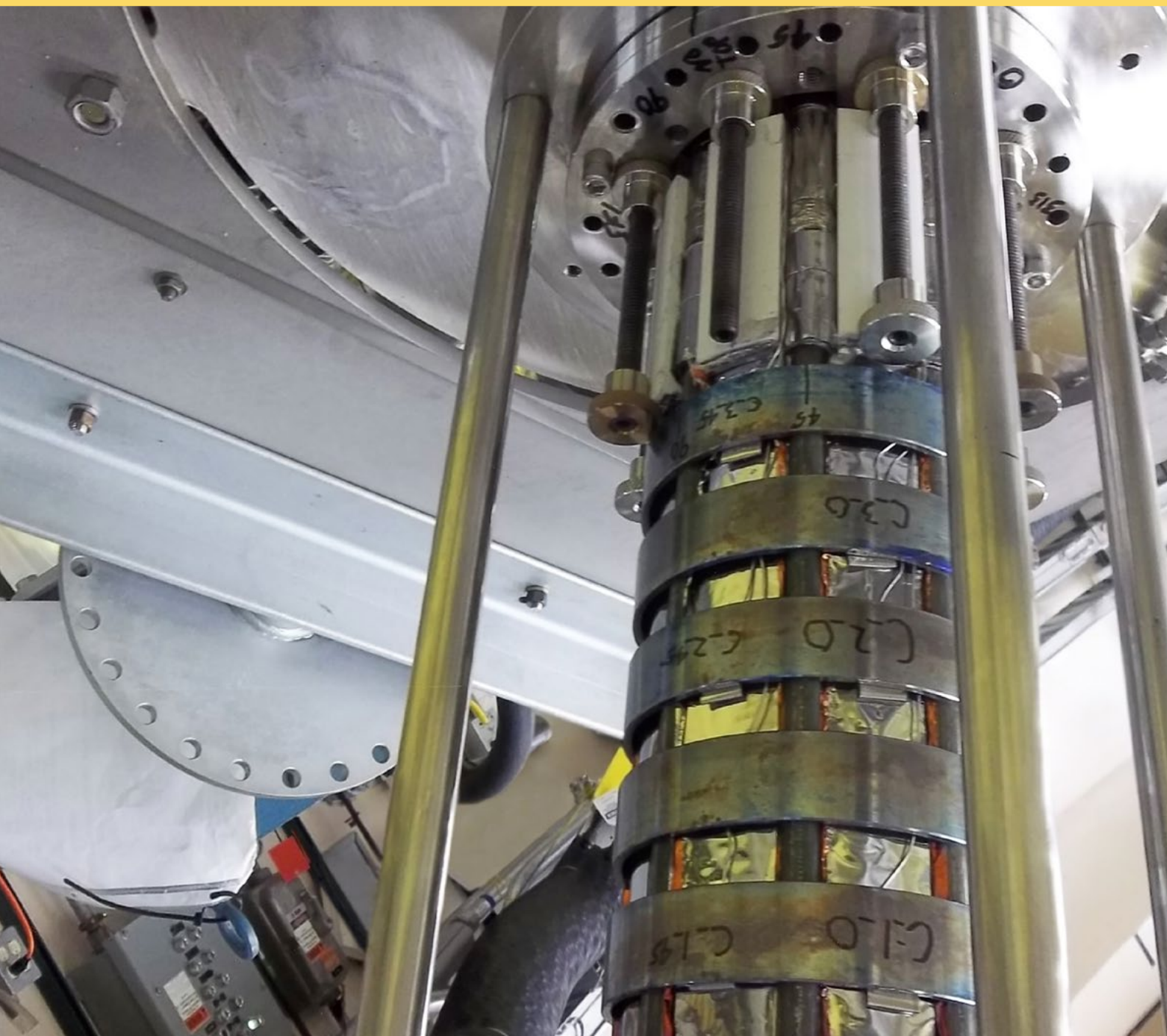


# JOM




NOVEMBER 2021  
[jom.tms.org](http://jom.tms.org)

An official publication of The Minerals, Metals & Materials Society



**2020 IN REVIEW: Read the TMS and TMS Foundation Annual Reports**

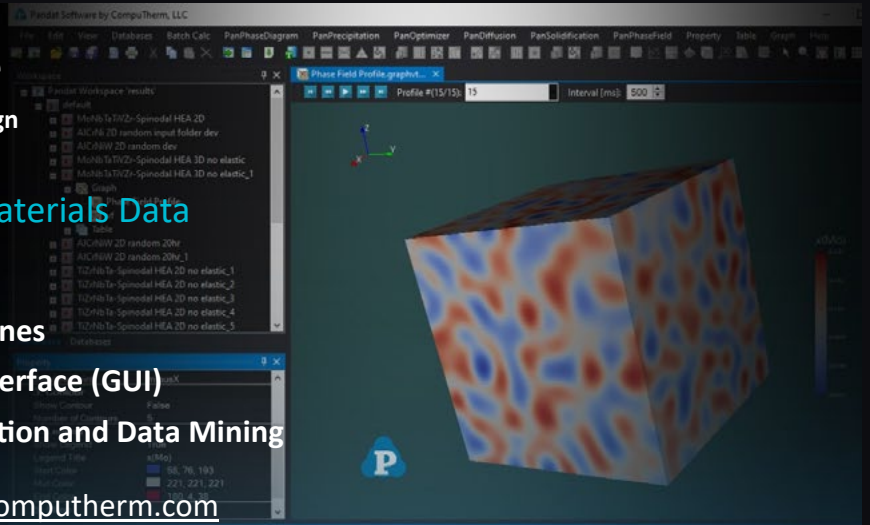
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## About the Cover

Meet KRUSTY—The Kilowatt Reactor Using Stirling Technology. Shown is the assembled KRUSTY reactor core, designed by Los Alamos National Laboratory. Advanced small reactor designs such as KRUSTY require development of novel materials as well as understanding their behavior during reactor operation, i.e. at temperature and during irradiation. The special topic Materials for Small Nuclear Reactors and Micro Reactors, including Space Reactors in this issue addresses materials research for this purpose. In the cover image, clamping rings press Na heat pipes onto a casting of U-Mo fuel. At the top of the core is a white BeO axial neutron reflector; here, the heat pipes are wrapped in Mo multi-layer insulation. KRUSTY is a prototype of a 400 kg, 1kW (electric) space fission power system, and was demonstrated successfully as a collaboration between NASA and the NNSA—the first nuclear-powered operation of any new U.S. reactor concept in over 40 years. For more information see Poston et al., *Nucl. Technology* Vol. 206 (2020). Photo courtesy of Los Alamos National Laboratory.



## November 2021 Guest Editors

### Advanced High-Strength Steels

*Steels Committee*

M.X. Huang, University of Hong Kong  
Ana Araujo, CBMM North America

### Advances in Multi-modal Characterization of Structural Materials

*Advanced Characterization, Testing,  
and Simulation Committee*

Andrew T. Polonsky, Sandia National Laboratories  
Amit Pandey, Lockheed Martin Space

### Informatics-Enabled Design of Structural Materials

*Mechanical Behavior of Materials Committee*

Jennifer L.W. Carter, Case Western Reserve  
University  
Amit K. Verma, Carnegie Mellon University

### Latest Developments in Manufacturing and Recycling of Refractory Materials

*Refractory Metals & Materials Committee*

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Ravi Enneti, Global Tungsten and Powders Corp.

### Materials for Small Nuclear Reactors and Micro Reactors, including Space Reactors

*Nuclear Materials Committee*

Sven C. Vogel, Los Alamos National Laboratory  
Aditya P. Shivprasad, Los Alamos National  
Laboratory  
Marisa Monreal, Los Alamos National Laboratory  
Raluca O. Scarlat, University of Wisconsin

