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// about the cover



The cover image for this issue depicts a collage of photos taken at technical sessions, networking events, and awards ceremonies held during the TMS 2022 Annual Meeting & Exhibition (TMS2022). Held February 27 through March 3 in Anaheim. California. TMS2022 marked a return to the in-person annual meeting after a fully virtual event in 2021. Five articles in this issue present just some of the many highlights of the meeting. The inset ribbon photo shows the logo for the 150th anniversary of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), TMS's parent organization, which was celebrated in person at TMS2022.



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About JOM: The Magazine:

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

About TMS:

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

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IN THE FINAL ANALYSIS

"A successful conference overall, but hindered somewhat by cancellations. The window of available on-demand presentations mitigates this, but it is still a missed opportunity for networking. COVID procedures were satisfactory, attendee cooperation was generally very good." —Comment from TMS2022 Attendee Survey

A fair comment. Preparing for and conducting TMS2022 was unlike any other meeting experience that I've had during the previous 37 annual meetings in my employ by TMS. The show must go on, and it did. But, behind the curtain, there was endless uncertainty and stress about every aspect of the meeting as we prepared, and we had many more questions than answers:

Would last-minute cancellations destroy the program? Could we provide adequate health and safety protocols and enforcement of same? Could we satisfy California's vaccination requirement without creating a logistical nightmare? Would our experiments with blending in-person and virtual event experiences work? Would Omicron or some new variant derail everything at the last minute? Would registrants show up? Would people from outside of the United States come? Could we pivot to changing circumstances with speed and effectiveness? Would we fulfill our contractual commitments to the host facilities or be forced to pay hundreds of thousands in penalties? How much more could I ask of staff without grinding them into pulp? ... Would our on-site registrants be glad that they came?

These and other questions dominated my day-and-night thoughts for months before boarding my flight to Anaheim. By the time I was walking the jetway, I had convinced myself that TMS2022 was going to have bumps but would work. The Omicron variant had gone into a steep decline, and our exceptional team was tireless in their commitment to making the event a success. While I was convinced that TMS2022 would turn out very well—not "very well all things considered" but "very well" period—you don't really know what will happen until it happens.

As you will read in this issue, TMS2O22 did happen, and, candidly, I've never been prouder of an event organized by the Society. There were certainly flaws (I'm looking at you, app, and you, last-minute cancellations), but the overall experience of registrants and staff was joy and relief that we were able to again assemble in person.

Do I have anything quantitative to say? You know that I do!

- Rounding, TMS2022 had 2,600 in-person registrants and 1,000 virtual-only registrants, so 3,600 total registrants. The all-virtual TMS2021 Virtual had 3,000 registrants. The all-in-person TMS2020 attracted 4,500 registrants (our record). The pre-pandemic 10-year average is roughly 4,200 attendees.
- Pre-COVID-19, we reliably attracted 50% U.S. and 50% international attendees. The 2022 blend was 80% U.S. and 20% international. If the international participation had been as traditional, I conjecture that TMS2022 would have had in the neighborhood of 4,200 in-person registrants.
- More than 3,700 presentations were slotted into TMS2022's program. More than 1,300 of those presentations were available in the virtual program.
- According to registrant surveys, 90% of TMS2022 respondents characterized the meeting as either "Excellent" (41%) or "Good" (49%). TMS2021 Virtual was much less well received: 48% (13% + 35%). TMS2020 is likely a better comparative: 80% (25% + 55%). I am quite pleased for everyone who worked on the meeting that more than 40% of TMS2022 survey respondents characterized TMS2022 as "Excellent."

What comes next? We take lessons learned, make improvements that are possible, and return to the safe harbor of a favorite TMS destination: the San Diego Convention Center. There is a twist; we are moving to the south of the center and using a new headquarters hotel: the Hilton San Diego Bayfront. I think that you'll like it and will again await your comments in the survey results. Volume 74 Number 6 June 2022



James J. Robinson Executive Director

aJJRofTMS

"While I was convinced that TMS2022 would turn out very well—not 'very well all things considered' but 'very well' period—you don't really know what will happen until it happens."



