation" of dislocations as they move at high velocities, etc. Novel experimental and computational approaches that enable determination of temperature/heat-generation in the plastic deformation zone are also of interest.
Editors: Aashish Rohatgi, Sean Agnew, and Thomas Bieler
Sponsor: Shaping and Forming Committee

Topic: Plasmonics in Nanocomposite Materials

Scope: Plasmonic nanocomposites are an emerging class of materials that integrate a plasmonic metallic nanoparticle with an assortment of other similar/dissimilar nanostructures leading to new multifunctional systems with improved functionalities and properties. This special topic will cover recent achievements in the design, fabrication, and application of plasmonic nanocomposites in different fields of science including material science, medicine, and industry, and it will cover their impact on global society.
Editors: Nasrin Hooshmand and Simona Hunyadi Murph
Sponsor: Composite Materials Committee

March 2022

Manuscript Deadline: October 1, 2021

Topic: Additive Manufacturing with Light Alloys

Scope: Additive manufacturing (AM) with light alloys, especially Al-based alloys, is both desirable and challenging. This is a rapidly growing research field with a clear impact on future manufacturing. Papers are invited on the development and adaptation of AM Al-based alloys, development of an AM process for mitigating technological issues such as hot and cold cracking, porosity, grain growth texture and compositional segregation, post-processing of AM parts, and advanced characterization and testing of AM parts.
Editor: Dmitry Eskin
Sponsor: Aluminum Committee

Topic: Decarbonization of Pyrometallurgical Processes

Scope: Pyrometallurgical processes require energy to heat the feed material up to the temperature required for reactions and phase separation to occur. Additionally, pyrometallurgical processes can also require reductants for the desired reactions to proceed. This energy and reductant can be derived from a variety of sources, with hydrocarbons commonly used. This topic focuses on techniques and technology to prevent or significantly reduce CO_2 emissions.
Editors: Stuart Nicol and Akbar Rhamdhani
Sponsor: Pyrometallurgy Committee

Topic: Environmental Degradation of Additively Manufactured Alloys

Scope: Additive manufacturing has grown and expanded throughout different areas of applications. Given the significantly different microstructures of additively produced materials as compared with traditional materials, evaluation of their environmental degradation is essential for the prediction of performance and life in harsh environments. This special topic welcomes contributions that will foster discussion on how additively produced materials degrade in: (i) corrosive environments; (ii) high-temperature, oxidizing environments; (iii) harsh environments while under mechanical stress; and (iv) high-radiation environments.
Editors: Kinga Unocic, Bai Cui, and Wenjun Cai
Sponsor: Corrosion and Environmental Effects Committee

Topic: Low-temperature Technology for Electronic Packaging and Interconnects

Scope: This special topic focuses on low-temperature technology for electronic packaging and interconnects.
Editors: Albert T. Wu and Babak Arfaei
Sponsor: Electronic Packaging and Interconnection Materials Committee

Topic: Powder Metallurgy of Non-Ferrous Metals: Striving Toward Technology Advancement

Scope: Papers are invited exploring all aspects of powder metallurgy of non-ferrous metals. Example topics include but are not limited to: (i) powder processing of light and reactive metals, high entropy alloys, and functionally graded materials and composites; (ii) recent advances in powder consolidation processes, e.g., spark plasma and microwave sintering, powder forging and extrusion, and cold spray forming; (iii) manufacturability investigations, novel process development, and robustness; and (iv) modelling and simulation.
Editors: David Yan and Kathy Lu
Sponsor: Powder Materials Committee

AIME-TMS ANNIVERSARY

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1871 Celebrating 150 Years 2021

150 years ago on May 16, 1871, in Wilkes-Barre, Pennsylvania, 22 mining engineers came together to form the American Institute of Mining Engineers, now the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME). As AIME is our parent organization, TMS is celebrating this historic milestone, too!

HELP US CELEBRATE ALL YEAR LONG!

Learn more about TMS and our shared history with AIME:

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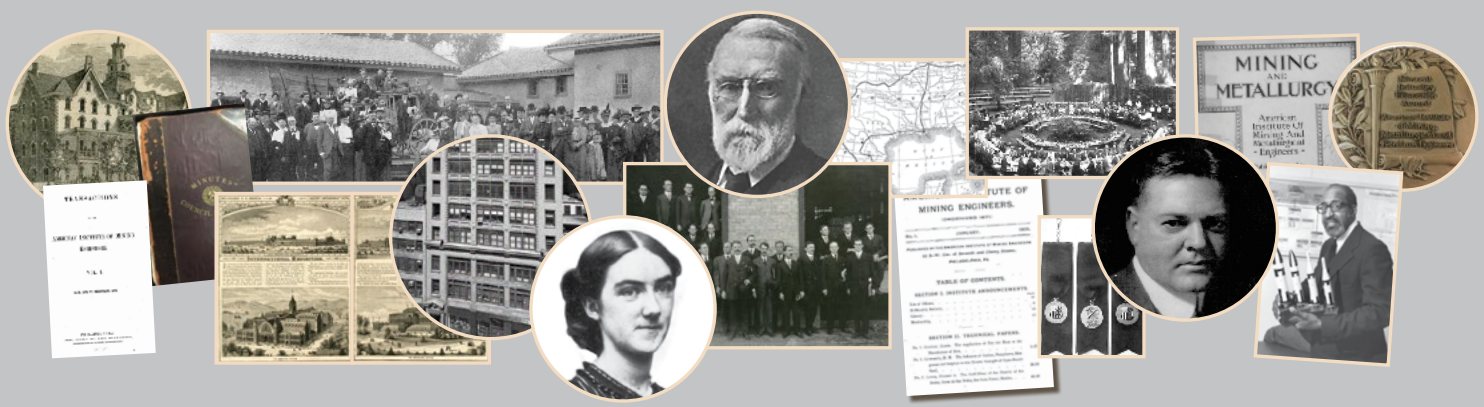
- Download the digital AIME History Walk companion booklet
- Watch the AIME Oral Histories, featuring prominent TMS members
- Keep reading *JOM* for more historical content