## 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.

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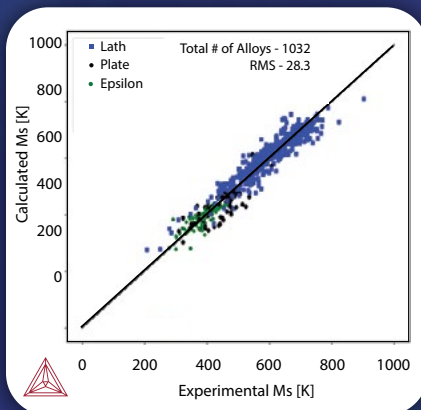
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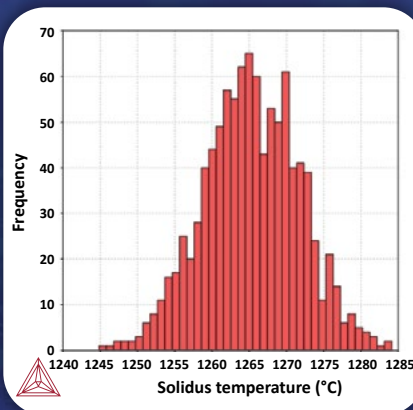
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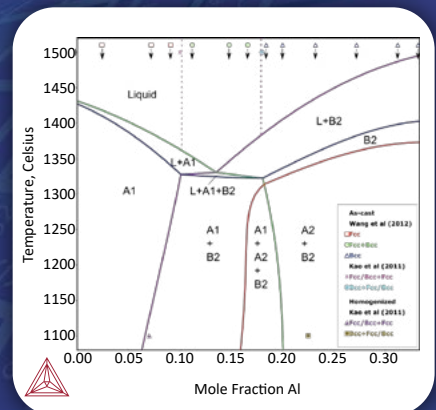
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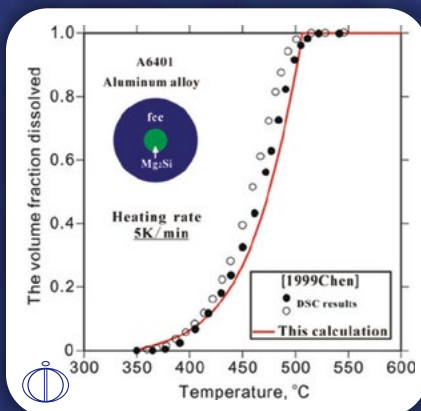
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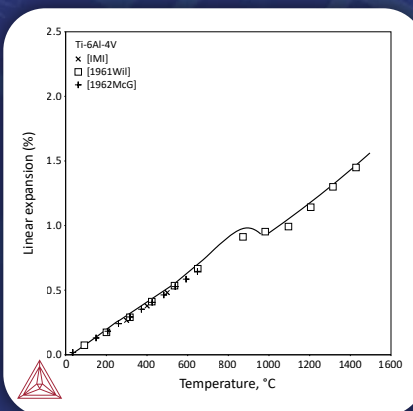
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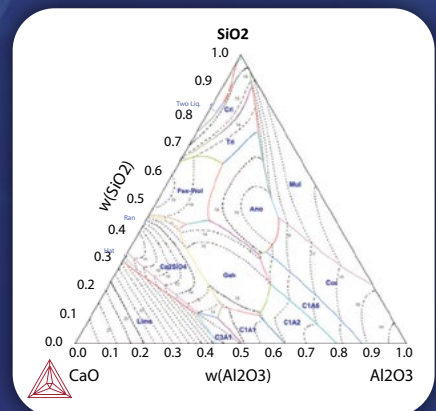
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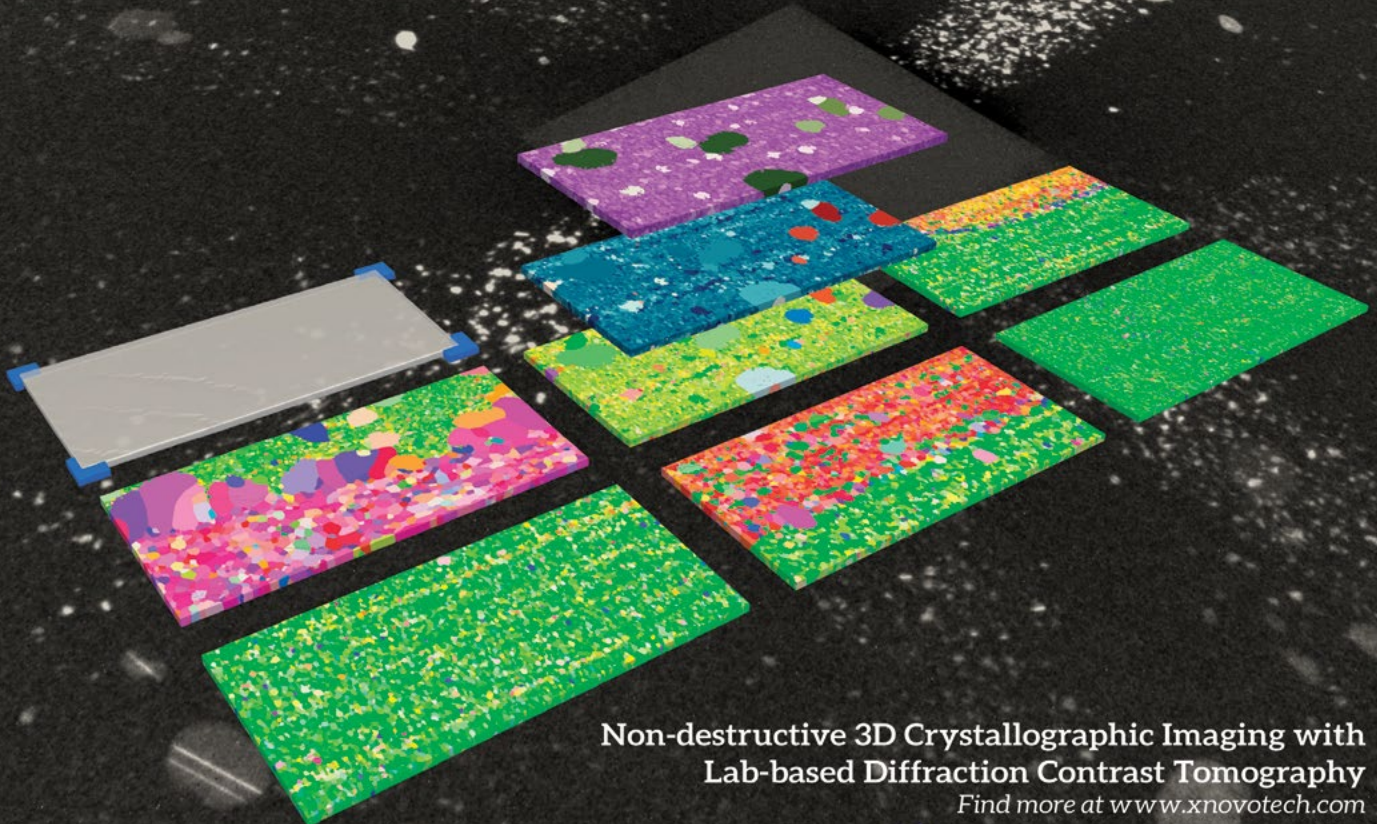
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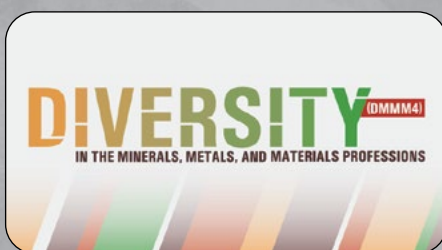


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# in the final analysis

*"If I waited for perfection, I would never write a word."*

— Margaret Atwood

Hear, hear! What a wise and widely extensible insight by the esteemed author and poet, who is likely best known for the much-honored dystopian novel *The Handmaid's Tale*. Margaret Atwood is certainly a great writer. I certainly am not. Still, we both begin the writing process at the same juncture, sharing non-grandiose expectations for how we will conduct our craft. Like her, I have never predicated a session at the keyboard with the expectation of delivering perfection. Unlike her, I have never delivered perfection as a writer. I'm okay with that, as my once-per-month act of creative writing is inextricably interwoven with the companion art of meeting one's deadline. Deadlines may sometimes be extended by cajoling, pleading, and negotiating, but the timer invariably counts down to zero, and the inescapability of the commitment must be satisfied with the best that you've got when the final moment arrives.

All readers of *JOM* are well familiar with the pressures of completing all manner of projects according to unforgiving, competing, and frequently unrealistic timetables. That's work. Is the work produced under deadline always perfect? I can't speak for the experiences of readers, only myself. Perfection is an aspiration beyond my grasp as a writer and in other responsibilities. If there is perfection to be had, it is often in the improvising and compromising that is done to deliver an acceptable outcome that meets the deadline.

As an example, I am reminded of a conversation that I once had with a coworker, who was charged with helping a new project to be held at a TMS meeting. As we reached a critical commitment point in planning, the coworker reported that the project was shaping up to be "good" as currently structured, but with more time and effort, we "could make it perfect." This colleague then inquired with some frustration, "Shouldn't we find a way to do that?" It was a laudable desire, but it was also an impractical one as ambiguity is an unenviable companion when signing contracts, committing resources, instructing participants, and launching publicity. The pursuit of a grander outcome would put other commitments of the event at risk. This represented a classic teachable moment. So, I explained that finding "a way to do that" was an opportunity to have been addressed months earlier when there was still flexibility in shaping the project. It is also important to recognize that we don't necessarily see all opportunities inherent in a project at the project's beginnings, and we can't fold them all in at the project's end. Promising elements and refinements reveal themselves over time and sometimes after the last minute. These learnings represent a great opportunity to improve the next iteration of the project. Bottomline: Get the first installment to the point of good enough, learn all available lessons when conducting it, and apply them to a version 2.0 next year. Was that perfect advice? I don't know. Was it my best advice in the moment? Yes, and I've given it on more than one occasion.

Of course, I'm not perfect at taking my own advice. I look at the two 2020 annual reports that are special inclusions in this month's *JOM*—one for TMS and one for the TMS Foundation. These reports tell a good, no, great story about both enterprises as they endured and, in some ways, grew during the first year of the pandemic. It is remarkable in many ways. Still, I wonder where I could have pulled another lever, pushed a little harder, invested some extra creativity, listened a bit better, negotiated with more vigor, . . . done a few more things to advance the Society and the Foundation that much farther. Oh, the eternal tug between perfectionism and pragmatism.

The tug notwithstanding, when the deadlines arrived, we met all our commitments. In a pandemic, I suppose that is a certain form of perfection to celebrate. Hmmm, perhaps we'll call that a teachable moment for me!

# JOM

Volume 73

Number 11

November 2021



James J. Robinson  
Executive Director

 @JJRofTMS

*"If there is  
perfection to be  
had, it is often in  
the improvising and  
compromising that  
is done to deliver an  
acceptable outcome  
that meets the  
deadline"*

An aerial photograph of a group of people standing on a paved surface marked with a white geometric pattern of triangles and hexagons. The people are scattered across the frame, some standing alone, others in small groups. The lighting creates long shadows, suggesting it's either early morning or late afternoon. The overall tone is professional and modern.

# FORGING AHEAD IN A CHALLENGING YEAR

2020  
**TMS ANNUAL  
REPORT**

# TMS

The Minerals, Metals & Materials Society



## A LETTER FROM TMS LEADERSHIP

### Dear TMS Members,

We can probably all agree that 2020 was a challenging year! For our TMS community, which values the personal connections forged at in-person events and collaboration among members, the primary challenge was this: How do we keep the profession—and the science—moving forward when we can't come together?

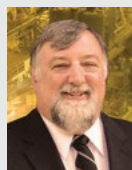
We were fortunate that our biggest event, the TMS 2020 Annual Meeting & Exhibition (TMS2020) in San Diego, California, was held early in the year, February 23–27. More than 4,600 scientists, engineers, and students from around the world attended TMS2020, making it the best-attended annual meeting in TMS history—and also the last in-person event that TMS would hold for the remainder of the year.

After our safe harbor of San Diego, TMS and our members had to get more creative to find ways to keep our community working and learning together, even as a global pandemic kept us physically apart. By April, TMS had revamped its webinar archive to make the contents available to all members free of charge and started offering new webinars on technical and professional topics (also free to members). Next, we launched the TMS COVID-19 Materials Needs Exchange to connect TMS members and their employers with organizations on the front lines of the COVID-19 pandemic, offering materials and manufacturing assistance, resources, and expertise.

As the year progressed, we virtualized large, in-person events, like MS&T, as well as smaller educational events, like our new Learning Pathways course. We continued to publish high-quality resources like our journals and accelerator studies, and we shifted our technical and functional committee meetings to virtual gatherings, allowing members to participate from any part of the world.

Not all of the challenges in 2020 were related to the pandemic. Social justice issues in the United States also came to the forefront of our attention. In collaboration with our Public & Government Affairs Committee and Diversity, Equity, and Inclusion Committee, TMS developed a statement to the membership decrying all forms of racism and discrimination. We pledged to add social justice for black Americans and underrepresented groups to our advocacy position when meeting federal officials and elected representatives. Looking internally, we also undertook to identify where biases might exist within TMS practices and work to eliminate them. These efforts will be ongoing well beyond 2020.

While it was a challenging year, TMS met those challenges with creativity and continued to provide valuable services to its members. What follows is a sampling of our activities in 2020, which show how our community found ways to come together, even as we had to stay apart.