JOM TECHNICAL TOPICS



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

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

// JUNE 2022

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, University of Leoben; Benoit Merle, University of Erlangen-Nuremberg; and Samantha Lawrence, Los Alamos National Laboratory Sponsor: Nanomechanical Materials Behavior Committee

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, Michigan Technological University

Sponsor: Magnetic Materials Committee

Contribute to JOM: The Journal

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

For further information on contributing to *JOM*, contact *JOM* Editor Maureen Byko at mbyko@tms.org.

New Frontiers in Physical Metallurgy of Steels

Scope: This topic presents 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 included.

Editors: Amit Behera, QuesTek Innovations LLC, and **Ana Araujo**, Companhia Brasileira de Metalurgia e Mineração (CBMM)

Sponsor: Steels Committee

Phenomena and Scales Influencing Alloy Solidification Microstructures

Scope: This topic focuses on numerical predictions and experimental observations of the coupling/ interaction of processes that occur across varying length and time scales simultaneously during solidification. Examples include microstructure simulations to characterize macroscopic properties such as permeability or experiments such as bulk stirring that have a direct influence on microstructure solidification.

Editor: Andrew Kao, University of Greenwich Sponsor: Solidification Committee



TMS MEMBER NEWS



Share the Good News!

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

TMS Members Announced as 2021 AAAS Fellows



In January 2022, the American Association for the Advancement of Science (AAAS) announced its 2021 class of fellows. These are distinguished scientists, engineers, and innovators who have been recognized for their achievements across disciplines. The following TMS members were elected as 2021 AAAS Fellows in the Section on Engineering.



Arvind Agarwal, Florida International University, has been a member of TMS since 1996. He has served on a multitude of TMS committees, including the Young Leaders Committee, the Public & Governmental Affairs Committee, and the Surface Engineering Committee; as

well as on the Materials Processing & Manufacturing Division (MPMD) Council. Agarwal is also the recipient of the 2004 MPMD Young Leaders Professional Development Award.



David A. Shifler, U.S. Office of Naval Research, has been a member of TMS since 1993. He is a member of the TMS Foundation Board of Trustees. Shifler has served on several TMS committees,

including the Corrosion and Environmental Effects Committee, the Accreditation Committee, and the Professional Registration Committee.

Congratulations to these TMS members and the entirety of the 2021 class of AAAS Fellows.

South Dakota Mines Honors TMS Member as a Distinguished Alumni



At the South Dakota School of Mines and Technology (South Dakota Mines)'s 184th commencement ceremony in December 2021, TMS member, **George T. "Rusty" Gray III** was among 10 honorees recognized as a Distinguished Alumni. South Dakota Mines selects alumni who have excelled

in their careers and have exhibited excellence in giving back to their communities as leaders in the fields of science and engineering for this honor. Gray attended South Dakota Mines, receiving his bachelor's degree and master's degree, both in metallurgical engineering, graduating in 1976 and 1977 respectively. He earned his Ph.D. in metallurgical engineering from Carnegie Mellon University in 1981.

Gray has been a member of TMS since 1986 and has served on both functional and technical TMS committees. He is a member of the 2013 class of TMS Fellows and served as the 2010 TMS President. Gray is also the recipient of the 2002 Structural Materials Division (SMD) Distinguished Scientist/Engineer Award and the 2005 SMD Distinguished Service Award. Congratulations to all the honorees.

 Image: Constraint of the student Program for Materials Science and Engineering

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The TMS Board of Directors have approved new Material Advantage chapter charters for the following universities: Vellore Institute of Technology Bhopal University and Pune Vidyarthi Griha's College of Engineering & Technology & G.K. Pate (Wani) Institute of Management.

Welcome to the Material Advantage and TMS family.