EXPLORE 150 YEARS OF THE MINERALS, METALS, AND MATERIALS COMMUNITY.

www.tms.org/OurHistory



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- ✓ **Accelerate** materials development while reducing risk
- ✓ **Troubleshoot** issues during materials processing

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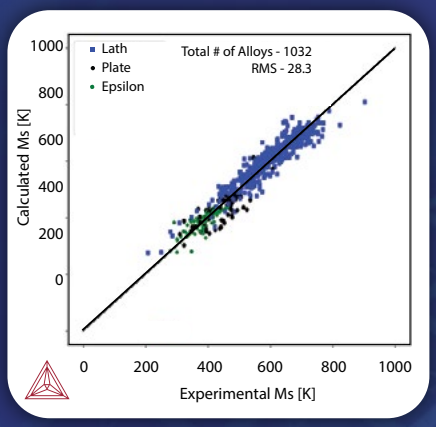
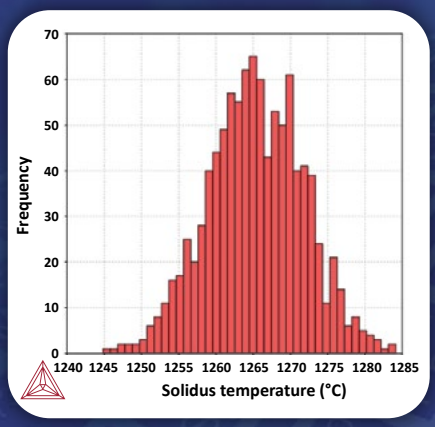


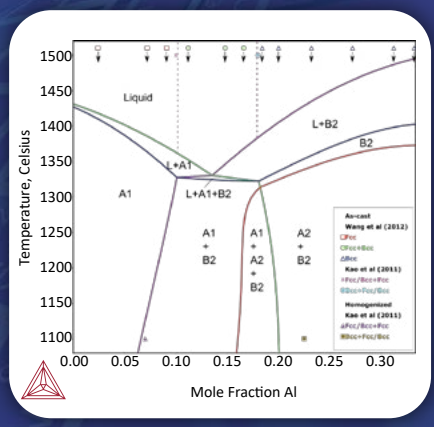
Comparison of calculated and experimental Ms temperatures for a wide range of steels

Nickel



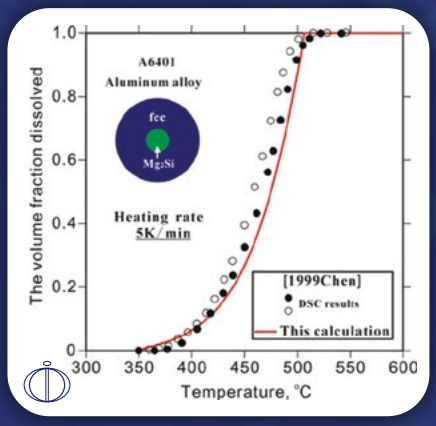
Variation in solidus temperature over 1000 compositions within alloy 718 specification

High Entropy Alloys



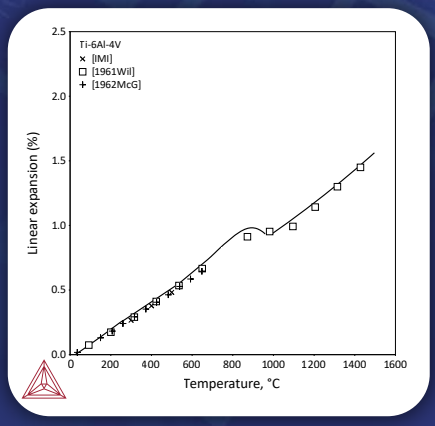
Calculated phase diagram along the composition line of CoCrFeNi-Al

Al Alloys



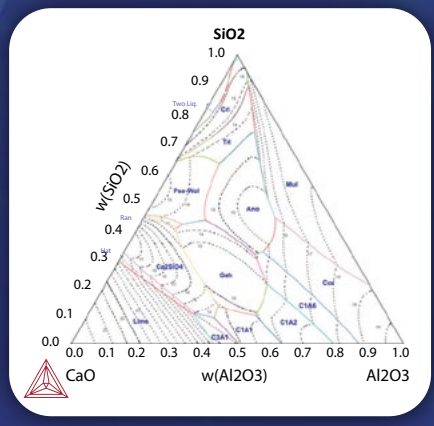
Dissolution of Mg2Si precipitate in Alloy A6401

Ti and TiAl Alloys



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

Oxides



Ternary liquidus projection in oxide systems

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