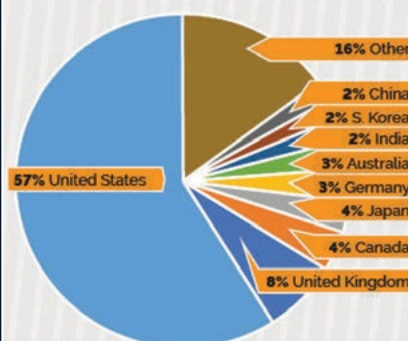
*Thomas P. Battle*  
**Thomas Battle**  
2020 TMS President



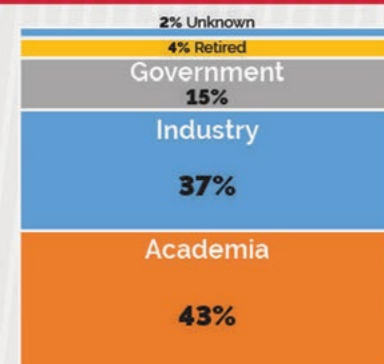
*James J. Robinson*  
**James J. Robinson**  
TMS Executive Director

## WHO WE ARE

### Where Our Members Live



### Where Our Members Work\*



### Our Membership Totals



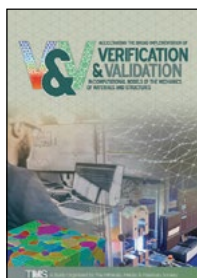
\*Percentages may not add up to 100% due to rounding.

## 2020 JOURNAL PERFORMANCE

By a number of measures, 2020 was a successful year for all six TMS journals: *Integrating Materials and Manufacturing Innovation (IMMI)*, *JOM*, *Journal of Electronic Materials (JEM)*, *Journal of Sustainable Metallurgy (JSM)*, *Metallurgical and Materials Transactions A (MMTA)*, and *Metallurgical and Materials Transactions B (MMTB)*. The chart below provides an overview of key metrics for each of these journals. For a more complete look at TMS journal performance for the year, see the September 2021 issue of *JOM*, which includes our 2020 rankings in Clarivate Analytics' subject categories and provides a look at impact factors over time.

Key Metrics	IMMI	JOM	JEM	JSM	MMTA	MMTB
2020 Impact Factor	3.404	2.471	1.938	2.347	2.556	2.47
Five-Year Impact Factor	4.423	2.988	1.746	3.428	2.602	2.57
Total Citations 2020	674	13,389	14,352	839	34,499	11,572
Total Downloads 2020	71,854	716,940	290,293	115,924	1,026,350	421,857

## NEW TMS STUDY



### ***Accelerating the Broad Implementation of Verification & Validation in Computational Models of the Mechanics of Materials and Structures***

Organized by TMS on behalf of the National Science Foundation, this science and technology accelerator study report was published in October 2020 and is now available for free download at [www.tms.org/Studies](http://www.tms.org/Studies).

## 2020 MEETINGS, EVENTS, AND WEBINARS

While a number of events had to be canceled or postponed in 2020, the following events were held either in person (TMS2020) or virtually (all other events).

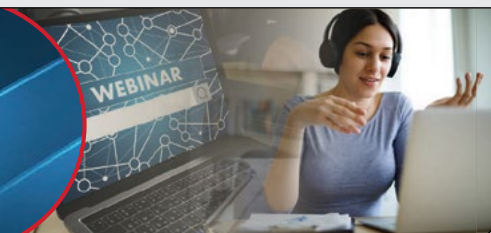


**22** WEBINARS

### **DID YOU KNOW?**

TMS presented and offered 22 total live webinars free to TMS members in 2020.

**TMS** WEBINARS  
[www.tms.org/WebinarLibrary](http://www.tms.org/WebinarLibrary)







## 2020 TMS BOARD OF DIRECTORS

### OFFICERS

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**Ellen K. Cerreta**  
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**Charles H. Ward**  
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**David L. Bourell**  
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Dissemination

**Eric N. Brown**  
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Affairs

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**Christina Meskers**  
Extraction & Processing  
Division

**Paul R. Ohodnicki Jr.**  
Functional Materials  
Division

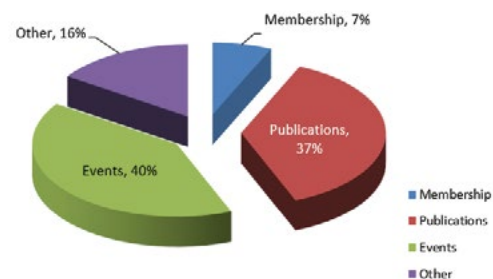
**Eric Nyberg**  
Light Metals Division

**Mark R. Stoudt**  
Materials Processing &  
Manufacturing Division

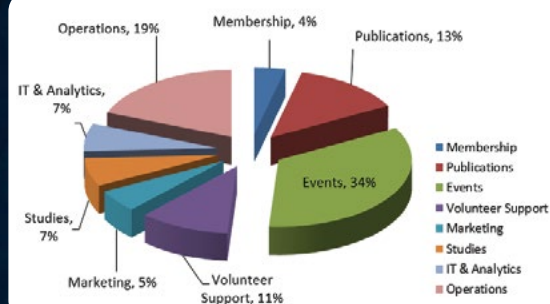
**Daniel Miracle**  
Structural Materials  
Division

## 2020 FINANCIAL REVIEW

### 2020 Operating Revenues by Program Area



### 2020 Operating Expenses by Program Area



### Summary of Operations Revenues and Expenses

REVENUE	% Total	
Events	40%	\$3,029,440
Publications	37%	\$2,787,499
Membership	7%	\$497,488
Other	16%	\$1,172,914
<b>TOTAL REVENUES</b>		<b>\$7,487,341</b>

### EXPENSES

Events	34%	\$2,479,317
Publications	13%	\$971,790
Membership	4%	\$273,382
Volunteer Support	11%	\$796,148
Studies	7%	\$496,746
IT & Analytics	7%	\$485,881
Marketing	5%	\$393,139
Operations	19%	\$1,386,741
<b>TOTAL EXPENSES</b>		<b>\$7,283,144</b>

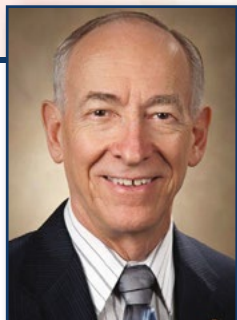






# Be the Solution for the Future

Garry Warren



*"Be part of the solution in making sure that we have the scientists and engineers necessary for society to thrive and progress, regardless of what the future holds."*

I have been a proud supporter of the TMS Foundation since its inception. Now more than ever, I can truthfully say that the work the Foundation does is crucial! I am not certain that I truly appreciated the full impact of our Foundation programs until the events of the past year or so. The pandemic has shown me just how fortunate I am. I'm retired, I could easily avoid crowds, I have a reliable income, etc., etc. That has definitely NOT been the case for many TMS members. For far too many people, life and work became more difficult, stressful, and solitary. In many cases professional collaborations were strained, delayed, or suspended. That last point is an important one, because I believe that the collaborative relationships that TMS provides and the recognition of accomplishments by our peers is the lifeblood of TMS. Imagine the impact that a scholarship could have on a young student struggling with a life upended by the pandemic. Think of a young assistant professor trying to jump start an academic career in these trying times. Consider a husband or wife who is unable to attend a TMS meeting because of childcare or elder

care issues. Yes, I am confident that we will be attending meetings again!

I urge you to give to the TMS Foundation today to expand support for our most vulnerable colleagues as an impactful way to ensure a strong scientific and engineering community for future generations. Starting this year, the TMS Foundation is focusing on increasing access to support for students and early career professionals in the following tangible ways:

- **Double the Number of TMS Family Care Grants**
- **Re-Establish the Presidential Scholarship**
- **Double the Number of Young Leaders Professional Development Awards**

Learn more about these programs in the Awards and Outreach section of the Foundation website at [www.TMSFoundation.org](http://www.TMSFoundation.org).

Be part of the solution in making sure that we have the scientists and engineers necessary for society to thrive and progress, regardless of what the future holds. Please give to the TMS Foundation today. Your gift would not only support the above programs, but it could also be just the perfect grant, award, or recognition that convinces a young engineer/scientist to stay the course, go to graduate school, seek a new position, or even to become an entrepreneur. The future is indeed in our hands.

**Garry Warren is chair of the TMS Foundation Board of Trustees and is a member of the Foundation's Gold Society for lifetime giving and the 1871 Legacy Circle.**

## The TMS Foundation Remembers Stan Howard

The TMS Foundation family wishes to honor the support and contributions of Stanley M. Howard, who passed away in May 2021. Howard, 2016 TMS President, served as a TMS Foundation Trustee and was a member of the Titanium Society for lifetime giving, along with his wife, Carol. In the August 2021 JOM article, "Honoring Stanley Howard, A True Friend to TMS," Garry Warren paid tribute to his friend: "It seemed to me Stan was good at everything he attempted...Stan was a 'one in a million' friend, mentor, educator, and many other titles. For me there will be a huge void in any future TMS meeting, since that was always a chance for me to get to sit and talk to Stan."

## How Can You Help?

### Support the 2021 Year-End Appeal

**Deadline:** December 31, 2021

**Donate Online:** Use our online contribution form at [www.TMSFoundation.org/Contribute](http://www.TMSFoundation.org/Contribute).

**Donate by Mail:** If you prefer, you can mail your donation to the TMS Foundation at 5700 Corporate Drive Suite 750, Pittsburgh, PA 15237.

**Employer Match:** Register The Minerals, Metals & Materials Society for an employer match with your company. TMS (EIN: 25-1484913) is a qualified 501(c)3 tax-exempt organization.

**Questions? Contact:** TMS Foundation staff at [TMSFoundation@tms.org](mailto:TMSFoundation@tms.org) or 1-724-776-9000 for more information or to discuss your donation personally.





# Committed to a Stronger Future: The TMS Foundation 2020 Annual Report





"The deliberate and dedicated support of young professionals in TMS, made possible by both the TMS Foundation and so many engaged, uplifting members, has helped advance my career and has made TMS feel like home. I am excited to continue working within TMS and alongside the Foundation to ensure that our membership will be diverse, vibrant, and dynamic as we tackle the most pressing technological challenges now and into the future."

—Jessica Krogstad, 2020 Early Career Faculty Fellow



## A LETTER FROM TMS FOUNDATION LEADERSHIP



2020 began with the TMS Foundation Board of Trustees and TMS Board of Directors meeting to outline a challenge. With renewed commitment to supporting students and early career professionals, the two boards made plans for meeting ambitious philanthropic goals and engaging Society members in pursuit

of these goals. Shortly after, the COVID-19 pandemic magnified the importance of this commitment.

What the pandemic demonstrated, was exactly what the Foundation trustees reaffirmed in February. Students and early career professionals faced many unprecedented roadblocks proving that the need to provide for these TMS members in the most vulnerable stages of their careers was greater than ever.