OM: The Magazine, Vol. 74, No. 6, 2022 https://doi.org/10.1007/s11837-022-05325-w 2022 The Minerals, Metals & Materials Societ **Table of Contents**

WELCOME BACK: A REFURN TO THE IN-PERSON INS ANNUAL MEETING

Kelly Zappas and Kaitlin Calva



"It's amazing to see so many TMS members together again in person."

> —Ellen Cerreta, 2021 TMS President, welcoming attendees at the TMS2022 Opening Reception



When TMS opened the doors to the Welcome Back Reception—the first all-conference event of the TMS 2022 Annual Meeting & Exhibition (TMS2022) on Sunday, February 27, attendees streamed in for an evening of casual networking with friends and colleagues from around the world, many of whom they hadn't seen since the last in-person TMS Annual Meeting in February 2020.

"It's amazing to see so many TMS members together again in person," said 2021 TMS President Ellen Cerreta, as she greeted the guests at the opening reception of TMS2022. It was a comment that was to be heard, in one form or another, throughout the week from organizers, presenters, and award recipients, in session rooms and hallway conversations. More than 2,600 attendees came together, February 27 through March 3 in Anaheim, California, for the first in-person annual meeting in two years.

TMS2022 also marked 150 years of convening the minerals, metals, and materials community, as part of the anniversary year of TMS and its parent society, The American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME). AIME was founded and

held its first technical meeting in 1871, a tradition that the TMS Annual Meeting continues today. All attendees received a commemorative pin to recognize this milestone.









Three co-located events re-convened during TMS2022, as well. The Fourth Summit on Diversity in the Minerals, Metals, and Materials Professions (DMMM4) was held as part of the TMS Annual Meeting for the first time, March 2–3. REWAS 2022 held the 7th installment of its conference series at TMS2022. with a focus on Developing Tomorrow's Technical Cycles. Furnace Tapping 2022, also co-located at TMS2022, offered an industry-focused event sponsored by TMS and the Southern African Institute of Mining and Metallurgy. Read the article, "Inside the TMS2022 Session Rooms," for more details on each of these events.

While not as large as some of TMS's recent annual meetings, TMS2022 was a strong step forward in convening international, in-person meetings while keeping health and safety measures at the forefront. You'll see masked audience members in many of the photos on the following pages. (Please note: participants were permitted to remove their masks for presentations and photos.) TMS followed all guidance from the state of California and the U.S. Centers for Disease Control and Prevention that were in effect at the time of the conference to help ensure as safe and healthy a meeting experience as possible for all attendees.

Livestreaming Room and On-Demand Presentations

Recognizing that many of our members are still unable to travel to in-person events, TMS2022 offered a virtual participation option that would help attendees to both contribute presentations and learn from others remotely. There were two components to the virtual conference.

First, during the week of the in-person meeting, TMS2O22 held two livestreaming sessions per day in a designated room for these special events. Virtual attendees could log in and watch the presentations live and contribute questions for presenters. It also allowed for presenters to deliver their talks remotely to a mixed in-person and virtual audience, blending the two groups together.

After the close of the in-person meeting, these sessions were made available to view as recordings for anyone who missed the livestream. On March 14, TMS also made available a collection of approximately 1,250 on-demand presentations, consisting of contributed talks from those who couldn't attend TMS2022 and any in-person presenters who contributed recordings of their work. These presentations were available to view through April 30.

"It's so awesome to see all these friends in the audience. I'm bubbling over here!" —Elsa Olivetti, introducing the REWAS 2022 Plenary Session



Symposium organizers and session chairs embraced opportunities to include all meeting participants, whether they attended in person, livestreamed a session, or accessed ondemand presentations after TMS2022 concluded. Pictured here are some of the organizers of the three co-located events (above from top to bottom): Aeriel D.M. Leonard, DMMM4; Gerardo Alvear Flores, Furnace Tapping 2022; and Elsa Olivetti, REWAS 2022.