With the support of 292 generous donors, the TMS Foundation did not waver in answering the call to provide financial assistance, valuable recognition, and leadership opportunities. Those 292 donors, 56 of whom made a gift for the first time in 2020, raised a total of \$172,308. During the 2020 year-end appeal campaign alone, which ran from mid-October through the end of December, a total of \$105,915 was raised to ensure the strength of our profession now and in the future.

Together, the TMS Foundation and its generous benefactors accomplished a great deal in 2020. When we stand together, we can make a difference in many lives. And we look forward to making an even greater impact in the years to come.

Sincerely,

**Garry W. Warren**  
Chair, TMS Foundation  
Board of Trustees  
Member, TMS Foundation  
Gold Society

## 2020 FOUNDATION BOARD OF TRUSTEES

### CHAIR

**Garry W. Warren**  
University of Alabama

### EXECUTIVE COMMITTEE REPRESENTATIVE

**James Foley**  
Los Alamos National Laboratory

### TRUSTEES

**Viola Acoff**  
University of Alabama

**Carl M. Cady**  
Los Alamos National Laboratory

**David DeYoung**  
Alcoa Technical Center

**Hani Henein**  
University of Alberta

**Edward D. Herderick**  
The Ohio State University

**Stanley M. Howard**  
South Dakota School of Mines & Technology

**Marc A. Meyers**  
University of California, Santa Barbara

**Brajendra Mishra**  
Metal Processing Institute and Worcester  
Polytechnic Institute

**Ray Peterson**  
Real Alloy

**David A. Shifler**  
Office of Naval Research

**Robert D. Shull**  
National Institute of Standards and Technology

### SECRETARY

**James J. Robinson**  
TMS Executive Director





## OUR MISSION

The TMS Foundation supports students and young professionals with meaningful financial assistance and impactful career-building experiences. To learn more about the mission, vision, and history of the TMS Foundation, visit the About section at [www.TMSFoundation.org](http://www.TMSFoundation.org).

## OUR PROGRAMS

### STUDENTS

By supporting scholarships, travel grants, and educational enrichment programs for students, the TMS Foundation helps remove barriers to education while encouraging a deeper involvement in the greater materials community.

### EARLY CAREER PROFESSIONALS

The TMS Foundation offers professional recognition awards, opportunities for presenting work and developing symposia, and leadership development programs through its support for professionals at this key stage in their career development.

### ESTABLISHED PROFESSIONALS

Awards supported by the TMS Foundation encourage diversity within the professions, outstanding mentors or educators, and distinguished achievements, helping to boost prestige within the fields.

### OUTREACH INITIATIVES

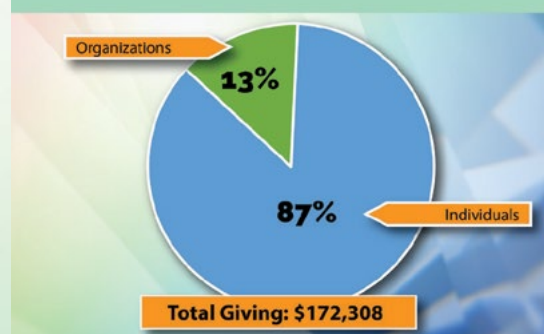
The TMS Foundation also supports the *Materials Explorers*™ high school outreach program and the TMS Bladesmithing Competition for college students, as well as student participation in the Electronic Materials Conference and the ASM Materials Camps.

## TMS FOUNDATION 2020 FINANCIAL OVERVIEW

The financial information below provides two perspectives on the TMS Foundation's performance in 2020:

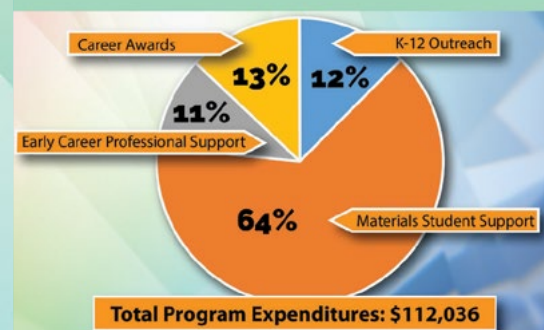
- Donations, inclusive of new endowments being established
- Program expenditures, including all gifts issued through the Foundation

### 2020 TMS FOUNDATION GIVING



CONTRIBUTIONS	% Total	
Individuals	87%	\$149,543
Organizations	13%	\$22,765

### 2020 TMS FOUNDATION PROGRAM EXPENDITURES



PROGRAM EXPENDITURES	% Total	
Materials Student Support	64%	\$71,936
Career Awards	13%	\$14,477
K-12 Outreach	12%	\$13,810
Early Career Professional Support	11%	\$11,813

The TMS Foundation is a unit of The Minerals, Metals & Materials Society (EIN: 25-1484913), which is a qualified 501(c)(3) tax-exempt organization. Official registration and financial information may be obtained from the Pennsylvania Department of State by calling toll-free, within Pennsylvania, 1-800-732-0999. Registration does not imply endorsement.

## THANK YOU TO OUR 2020 DONORS

In addition to special donor groups such as the **40/40 Club** for young professionals and the **1871 Legacy Circle** for individuals who have provided for the TMS Foundation through planned giving, the TMS Foundation celebrates its donors through its **Lifetime Giving Honorary Societies** and the **Annual Giving Honor Roll**. With their generous contributions to the TMS Foundation, our donors are making a significant and permanent impact on the future of the minerals, metals, and materials professions.

To view current members of both honor rolls, visit [www.TMSFoundation.org/HonorRolls](http://www.TMSFoundation.org/HonorRolls).



"You who are gathered here this evening are not only resilient in your own lives, but you also reached out to others in need in their lives with your financial generosity," said Garry Warren (fourth photo, top row) to the attendees of the Foundation's March 2021 donor appreciation, held virtually for the first time. "Although the world changed, the need did not. The TMS Foundation and its many beneficiaries are deeply grateful to you."

—Garry Warren, at the 2020 Virtual Donor Appreciation Dinner

## ORGANIZATIONAL GIVING



Acta Materialia Inc.



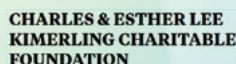
AmazonSmile  
Foundation



American Institute of Mining,  
Metallurgical and Petroleum  
Engineers (AIME)



Bognar and Company Inc.



Charles & Esther Lee Kimerling  
Charitable Foundation



Thermo-Calc Software Inc. (U.S.)

You can make a difference, too, by donating to the TMS Foundation online or mailing a check, payable to the TMS Foundation, to the address below.

[www.TMSFoundation.org](http://www.TMSFoundation.org)  
1-724-776-9000  
[TMSFoundation@tms.org](mailto:TMSFoundation@tms.org)

**TMS Foundation**  
5700 Corporate Drive Suite 750  
Pittsburgh, PA 15237





## SHAPING A COMMUNITY: THE IMPACT OF THE MATERIALS PROCESSING & MANUFACTURING DIVISION

Kaitlin Calva

**TEN** years after the creation of the five TMS technical divisions, one division made the bold decision to change its name. At the 1998 TMS Annual Meeting & Exhibition, the Materials Design & Manufacturing Division (MDMD) officially became the Materials Processing & Manufacturing Division (MPMD) that TMS members know today. The decision came after division members, encouraged by past MDMD chair and 1997 TMS President Robert Wagoner, considered their role not only within TMS, but within the broader manufacturing community. A 1998 *JOM* article explained that the MPMD's decision would "better reflect its membership and clear some ambiguities about the definition of the word 'design.'"<sup>1</sup>

"Shaping a Community: The Impact of the Materials Processing & Manufacturing Division," is the fourth 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](mailto:kcalva@tms.org).

### Meet the MPMD Interviewees



#### David Bourell

Temple Foundation Professor,  
 The University of Texas at Austin  
*2011 TMS Fellow, current director,  
 TMS Professional Development*



#### Megan J. Cordill

Deputy Director, Erich Schmid  
 Institute of Materials Science,  
 Austrian Academy of Sciences  
*2015 MPMD Young Leader*



#### Mark R. Stoudt

Staff Scientist, Material  
 Measurement Laboratory,  
 National Institute of Standards  
 and Technology  
*Current MPMD chair*

Paul Follansbee, a past chair of the MDMD, further clarified the decision in noting that: "To materials engineers who work in the manufacturing environment, design means something totally different than it does to the average TMS member or even MDMD member... To them, it has to do with the design of a component; we mean it very differently as the design of a material. It wasn't helping us that the word design was in the title, but not in the mission statement. We essentially work in materials processing issues, and we wanted the name to reflect who we really are."<sup>1</sup>

Now, *JOM* continues the celebration of TMS and the American Institute of Mining, Metallurgical, and Petroleum Engineers, (AIME) 150th anniversary, as it dives in to the history of the MPMD. Through



interviews with division members and leaders, see the impact of the division on the Society over the years.

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

**David Bourell:** I joined TMS as a student member while in graduate school. I attended my first TMS conference in 1979 as a young assistant professor.

**Megan J. Cordill:** I was an undergraduate student at Washington State University (WSU). Dave Bahr was the advisor and with only a class of 12, we all joined Material Advantage (but at that time it was not Material Advantage). All of the professors at WSU highly encouraged joining the professional society and we even went to conferences to be student monitors (count the number of people in the room and turn the lights on and off). I even won a TMS undergraduate scholarship during my last year.

**Mark R. Stoudt:** I joined TMS as a student member in 1983 while I was an undergraduate student at The Pennsylvania State University, and I have been a member of TMS since then. However, I became a more active member after joining the Shaping and Forming Committee

in 2000 because I felt it necessary to develop technical programming that emphasized the enormous challenges associated with the new alloys designed to improve fuel economy in the automotive industry. The structure of TMS provided the right platform, and the TMS membership contributed the right balance of technical expertise from industrial, government laboratory, and academic experts to properly address those challenges.

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

**Bourell:** The MPMD is the place where persons interested in materials and processing can network and share knowledge that advances materials research and development. Materials expertise is critical to understanding which materials can be processed given a manufacturing process, and manufacturing affects microstructure and therefore service properties.

**Cordill:** The division collects the different technical committees that are responsible for manufacturing and processing of different materials as well as the computational materials science and nanomechanics. This



Megan Cordill (third from left) receives the 2015 MPMD Young Leaders Professional Development Award.