Enjoying the Sun

Attendees were able to step out and enjoy the California sunshine during a new event, the Welcome Breakfast, held on Monday morning prior to the start of technical programming. In addition, each attendee received a voucher good for use at one of the food trucks lined up outside of the Anaheim Convention Center at lunch time. These outdoor dining options helped attendees to get some fresh air and allowed for social distancing while eating.

A Look at the TMS2022 Exhibit

A total of 47 exhibitors displayed their products and services in the TMS2O22 Exhibit Hall, which was open Monday, February 28, through Wednesday, March 2. Poster sessions and receptions drew attendees to the exhibit hall on Monday and Tuesday evening for food, drinks, and socializing with exhibitors and poster presenters.

The 2022 TMS Bladesmithing Competition entries were a central feature of the exhibit hall, displaying 18 blades in cases for attendees to browse.



TMS2022 Proceedings

Ten TMS2022 proceedings volumes were published and made available for free online access to both in-person and virtual conference registrants. These volumes are now available for purchase through the TMS Bookstore. TMS members are eligible for 40% discounts on these and other TMS proceedings. Log in to www.tms.org/Bookstore to access your member discount codes.



From left to right: Eric Nyberg, 2019–2022 chair of the TMS Light Metals Division, presents a copy of the *Light Metals 2022* proceedings volume to this year's editor Dmitry Eskin. They are joined by Linus Perander, organizer of the 2022 Light Metals Keynote Session.



From left to right: 2021 TMS President Ellen Cerreta presents a copy of the *Magnesium Technology 2022* proceedings to the book's editors during the Magnesium Committee meeting at TMS2022. This year's editors are Petra Maier, Victoria M. Miller, Steven Barela, and Neale R. Neelameggham (not pictured).

TMS2022 By the Numbers

Meeting and Exhibition Attendance

- 2,602: In-person attendees 1,114: Virtual conference registrants (as of
- 4/18/22) 46: Countries represented ____
- 47: Exhibiting companies

Overall TMS2022 In-Person Meeting

Experience* 41%: Excellent

50%: Good

Technical Program

2,450: Papers presented in person**
1,250: On-demand presentations***
105: Symposia presented

Student Competitions

- 33: TMS Technical Division student poster contest entries
- 18: 2022 Bladesmithing competition teams
- 11: 2022 TMS Materials Bowl student teams

* Data gathered from post-meeting attendee survey ** Approximate number

*** Approximate number of presentations available through the TMS2022 Virtual Conference platform

Jud Ready Takes Office as 2022 TMS President

Each year, the TMS Annual Meeting & Exhibition marks the transition to the new year's TMS president. At this time, several members of the TMS Board of Directors end their leadership terms and new directors begin their cycles.

Jud Ready (pictured below, right) of the Georgia Institute of Technology was installed as 2022 TMS President during the TMS-AIME Awards Ceremony at TMS2022. Ready has been a member of TMS since his student days, was a TMS Young Leaders Professional Development Award recipient and Brimacombe Medalist, and has served two terms on the TMS Board of Directors, first as Membership & Student Development Director and then as Content Development & Dissemination Director.

"TMS has been with me for every step in my career and will continue to be with me in those years still to come," Ready told the audience at the awards ceremony. "It is, and will be, the same for you."

"It's been so refreshing to see so many friends and familiar faces and to talk about materials."

-Paul Krajewski, delivering the Extraction & Processing Division/Materials Processing & Manufacturing Division Luncheon Lecture

Top TMS Trivia Competitors

Did you know that before he became President of the United States, Herbert Hoover served as the president of TMS's parent society, AIME? If you did, you could have gained points in the TMS2022 Trivia Competition, available through the TMS2022 App. The just-for-fun trivia game offered attendees the chance to test their knowledge of TMS and AIME history in honor of the organizations' joint 150th anniversary celebration at TMS2022.