## AN EARLY LOOK AT THE MPMD

First called the Materials Design and Manufacturing Division (MDMD), the MDMD's initial scope statement said that the division "will cover: (1) manufacturing from product design to production; (2) integrating of process control technology into manufacturing (e.g., applying concepts from the intelligent processing of materials to intelligent design and manufacture); and (3) research into computer-based design, automating manufacturing systems, and

**Division Chairperson:**  
Glen Y. Che  
AT&T Laboratories

**Encapsulated Committees (tentative):**  
University and Division of Materials  
Electronic and Materials Design Division  
Materials Processing Division (Materials)  
Electronic Materials  
Materials Manufacturing  
Process and Materials Manufacturing  
Materials and Materials Processing  
Materials and Materials Processing

**Scope Statement:**  
The Materials Design and Manufacturing Division (MDMD) will cover the topics of materials design, manufacturing, and process control technology into manufacturing (e.g., applying concepts from the intelligent processing of materials to intelligent design and manufacture); and (3) research into computer-based design, automating manufacturing systems, and

### The Materials Design and Manufacturing Division (MDMD)

**Division Chairperson:**  
Robert Mehrabian  
University of California, Santa Barbara

**Encapsulated Committees (tentative):**  
Composite Materials  
Powder Metallurgy  
Shaping & Forming  
Solidification  
Synthesis and Analysis in Materials  
Processing

**Scope Statement:**  
With the long term character of bringing the needs of the designer to the production of materials, the Materials Design and Manufacturing Division (MDMD) recognizes that, in order to develop, design and manufacture, the division of materials, manufacturing, and process control technology into manufacturing (e.g., applying concepts from the intelligent processing of materials to intelligent design and manufacture); and (3) research into computer-based design, automating manufacturing systems, and

### Technical Division Affiliation Response Form

Please complete this form and return it to the Executive Director of TMS, 420 Commonwealth Drive, Warrendale, PA 15066. Please fill in the completed form in the enclosure directory of TMS and the enclosed form below.

#### Preferred Address for TMS Mailings

Name  Title  (Indicate Title)

Member Number

Employment Address

Full Name/Address

City

State

Country

Telephone

Fax

Are You a Registered Professional Engineer (P.E.)?

Yes ☐ No ☐

Other ☐

Return Completed Form to:

Executive Director TMS Headquarters, 420 Commonwealth Drive, Warrendale, PA 15066

Please type or print  
enclosure one acceptable

#### Divisional Affiliation Preferences

Indicate your primary interest in membership by checking "1" (primary), "2" (secondary), or "3" (tertiary) in the space next to the appropriate committee. You may leave a box blank if you are not interested in any of the committees. All your preferences will be used to assign you to committees in other areas.

The Electronic and Materials Processing Division (EPM-D)

The Light Metals Division (LMD)

The Solidification and Materials Processing Division (SMD)

The Electronic Materials and Materials Processing Division (EMMD)

The Materials Design and Manufacturing Division (MDMD)

The above excerpt from the September 1988 issue of JOM shows the initial plan and direction for the MDMD.<sup>2</sup>

developing control and information systems."<sup>2</sup>

The first committees under the MDMD were:

- Composite Materials
- Powder Metallurgy
- Shaping & Forming
- Solidification
- Synthesis and Analysis in Materials Processing

For a look at the current MPMD committees and to get involved in the division's activities, visit [www.tms.org/Committees](http://www.tms.org/Committees).

Robert Mehrabian, pictured here, was selected to serve as the first MDMD Chair in 1988.

is a unique combination of the materials science triangle of processing-properties-structure within one division. The division is quite diverse and covers a lot of different materials science topics.

**Stoudt:** Since I have been affiliated with MPMD, our programming has consistently been designed to address the needs of industry and to be on the cutting edge of the materials field. For example, the emergence of additive manufacturing has emphasized the importance of the programming from the Phase Transformations, the Powder Materials, and the Solidification Committees. Also, both the Integrated Computational Materials Engineering (ICME) and the Computational Materials Science and Engineering Committees have been at the forefront of the use of artificial

"This is a unique combination of the materials science triangle of processing-properties-structure within one division. The division is quite diverse and covers a lot of different materials science topics."

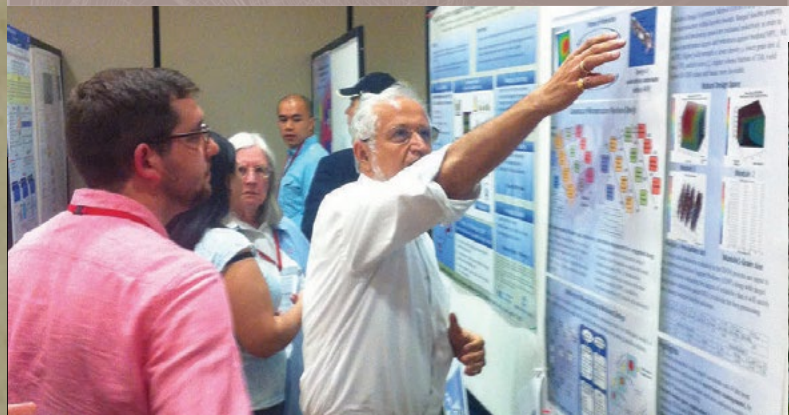
—Megan J. Cordill

intelligence and machine learning in materials research. The MPMD also has a long history of co-programming with other technical committees within and outside of our division, which enhances the value of the technology transfer.

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

**Bourell:** In the early 2000s, the MPMD organized a series of division-wide sessions under the name, Global Innovations in Materials Processing and Manufacturing. These were among the first symposia within the division with a broad theme of interest to the entire processing and manufacturing community. I thought that this activity helped technical committee chairs bridge across their focus areas to gain a big-picture perspective on timely issues in processing and manufacturing.

**Cordill:** The ICME congresses are great, and we have had some excellent honorary symposia. TMS is becoming the home for ICME and additive manufacturing, a bridge technical committee between TMS's five divisions.



The World Congress on ICME is a signature event for TMS, sponsored by the MPMD. The photos here are from the second congress, held in 2013. From top: an attendee asks a question at the closing session panel discussion; attendees participate in the ICME 2013 poster session; and Tresa Pollock, University of California, Santa Barbara, answers a question during the panel discussion.



**Stoudt:** As a division, the MPMD has always been very active regarding both programming and publications. Over the last decade or so, the ICME Committee founded the World Congress on ICME as a standalone conference to highlight the use of, and the need for, ICME approaches in materials design and validation. This year will feature the sixth iteration of this highly successful biennial conference. Next year, TMS will debut a new conference series on Artificial Intelligence in Materials and Manufacturing. Members from MPMD committees have had several prominent roles in the development and organization of both conferences.

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

**Bourell:** I've enjoyed most the technical exchange fostered by the forum created by TMS. As well, my career has benefited from and been enriched by networking, seeing old friends, and making new ones. The most meaningful

event for me was being elected Fellow of the Society. This achievement was both a recognition of my contributions and a humbling moment given the exceptional persons who had previously received this honor.

**Cordill:** From my time on the division, I always enjoyed the introduction rounds at the beginning of every meeting. Jim Foley started the tradition of introducing yourself and answering a random question, such as, what was your first

"I've enjoyed most the technical exchange fostered by the forum created by TMS. As well, my career has benefited from and been enriched by networking, seeing old friends, and making new ones."

—David Bourell



Mark Stoudt (back row, far left) joins the TMS Board of Directors as the incoming MPMD Chair at the TMS 2019 Annual Meeting & Exhibition.



car or most memorable vacation.

**Stoudt:** I would have to say my favorite memory (so far) would be being elected to lead the MPMD and to serve on the TMS Board of Directors. It was humbling to know that my peers believed I had what it takes to do this very important job. Being on the Board has provided me with an opportunity to grow as a professional and that has been special.

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

**Bourell:** Materials will always need to be processed and manufactured. This is a critical need for societal implementation of the results of our best research and

**"I have no doubt that the MPMD will continue to develop high-level technical programming and meeting events that will be at the forefront of the field of materials science and engineering as a whole."**

—Mark R. Stoudt

**development. The MPMD must continue to serve this important sector by offering relevant programming and educating the materials community.**

**Cordill:** Additive manufacturing will be a popular topic for TMS for the next decade. Within this topic, all other technical committees within the MPMD will be involved in some way. For example, powder metallurgy, nanomechanical behavior, phase transformations, and ICME/computational materials science are all interrelated when it comes to additive manufacturing.

**Stoudt:** I have no doubt that the MPMD will continue to develop high-level technical programming and meeting events that will be at the forefront of the field of materials science and engineering as a whole. Our volunteers are both dedicated and extremely capable and it has been my honor to represent them on the Board of Directors.

#### End Notes

1. "TMS News," *JOM*, 50, 69 (1998).
2. "News," *Journal of Metals*, 40, 49 (1988).



David Bourell teaches a professional development workshop at the TMS 2016 Annual Meeting & Exhibition on Additive Manufacturing Materials and Processes.



#### Correction

*JOM* staff apologizes for an error in the July 2021 article, "What's in a (Division) Name: A Look Back at the Functional Materials Division," which incorrectly left 2009 TMS

President Ray Peterson out of the caption for the past presidents photo on page 1999. Peterson is pictured in the back row, third from left.



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## EXAMINING THE MECHANICS OF THE STRUCTURAL MATERIALS DIVISION

Kaitlin Calva

**AT** its inception in 1988, the Structural Materials Division (SMD) was the largest of the five technical divisions within the Society, with 13 committees. Ram Kossowsky, the first SMD chair, shared his thoughts on the progress made in the division's first three years. "It has always been my strongest conviction that programming is the backbone of TMS," Kossowsky said, explaining one of the division's goals to create strong, quality technical programming that would attract attendees to TMS meetings.<sup>1</sup> It was up to the divisions and their committees, he reasoned, to come together and develop successful programming.

"Examining the Mechanics of the Structural Materials Division," is the fifth 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 2022. For more information, contact Kaitlin Calva, *JOM* Magazine Managing Editor, at [kcalva@tms.org](mailto:kcalva@tms.org).

"The society's programming is the umbrella under which we gather to meet people, to exchange ideas, to discuss new developments, to receive feedback, and to learn the latest and the best. It is paramount that *excellence* be the only framework in which a meeting can be discussed," Kossowsky continued.<sup>1</sup> "For the SMD to succeed, members will have to view themselves as operating within the division. For our members, the SMD is the unit; it is our focus of allegiance. The breakdown to committees has to be viewed as an organization, a convenience, and a necessity. The SMD programs as a unit, with input from the committees."<sup>1</sup>

Continuing the 150th anniversary celebration of TMS and the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) in 2021, *JOM* focuses on the history and impact of the SMD on both the Society and the broader materials community. In this article, *JOM* talks with several TMS members and leaders about their personal experiences and memories of the SMD.

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

**Amy J. Clarke:** I first became involved in TMS as a student via what is now known as Material Advantage, but my involvement increased and accelerated while I was a postdoc after receiving a TMS Young Leaders Professional Development Award.

**Dan Miracle:** Like so many others, my TMS experience began as a conference attendee. I relied on TMS programming to keep pace with advances in my field and to present my results to others. Organizing a symposium was the next step, and this eventually opened the door to the broad opportunities to contribute to the profession as a TMS volunteer leader.

**George T. (Rusty) Gray III:** My very first involvement in TMS was when I presented at the Materials Science & Technology (MS&T) meeting in Pittsburgh, Pennsylvania,



## Meet the SMD Interviewees



### Amy J. Clarke

Professor, Colorado School of Mines  
*2020 Brimacombe Medalist*



### Dan Miracle

Senior Scientist, Air Force Research Laboratory, Materials and Manufacturing Directorate  
*Current SMD Chair, 2018 TMS Fellow*



### George T. (Rusty) Gray III

Scientist 6/Laboratory Fellow, Los Alamos National Laboratory  
*2010 TMS President, 2013 TMS Fellow, past SMD Chair*

in 1979 or 1980 when I was a Ph.D. student at Carnegie Mellon University. After I joined Los Alamos National Laboratories (LANL) in 1985, I began attending every MS&T meeting and every TMS Annual Meeting. Besides presenting a talk at each of these meetings I got involved in the Titanium Committee and the Mechanical Behavior of Materials Committee. I attended both committee meetings and soon was helping organize symposia in the

**"The SMD is a large and vibrant community of international volunteer leaders from industry, academia, and government labs who are working to improve society through the science and engineering of load-bearing materials."**

—Dan Miracle

areas of titanium physical metallurgy and the dynamic behavior of materials—a few of us organized the first of these symposia in the late 1980s or early 1990s; the ninth of these, Dynamic Behavior of Materials IX, is scheduled to be held at the TMS 2022 Annual Meeting & Exhibition in Anaheim, California. However, the first committee in which I became intensely involved that eventually led to a leadership position, was serving on the Programming

Committee—eventually becoming the SMD representative on programming. Thereafter, I moved to the Publications Committee and in that capacity served on the TMS Board of Directors. This was followed by serving on the SMD as vice chair and then chair, again serving on the Board. My passion for serving TMS thereafter led to becoming vice president, president, and past president of TMS.

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

**Clarke:** The SMD is the largest division within TMS, covering a broad range of materials from biomaterials and engineering alloys like steels and titanium to high-performance alloys for extreme environments, including modeling, characterization, and manufacturing. Volunteers within the SMD regularly organize vibrant technical programming for annual and specialty meetings and aid in content capture. The SMD also affords networking and professional development opportunities for early, mid-career, and established professionals in the materials community.

**Miracle:** There are five technical divisions in TMS, each representing important and exciting technical fields. The SMD is a large and vibrant community of international volunteer leaders from industry, academia, and government labs who are working to improve society through the science and engineering of load-bearing materials. The SMD is distinguished by its breadth and diversity, with 13 technical committees (several that are shared with other divisions) that cover a range of materials and technologies. The SMD provides a significant fraction of programming at MS&T and the TMS Annual Meeting, as well as at a number of specialty conferences. Just as important, the SMD offers many opportunities for career development and professional leadership, and sponsors recognition and awards for deserving students and professionals.



Miracle (standing) gives career advice to students and early career professionals as the Young Professionals Tutorial Lecturer at the 2018 Materials Science & Technology conference in Columbus, Ohio.



## AN EARLY LOOK AT THE SMD

When the Structural Materials Division (SMD) first took shape, its initial aim was to "cover the many varied aspects associated with the science and engineering of load-bearing materials, including studies into the nature of a materials physical properties based upon its microstructure and operating environment."<sup>2</sup> The first committees under the SMD, as reported in the June 1988 issue of JOM, were:

- Alloy Phases
- Corrosion & Environmental Effects
- Ferrous Metallurgy
- High Temperature Alloys
- Mechanical Metallurgy
- Nonferrous Metals
- Nuclear Metallurgy
- Offshore Technology
- Physical Metallurgy
- Refractory Metals
- Structural Ceramics and Polymers
- Structural Materials
- Superconducting Materials
- Titanium

For a look at the current SMD committees and to get involved in the division's activities, visit [www.tms.org/Committees](http://www.tms.org/Committees).

structure of the society by which technical activities would be organized under five divisions, specifically the Extraction and Processing Division (EPD); the Light Metals Division (LMD); the Structural Materials Division (SMD); the Electronic, Magnetic and Photonic Materials Division (EMPD); and the Materials Design and Manufacturing Division (MDMD). Each division has considerable responsibility and authority for the development of technical programming.

### The Extraction and Processing Division (EPD)

Division Chairman:  
J.K. Brimacombe  
University of British Columbia

#### Encompassed Committees (tentative):

Copper, Nickel, Cobalt and Precious Metals  
Economics  
Electrolytic Processes  
Hydro-metallurgy  
Lead, Zinc and Tin  
Physical Chemistry  
Process Metallurgy  
Process Modeling  
Pyrometallurgy

gies. With regard to existing technical committees, each one has been assigned to, at least tentatively, the most technically compatible division.

In an open letter to the membership which appears in the June 1988 TMS News, Robert W. Bartlett, TMS vice president, said that the new divisional structure is "designed to continue and improve member services in traditional metallurgical areas while more vigorously pursuing our activities in high-

ties. We also want to reinvigorate processing, both for primary and advanced materials." Dr. Bartlett encouraged members to select a preferred division. Any member who has not yet indicated a divisional affiliation is asked to fill out the accompanying form. To assist in this decision, the divisional chairmen have developed the accompanying scope statements which outline current fields of interest and identify potential areas of activity.

#### Scope Statement:

The Extraction and Processing Division (EPD) has been formed to build upon TMS strength in the fields of metals extraction and refining. With the above-mentioned technical-committee areas as its foundation, the EPD will move to address three major issues: (1) the emergence of materials; (2) the increasing role of the computer in all facets of processing; and (3) the need to unify the processing field to encompass physical processes like solidification and thermomechanical treatment as well as mineral preparation and extraction and refining. The latter thrust will remove the artificial barrier between extraction/refining and physical processing that

has dominated the metallurgical scene and will reflect the reality that any metal or material is produced from raw material(s) and then progresses through a series of finishing processes.

Within the broad framework of processing, the EPD will concentrate its efforts on publications (journals and conference proceedings), programming conferences and international symposia and continuing education initiatives (short courses and seminars).

The EPD will work cooperatively with other TMS technical divisions, as well as with other technical societies, in all areas of programming, publications, continuing education and student affairs.

### The Light Metals Division (LMD)

Division Chairman:  
Ronald E. Miller  
Alcoa

#### Encompassed Committees (tentative):

Reactive Metals

#### Scope Statement:

The Light Metals Division (LMD) is organized to serve the professional needs of the men and women in the light metals industries, both traditional (e.g., aluminum, beryllium, titanium, lithium, etc.), and emerging

(e.g., composites, laminates, etc.) This mission will be accomplished by: (1) disseminating current research, development and production information; (2) providing opportunities for continuing education; and (3) serving as a focal point for ongoing social interactions.

A primary thrust of the LMD will be to become highly proactive in identifying and satisfying the continuing education needs of its membership. This will be done by offering short courses in conjunction with the annual meetings of the society. Another high-priority item will be to enhance programming in the

technical areas of post-solidification processing (e.g., light-metal composites manufacturing, advanced manufacturing techniques applied to the aluminum industry, etc.). Such programming will often be accomplished by joint activities with other technical divisions. Technical programming in the traditional subject areas of aluminum and bauxite, carbon, reduction and environment, casthouses, and reactive metals is done at the annual meeting and is documented in the annual proceedings volume *Light Metals*, which contains nearly all of the sessions' papers.

### The Structural Materials Division (SMD)

Division Chairman:  
Ram Kossowsky  
Pennsylvania State University

#### Encompassed Committees (tentative):

Corrosion & Environmental Effects  
Ferrous Metallurgy  
High Temperature Alloys  
Mechanical Metallurgy  
Non-ferrous Metals  
Nuclear Metallurgy  
Offshore Technology  
Physical Metallurgy  
Refractory Metals  
Structural Ceramics and Polymers (new)  
Structural Materials  
Superconducting Materials (new, in cooperation with the EMPMD)  
Titanium

#### Scope Statement:

The Structural Materials Division (SMD) has been chartered to cover the many varied aspects associated with the science and engineering of load-bearing materials, including studies into the nature of a material's physical properties based upon its microstructure and operating environment. To fulfill this mission, the SMD will concentrate on three primary activities: (1) the organization of in-depth, national and international programming as sponsored by individual committees; by multiple committees within the division; and through collaborative efforts with not only other divisions, but other societies as well; (2) the presentation of regularly offered short courses which will be delivered by experts in their respective fields and which will examine topical subjects, areas of spe-

cial interest and issues of a fundamental engineering nature; and (3) development of special, student-oriented activities.

As needs are identified, the SMD will create new committees and combine existing ones. For example, the division has already created two new committees—the Structural Ceramics and Polymers Committee and the Superconducting Materials Committee (in cooperation with the EMPMD)—and has plans for committees on biomaterials and the structure of composites (in cooperation with the MDMD).

The SMD is sponsoring two courses at the 1988 TMS Fall Meeting and has contacted a number of lecturers about the development of short courses for upcoming meetings. A chairman for student affairs has been appointed and will begin activities shortly.

And the long-term thrust of bringing the needs of the designer to the processing of materials, the Materials Design and Manufacturing Division (MDMD) recognizes that, in terms of modeling, simulation and control,

manufacturing is the key to developing optimal and innovative systems. In meeting its mission, the MDMD will pursue a number of primary objectives. The division will attempt to identify what it means to

the stated goal of making materials scientists and designers more aware of each other's activities. The symposium will also attempt to stimulate materials and design continuity, especially in the concept of concurrency.

### Technical Division Affiliation Response Form

If you have not yet completed a Technical Division Affiliation Response Form, please do so at this time by providing all the information requested in the following. Please return the completed form to the executive director of TMS and the address listed below.

#### Preferred Address for TMS Mailings

Name \_\_\_\_\_ (last) \_\_\_\_\_ (first) \_\_\_\_\_ (initials)  
Member Number \_\_\_\_\_  
Employer/Institution \_\_\_\_\_  
P.O. Box/Street Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_  
Country \_\_\_\_\_ Zip/Postal Code \_\_\_\_\_  
Telephone \_\_\_\_\_ Telex \_\_\_\_\_ Fax \_\_\_\_\_  
Are You a Registered Professional Engineer (P.E.)? Yes \_\_\_\_\_ No \_\_\_\_\_  
Date(s) \_\_\_\_\_ Year of Registration \_\_\_\_\_

Please type or print.  
Photocopies are acceptable.

#### Divisional Affiliation Preferences

Identify your primary technical interests by indicating "1" (first choice), "2" (second choice) and "3" (last choice) in the space next to the appropriate technical division. You do not have to select more than one division, but you are encouraged to add your second through fourth choices if you have interests in other areas.