The following were the top scorers in the competition, with 200 or more points each:

- Noah Molko, University of Florida, 220 points
- Behnam Ahmadikia, University of California, Santa Barbara, 210 points
- Ho Lun Chan, University of Virginia, 210 points
- Theophil Oros, University of Southern California, 210 points
- Dominick Sylvia, University of Florida, 200 points
- Garry Warren, University of Alabama, 200 points

Congratulations to our top trivia competitors!

In his speech, Ready emphasized the importance of expanding on the innovative digital content delivery methods developed in response to COVID, while continuing to enhance our in-person activities. "I think we all realize what we missed last year," he said. As Ready's presidential year began, Ellen Cerreta (pictured below, left) of Los Alamos National Laboratory concluded her term as 2021 TMS President by looking back on what the Society was able to do under unprecedented circumstances to move the Society closer to achieving the goals of the TMS Aspires Strategic Plan.

"We did this while trying not to lose sight of some of TMS's core values, including: volunteer-driven programming, robust annual meetings, inclusive membership, and strong partnering between fundamental and applied science & engineering," said Cerreta.

The change in leadership also included Brad Boyce of Sandia National Laboratories, who moved into the role of 2022 Vice President. Boyce will serve as president in 2023.



See You in San Diego for TMS2023!



Next year, TMS returns to one of its most popular meeting destinations—San Diego, California—for the TMS 2023 Annual Meeting & Exhibition, to be held March 19–23, 2023. While returning to the San Diego Convention Center, TMS2023 will be using a new headquarters hotel—the Hilton San Diego Bayfront—for a number of networking and social events, as well as committee meetings.

Abstracts are now being accepted; visit the TMS2023 website at www.tms.org/TMS2023 to submit your work.



TMS2022 PLENARY DISCUSSES ALLOY DESIGN AT APPLE; HIGHLIGHTS TMS CONNECTIONS Kelly Zappas

"Jim's story is a TMS story." —Ellen Cerreta

"Jim's story is a TMS story," said Ellen Cerreta, 2021 TMS President, as she introduced Jim Yurko, the allconference plenary speaker at the TMS 2022 Annual Meeting & Exhibition (TMS2022). Yurko is senior distinguished engineer at Apple Materials Engineering and has an extensive history of involvement in TMS.

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Annual Meeting

Materials Society

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& Exhibition

His plenary talk, "Alloy Design at Apple," discussed the role that materials play in making Apple products a reality and in reducing the company's environmental footprint. But it also told the story of how Yurko and his team found solutions to pressing design and sustainability issues with the help of collaborators they met through organizations like TMS.

At the outset of the TMS2022 plenary, delivered on March 1 in Anaheim, California, Yurko promised he'd do his best to deliver a cross-cutting presentation that would appeal to audience members whose interests spanned all five TMS technical divisions.

In his current role, leading the Alloy Engineering Team at Apple, Yurko and his group are responsible for alloy design and engineered surface development of all Apple products. But when he started his career, he told the audience, he was part of the TMS Extraction & Processing Division. In discussing his work with Apple, Yurko talked about topics ranging from functional thin films and integrated computational materials engineering (ICME) to alloy design and metal manufacturing.

Above: Jim Yurko engaged a full, yet socially distanced, crowd with an overview of the work his team at Apple is doing in his plenary presentation. Below: Ellen Cerreta, 2021 TMS President, presents Jim Yurko with a coin commemorating the return to the in-person TMS Annual

Meeting, in recognition of his role as TMS2022 **Plenary Speaker.**

Alloy Development at Apple

At Apple, Yurko and his team face a number of materials design challenges that require fast solutions. This sometimes means introducing new materials (developing, testing, and qualifying) in the timespan of a year or less.

"We're developing materials for products at such an amazing pace and at a scale that's really mind boggling, when you think about more than 1.8 billion active devices," said Yurko.

Ten years ago, Apple made a decision to further enhance its materials development capabilities. The decision was made to build a dedicated Alloy Engineering Team with a foundation in computational and system alloy design. "What seems intuitive now as the way to design materials was pretty groundbreaking ten years ago," said Yurko, explaining that the system design approach relates performance to properties to structure to process.

Yurko highlighted his group's ICME tools and the development of new approaches to expand their materials development capabilities. He pointed out that a number of people sitting in the audience at TMS2022 were part of the research community that is helping Apple to find these solutions.

"I really want to emphasize to the industry folks in the crowd: TMS is an amazing resource for collaboration," he said. "It is a one-stop shop where you can work with people in this large materials research community and develop what is needed in a mutually beneficial relationship."

To illustrate how Apple is able to use some of the tools it has acquired over the years, Yurko highlighted the rapid development of a new, highstrength 6000-series aluminum, a high-strength and non-magnetic stainless steel for iPhone X, and new PVD colors on iPhone Pro. "I want the research community to know that we are looking for engagement with you." —Jim Yurko

Sourcing Sustainable Materials

Yurko ended his talk with a look at how Apple is working to meet its environmental goals of creating products that will be net carbon zero and made from 100% recycled or renewable materials by 2030. It's a massive materials challenge, but he shared a story that showed how partnerships can help them reach those goals.

One significant way the company is reducing its carbon footprint is through aluminum. Apple uses recycled aluminum for their products when possible and sources primary aluminum from smelters that use renewable, rather than coal-fired, energy sources.

Apple wanted to help the aluminum indstry with their push towards carbon-free smelting, and Yurko shared the story of how they assisted with the formation of Elysis, the Rio Tinto and Alcoa joint venture. Yurko went on to describe the TMS connections to this project, especially with 2017 TMS President Dave DeYoung. In 2018, Elysis was launched and Apple bought some of the company's first aluminm to meet commercial purity for use in the MacBook Pro. Since Yurko's talk at TMS2022, Apple has announced it is using Elysis aluminum in the production of the iPhone SE.

"I want the research community to know that we are looking for engagement with you." Yurko told the audience. "We want to apply what you're developing into our products. I'm reaching out to all the people in industry who want to work with us to make our products more environmentally sound and higher performing."







In total, more than 100 symposia were held at the TMS 2022 Annual Meeting & Exhibition (TMS2022), spanning 14 technical topics over four days, February 28–March 3, in Anaheim, California. Among these were three colocated meetings, five honorary symposia, special invited sessions on various technical topics, and award lectures delivered by leaders in the field.

While many presentations were delivered in person, select symposia were held in a special livestreaming room, which allowed remote presenters to deliver talks to an in-person audience and allowed in-person presenters to stream talks to remote participants. Additional presentations were made available as on-demand recordings after the in-person conference had ended. The following pages offer a look at just some of these featured sessions from TMS2022.

Technical Keynote Sessions

In keeping with the theme of the TMS2022 150th anniversary year, the 2022 Light Metals Keynote Session focused on 50 Years of Continuous Light Metals Proceedings—Highlights and Vision for the Century. Organized by Linus Perander, Yara International and editor of *Light Metals 2021*, this session featured talks by eight speakers (delivering both in-person and virtual presentations) who offered a sense of the history of technology development and highlighted key changes that have taken place in the industry since the publication of the first *Light Metals* proceedings volume in 1971.

Among the speakers were current and past editors of the *Light Metals* conference proceedings, as well as editors of the *Essential Readings in Light Metals* books published in 2013. Each speaker looked back at a different aspect of Light Metals history over the past 50 years. "There are always problems to solve and new solutions just around the corner." —John Grandfield, Grandfield Technology, in his talk, "50 Years of Aluminum Cast House Technology Development: Lessons from Five Case Studies"



INSIDE THE TMS2022 SESSION ROOMS: SPECIAL LECTURES AND AWARD SYMPOSIA // 13

Light Metals proceedings volumes from the past decade and *Essential Readings* books can be purchased through the TMS Bookstore at www.tms.org/Bookstore, while papers from *Light Metals* proceedings volumes published between 1971 and 2010 can be accessed through a subscription to the Light Metals Digital Library. Learn more at members.tms.org.