\_\_\_\_\_ The Extraction and Processing Division (EPD)  
\_\_\_\_\_ The Light Metals Division (LMD)  
\_\_\_\_\_ The Structural Materials Division (SMD)  
\_\_\_\_\_ The Electronic, Magnetic and Photonic Materials Division (EMPMMD)  
\_\_\_\_\_ The Materials Design and Manufacturing Division (MDMD)

Return Completed Form to:  
Executive Director, TMS Headquarters, 420 Commonwealth Drive, Warrendale, PA 15086

This excerpt from the 1988 issue of *JOM*, shown above, describes the initial plan and direction for the SMD.<sup>2</sup>

Ram Kossowsky, pictured here, was selected to serve as the first SMD Chair in 1988.



## WILKES-BARRE, PA, CELEBRATES AIME ANNIVERSARY

A plaque commemorating the 150th anniversary of the founding of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) was unveiled at a ceremony held in Wilkes-Barre, Pennsylvania, on May 16, 2021, the official date of the organization's 150th birthday. AIME, the parent organization of TMS, was founded in the mining town of Wilkes-Barre in 1871, when a three-day meeting of mining and metallurgical engineers took place.

The plaque was unveiled in Wilkes-Barre's Public Square, directly below a plaque that recognized the organization's 125th anniversary in 1996. AIME President George Luxbacher (pictured, right), Society for Mining, Metallurgy & Exploration (SME) President Bill Edgerton (pictured, left), and SME Pennsylvania Anthracite Section Chair John Voigt all spoke at the event, as well as Wilkes-Barre Mayor George Brown, U.S. Representative Matt Cartwright, and Mark J. Riccetti of the Luzerne County Historical Society.

Since the organization's founding, AIME has grown from 69 founding members—largely based in northeastern Pennsylvania—to encompass four standalone professional societies having nearly 200,000 members around the world. To learn more about the shared history between TMS and AIME, visit [www.tms.org/OurHistory](http://www.tms.org/OurHistory).

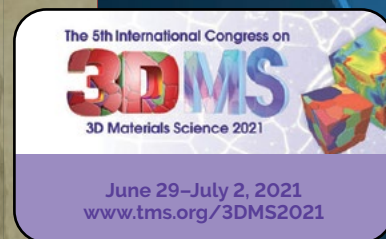
Wilkes-Barre, Pennsylvania, Mayor George C. Brown issued this proclamation of congratulations to celebrate AIME's 150th anniversary.



**Gray:** The SMD encompasses a large portion of the committees central to the structure/property behavior of structural materials—classic physical metallurgy. As such, the SMD offers symposia and committees pertinent to the mechanical behavior of materials, fatigue, fracture, high-temperature materials, nuclear materials, refractory materials, biomaterials, composites, alloy phases, titanium, and most recently additive manufacturing.

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

**Clarke:** Over the years, SMD volunteers have developed key events and continue to push the state-of-the-art in structural materials. For example, the International Symposium on Superalloys is in its 14th installation, whereas the World Congress on High Entropy Alloys—an emerging topic—is in its second installation.







Clarke (sixth from left) was elected to serve as chair of the reactivated Steels Committee, pictured here at the TMS 2017 Annual Meeting & Exhibition in San Diego, California.

**Miracle:** As a young scientist just out of undergraduate school, I have strong memories of my first TMS specialty conference, the 4th International Symposium on Superalloys (Superalloys 1980). Specialty conferences have always been a vital part of the SMD contribution to our field by providing a focused forum for established technologies, like superalloys, and by nurturing rapid growth in new directions. More recent examples of TMS

“The SMD has consistently offered technical programming opportunities germane to the physical metallurgist and materials science professional to stay abreast of the evolving science and technology surrounding materials and manufacturing, as well as providing a learning environment for undergraduate and graduate students.”

—George T. (Rusty) Gray III

specialty conferences that support emerging communities include the International Congress on 3D Materials Science (3DMS), the World Congress on Integrated Computational Materials Engineering, and the World Congress on High Entropy Alloys. Specialty conferences are one of the ways that the SMD plays a leadership role in supporting the advancement of important technologies for the profession and for society.

**Gray:** I think strong programming lies at the heart of TMS overall, and this is certainly the case within SMD. The SMD has consistently offered technical programming opportunities

germane to the physical metallurgist and materials science professional to stay abreast of the evolving science and technology surrounding materials and manufacturing, as well as providing a learning environment for undergraduate and graduate students. The Dynamic Behavior of Materials Symposia have certainly sought to hit this mark and have been extremely successful at bringing together the leading researchers in this area every three to four years over the past three decades. Today, as evidenced by the recent formation of the Additive Manufacturing Committee, the division continues to evolve to serve the ongoing and emerging areas of science and technology.



Gray (left) presents the presidential plate to 2009 TMS President Ray Peterson, as Gray transitions to the role of president at the TMS 2010 Annual Meeting & Exhibition in Seattle, Washington.



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

**Clarke:** My favorite memory associated with the SMD is the revitalization of the Steels Committee.

**Miracle:** It has to be the people! My favorite TMS and SMD memories all center on the professional relationships and shared activities associated with TMS meetings and the volunteer work that makes them happen. Meeting with friends and colleagues, working with other volunteer leaders on SMD and TMS activities, and interacting with the exceptional TMS staff all provide strong and cherished memories through my years in TMS.

"I believe the SMD will continue to cultivate the next generation of leaders within TMS and drive innovations within the materials community, particularly with respect to cross-cutting topics like additive manufacturing."

—Amy J. Clarke

**Gray:** Given my over 37-year involvement with TMS it is impossible to pick one "favorite"—certainly my year as President of TMS was very special and one I will always cherish. The ongoing opportunity to meet twice each year, at MS&T and the TMS Annual Meeting, with my friends and colleagues in TMS is a high point of my professional career as well as a chance to catch up with friends in the materials community.

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

**Clarke:** I believe the SMD will continue to cultivate the next generation of leaders within TMS and drive innovations within the materials community, particularly with respect to cross-cutting topics like additive manufacturing.

**Miracle:** Technical leadership. More than ever, society relies on science and technology to advance our standard of living and to provide a safe and secure environment. The SMD offers exceptional opportunities to lead the scientific and technical community by supporting technical directions

that are consistent with this higher purpose. Materials for more efficient transportation systems, materials for new approaches to produce energy with reduced environmental impact, and stewardship of limited resources are all themes supported by SMD. This technical leadership is captured in Goal 3 of the TMS strategic goals, TMS Aspires. **(Editor's note: for more on the strategic goals, visit [www.tms.org/TMSAspires](http://www.tms.org/TMSAspires).)**

**Gray:** I see the SMD with a bright future. The areas of structure/property behavior of structural materials continue to be of great interest and importance to the broad area of materials and manufacturing serving domestic products, aerospace, energy, transportation industries. Continued emphasis on less energy intensive manufacturing, recycling, and lowering environmental impact of the production and utilization of structural materials offer exciting opportunities to the scientists and engineers served by the SMD and TMS overall.

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

**Miracle:** I feel very lucky to be part of TMS volunteer leadership at this point in time. TMS is an exceptional professional society with a clear vision that encompasses more than simply the technology. If you're not familiar with this vision, I would encourage you to read the TMS strategic goals, given in the TMS Aspires document. It's just one page, and it makes me proud to be part of the TMS family.

**End Notes**

1. "SMD Edition," *JOM*, 43, A64 (1991).
2. "News," *Journal of Metals*, 40, 49 (1988).







## The Brimacombe Prize: Continuing an Extraordinary Legacy

Ashley-Anne Bohnert

“All of us who knew and worked with Keith [Brimacombe] were so touched by him that we wanted to create something substantial to honor his memory,” notes Brian Thomas, chair of the Brimacombe Prize Awards Committee. Created in 1997 to celebrate the memory of J. Keith Brimacombe, 1993 TMS President, by his former students, colleagues, and friends, Thomas has been involved with the award from its inception. “Although many awards have been created to honor Keith, especially student scholarships, the Brimacombe Prize is envisioned as a substantial recognition of someone who comes close to capturing Keith’s best attributes.”

The recognition certainly is substantial. Honorees receive a cash prize of CA\$20,000 as well as a specially designed award piece depicting the Greek goddess

Athena. As the embodiment of wisdom, reason, and purity, Athena symbolizes many attributes the awards committee seeks in recipients including accomplishments as excellent researchers; visionaries; innovators for a better society; teachers; and world ambassadors who are creatively integrating science and technology. It’s a tall order, but one that the award’s namesake demonstrated throughout his career.

In terms of technical accomplishments, Brimacombe is best known for revolutionizing metallurgical process engineering by co-creating the field of computational process modeling and pioneering the validation of computer models with commercial plant experiments. He published over 150 journal papers, over 120 conference papers, held 15 patents, and served as president of numerous professional societies. “In spite of his superstar reputation,” Thomas recounts, “Keith was a very humble

person who was always promoting others, especially his students. For example, he often listed himself last on papers despite his tremendous contributions to them.”

Thomas also recalls a personal example of Brimacombe’s mentorship where his first paper as a Ph.D. student was published and presented under Brimacombe’s guidance: “At the time, I was a little surprised at the size of the audience and that I gave the first talk at the conference.” What he did not deduce until later in his career was that the conference organizers must have assumed Brimacombe would be presenting the paper and scheduled it as the conference’s opening presentation. “Unbeknownst to me, Keith somehow convinced them at the last minute to let me present the paper.” Thomas notes, “This gave me tremendous exposure and launched my career.”

Thomas is not alone in this experience. “Every one of Keith’s students has similar stories to tell. We owe him so much. Administering this award is a small token to give something back.” In doing so, the awards committee also perpetuates Brimacombe’s legacy by celebrating those who embody his spirit. “The award has different criteria than many other awards which focus solely on research excellence,” Thomas explains. While recipients must have made landmark advances to metallurgical process engineering, the committee looks for leaders who have also “directed positive change towards a better global society, who are outspoken and not afraid to go against conventional wisdom, and who have striven to improve the future of the field by putting an emphasis on education and people.”

**TMS member Brian Thomas is a professor of mechanical engineering at the Colorado School of Mines and the C.J. Gauthier Professor Emeritus and Research Professor at the University of Illinois.**



### Submit A Nomination

You can help ensure that a deserving engineer, or group of engineers, receive recognition for achievements which have contributed to education, research, and innovation in metallurgical/ materials process engineering.

Individuals or a team from academia, industry, or government may be nominated by a person or an institution for the Brimacombe Prize, given out every two years. There are no age or country restrictions with respect to the nominee(s) for this prize. Nominations for the 2022 award must be submitted by December 1, 2021.

Learn more about the award criteria and the process for submitting awards on the dedicated Brimacombe Prize page at [awards.tms.org](https://awards.tms.org).



## Other Meetings of Note

**Offshore Technology Conference (OTC Asia 2022)**  
March 22–25, 2022  
Kuala Lumpur, Malaysia

**World Congress on Artificial Intelligence in Materials and Manufacturing (AIM 2022)**  
April 3–6, 2022  
Pittsburgh, Pennsylvania, USA

**8th International Conference on Solid - Solid Phase Transformations in Inorganic Materials (PTM2022)**  
June 27–July 1, 2022  
Xi'an, China

**6th International Congress on 3D Materials Science (3DMS 2022)**  
June 26–29, 2022  
Washington, D.C., USA

**Materials Science & Technology 2022 (MS&T 2022)**  
October 9–13, 2022  
Pittsburgh, Pennsylvania, USA

**COPPER-COBRE 2022 (Copper 2022)**  
November 13–17, 2022  
Santiago, Chile

**TMS 2023 152nd Annual Meeting & Exhibition**  
March 19–23, 2023  
San Diego, California, USA

**Superalloy 718 & Derivatives 2023 (Superalloy 718)**  
May 14–17, 2023  
Pittsburgh, Pennsylvania, USA

# TMS meeting headlines

TMS is committed to your safety during the pandemic. Meeting dates and locations are current as of September 1, 2021. For the most recent updates on TMS-sponsored events, visit [www.tms.org/Meetings](http://www.tms.org/Meetings).



**December 5–8, 2021**  
**Hilton Charlotte University Place**  
**Charlotte, North Carolina, USA**  
**Register Now**  
**[www.tms.org/HEA2021](http://www.tms.org/HEA2021)**

- The 2nd World Congress on High Entropy Alloys (HEA 2021) is a cross-disciplinary technical forum designed to share the latest research advances in single-phase and multi-phase metallic, intermetallic, and ceramic high entropy materials for functional or structural applications.
- HEA 2021 will feature highly focused technical talks on topics that include, but are not limited to, fundamental theory of alloy design, computational modeling and simulation, properties, processing, and applications of high entropy alloys.



**February 27–March 3, 2022**  
**Anaheim Convention Center**  
**& Anaheim Marriott**  
**Anaheim, California, USA**  
**[www.tms.org/TMS2022](http://www.tms.org/TMS2022)**  
**Make Travel Plans Now**

- Plan now to attend the TMS 2022 Annual Meeting & Exhibition (TMS2022) to celebrate the return of the in-person exhibit, the continuation of the TMS-AIME 150th Anniversary Year, and the excitement of the TMS Bladesmithing Competition!
- All attendees are encouraged to stay at the Anaheim Marriott for convenience to technical sessions and networking events at the convention center. TMS has arranged a block of rooms at a discounted rate for attendees—book your room today.



**ADDITIVE MANUFACTURING BENCHMARKS**

**August 15–18, 2022**

**Hyatt Regency Bethesda, Bethesda, Maryland, USA**

**Submit an Abstract by January 7, 2022**  
**[www.tms.org/AMBench2022](http://www.tms.org/AMBench2022)**

- The Additive Manufacturing Benchmarks (AM-Bench) conference is the home for presenting the findings and results associated with a continuing series of controlled benchmark tests from the AM-Bench committee.
- Technical areas to be covered include: Quantitative Measurements and Characterization; State-of-the-art Models and Future Directions; AM Benchmark Needs and Directions; Qualification and Certification of AM Components; and other related areas.



**Liquid Metal Processing & Casting Conference**

**September 18–21, 2022**

**Bellevue Hotel**

**Philadelphia, Pennsylvania, USA**

**Submit an Abstract by January 7, 2022**  
**[www.tms.org/LMPC2022](http://www.tms.org/LMPC2022)**

- The Liquid Metal Processing & Casting Conference (LMPC) conference series convenes experts from both industry and academia to specifically discuss the latest advances in primary and secondary melt processing including vacuum induction melting (VIM), vacuum arc remelting (VAR), electroslag refining (ESR), and electron beam cold hearth remelting (EBCHR). No other dedicated conference specializes in this type of melting.
- Share your work—submit an abstract by January 7, 2022. If your abstract is scheduled for presentation during LMPC 2022, a proceedings manuscript is required. The manuscript deadline is April 1, 2022.





# 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](http://www.tms.org/EditorialCalendar).**



## May 2022

**Manuscript Deadline: December 1, 2021**

**Topic: Advances in Characterization of Functional Composite Materials**

**Scope:** Papers are invited on the latest developments and applications of functional composite materials with advanced engineering uses, from initial conception to obsolescence. Of particular interest are original papers and reviews focusing on characterization and non-destructive evaluation of metal-matrix composites, ceramic-matrix composites, polymer-matrix composites, and coatings at the nano- and microscales.

**Editors:** Zhiwei Peng, Rajiv Soman, Yunus Eren Kalay, and Ramasis Goswami

**Sponsor:** Materials Characterization Committee

**Topic: Progress on Recovery of Critical Raw Materials**

**Scope:** For a sustainable economy, many countries have published their Critical Raw Materials (CRM) list. Over time, extensive research and developmental activities have led to the emergence of new methods and engineering processes for the recovery of CRM from mineral ores or tailings, extractive waste, and metallurgy slags. Authors are welcome to contribute manuscripts on the recovery of CRM from various feeds, ranged from ore to metallurgical slag, using hydrometallurgical and electrometallurgical extraction processes.

**Editors:** Hong Peng and Kerstin Forsberg

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

**Topic: Sustainable Composite Materials**

**Scope:** This special topic covers composite materials that are derived from renewable sources and/or can be used in renewable energy-based applications such as wind and solar energy, among others. Fundamental and applied research in this area is welcome. This call invites scientists from diverse groups such as early career, graduate students, academics, industry, and national labs to submit their research.

**Editors:** Simona Hunyadi Murph and Surojit Gupta

**Sponsors:** Composite Materials Committee and Energy Conversion and Storage Committee

## June 2022

**Manuscript Deadline: January 1, 2022**

**Topic: 30 Years of Oliver-Pharr: Then, Now and the Future of Nanoindentation**

**Scope:** The 1992 seminal publication by W.C. Oliver and G.M. Pharr laid a cornerstone for the development of nanoindentation as reference technique for nanomechanical characterization. The “Oliver-Pharr” method has enabled numerous transformative research efforts in a wide range of fields spanning materials science, geology, biology, and medicine. This special topic is devoted to its amazing range of applications, as well as the current developments and future trends that it continues to inspire.

**Editors:** Verena Maier-Kiener, Benoit Merle, and Samantha Lawrence

**Sponsor:** Nanomechanical Materials Behavior Committee

**Topic: Magnetic Materials for Multifunctional Applications**

**Scope:** Papers are invited on magnetic materials which can be used for multifunctional applications in the power and energy sector (energy conversion, energy storage, power generation, etc.). Fundamental and applied research in this area with an emphasis in novel processing, and the interplay between composition-processing-structure-microstructure-property-performance is welcome. Peer-reviewed manuscripts based on original research, literature review, and scientific viewpoint will be considered for publication. This call targets scientists/researchers from diverse groups such as early career professionals, graduate students, academics, industry, and national labs to submit their research.

**Editors:** Surojit Gupta, Radhika Barua, Manoj Mahapatra, and Lan Li

**Sponsor:** Energy Conversion and Storage Committee

### Topic: Magnetic Structure Characterization over Multiple Length Scales

**Scope:** Magnetic structures form over multiple length scales. Characterization of magnetic structures over multiple length scales plays an essential role in advancing the understanding of structure-property-processing relationships of magnetic materials. This topic covers various complementary characterization techniques that help illuminate the magnetic phenomena from atomic-scale spin configurations to nano-scale structures to meso-scale domains in magnetic materials.

**Editor:** Yongmei Jin

**Sponsor:** Magnetic Materials Committee

### Topic: New Frontiers in Physical Metallurgy of Steels

**Scope:** This topic seeks articles focusing on physical metallurgy of steels with novel alloying concepts including increased levels of elements such as Mn, Al, and Si. Novel microstructure concepts and processing strategies to manufacture high performance steels are encouraged. Research articles highlighting recent advances in experimental and modeling studies for multi-phase steel microstructure such as TRIP/TWIP effect and interface precipitation, as well as their industrial applications, are recommended.

**Editors:** Amit Behera and Ana Araujo

**Sponsor:** Steels Committee

### July 2022

#### Manuscript Deadline: February 1, 2022

#### Topic: Cold Dwell Fatigue of Titanium Alloys

**Scope:** The topic of dwell fatigue of titanium alloys is experiencing a resurgence of international activity following the realization that the industry workhorse Ti-6Al-4V is susceptible to cold dwell fatigue. This special topic will invite top international researchers to summarize the state of the art in understanding and modeling dwell fatigue failure of titanium alloys.

**Editors:** Adam Pilchak and Michael Gram

**Sponsor:** Titanium Committee

#### Topic: In-situ Methods for Understanding Deformation & MS Evolution in Mg Alloys

**Scope:** Magnesium and its alloys have many unique transformations that occur during loading and thermomechanical processing due to its HCP crystal structure. Advanced in-situ characterization techniques are powerful tools for providing valuable information in real time. When used in combination with mechanical loading, processing techniques, and thermal treatments, comprehensive studies have been carried out to understand complex relationships between processing, structure, and properties.

**Editors:** Aerial Leonard and Domonkos Tolnai

**Sponsor:** Magnesium Committee

#### Topic: Interactions between Biomaterials and Biological Tissues and Cells

**Scope:** Manuscripts are solicited in all areas of research that investigate the physical, mechanical, biological, and biochemical interactions between engineered biomaterials and biological tissues and cells. Topics of interest include but are not limited to biointerfaces, mechanobiology, biocompatibility, tissue compatibility, inflammatory responses, biodegradation, toxicity, tissue regeneration, protein-materials interactions, cell-material interactions, and biomimetic and bioinspired surfaces. All approaches are welcome, including experiments, modeling, and machine learning.

**Editors:** Jing Du, Dinesh Katti, and Vinoy Thomas

**Sponsor:** Biomaterials Committee

#### Topic: Machine Learning and New Paradigms in Computational Materials Research

**Scope:** The field of computational materials science has been applying essential concepts of machine learning such as iteratively optimizing solutions, interpolating functions in high-dimensional space, and manipulating patterns in data, effectively since its inception. Recent developments in learning theory and practice, along with the proliferation of data and cheap computing, have resulted in promising new methods and enhanced embodiments of established techniques. This topic aims to showcase and review some of these developments.

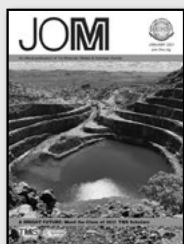
**Editors:** Sara Kadkhodaei, Eva Zarkadoulas, and James Morris

**Sponsor:** Chemistry and Physics of Materials Committee

## Contribute to JOM



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





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