The Magnesium Technology 2022 symposium also opened four days of in-person programming with a keynote session of invited talks by speakers from academia and industry, while the ten additive manufacturing-themed symposia held at TMS2022 came together for a well-attended keynote session of invited speakers. Both events were held on Monday, February 28.





Amy Clarke, Colorado School of Mines, delivers the presentation "Metallic Alloy Microstructure Control under Additive Manufacturing Conditions" to a standing-room-only audience at the Additive Manufacturing Keynote Session.

Arne Ratvik (above, left), SINTEF, discussed "50 Years of Research and **Developments on Cathode Designs in Aluminium Reduction**" at the 2022 Light Metals Keynote session; Alan Luo (right), The **Ohio State University**, opened the Magnesium Technology 2022 keynote session with the invited talk, "Magnesium Alloy Development for **Structural and Biomedical Applications.**"

Award Lectures

Several distinguished award recipients were honored with featured talks at technical sessions throughout the week at TMS2022, including those pictured here. Not pictured is Ke Lu, Chinese Academy of Sciences, who delivered the Institute of Metals/Robert Franklin Mehl Award lecture as part of the on-demand portion of the Ultrafine-Grained and Heterostructured Materials (UFGH XII) symposium.



Anton Van der Ven, University of California, Santa Barbara, delivers the William Hume-Rothery Award Lecture, "Study of Ferroelectricity and Phase Transitions in Hafnia."





The 2021 and 2022 recipients of the William D. Nix Award were present in Anaheim to deliver lectures as part of the Nix Award and Lecture Symposium. George Pharr (top), Texas A&M University, discussed "Nanoindentation—The Next Generation" at the Wednesday morning session, while Huajian Gao (bottom), Nanyang Technological University, gave the presentation "Mechano-Materials: **Engineering Mechanical Properties of Materials with** Internal Interfaces and Lightweight Structures" on Wednesday afternoon.

"What will it take to build the future? New materials. And a big part of that new material supply is going to be rare earth metals."

—David Dreisinger, University of British Columbia, Extraction & Processing Division Distinguished Lecturer, in his talk, "Rare Earth and Critical Material Recovery from Peralkaline Volcanic Ores: Minerals Processing, Hydrometallurgy, and Solvent Extraction Separation"



Acta Materialia Symposium

Four TMS members were honored at the Acta Materialia Symposium at TMS2022 on March 1, delivering presentations on topics that ranged from engaging underrepresented groups in education to jet engines and green steel. Also at this session, Christopher Schuh, coordinating editor/governor for Acta Materialia Inc., presented the Acta Materialia student awards. He congratulated the recipients on having their work selected for recognition from the thousands of papers that are submitted each year.

"We have a lot of work going on with the relationship between climate change and carbon dioxide emissions, but we have very little research on direct carbon dioxide avoidance, particularly green steelmaking. That leaves a lot of room for further research."

—Dierk Raabe, Max-Planck Institut für Eisenforschung GmbH, in his Acta Materialia Gold Medal Lecture, delivered remotely



Alexander Michaelis of Fraunhofer Institute of Ceramic Technologies and Systems, IKTS, received the Acta Materialia Hollomon Award for Materials and Society.



Amber Genau, University of Alabama at Birmingham, delivers the Acta Materialia Mary Fortune Global Diversity Lecture.

Frontiers of Materials Symposia

TMS2022 featured three special symposia as part of the Frontiers of Materials Award program, a competitive award given to top-performing early career professionals. As part of the award, the honoree organizes a symposium on an emergent technical topic and delivers a keynote lecture during the symposium. This award is designed to bring novel, exciting programming to TMS meetings in topics that are not traditionally captured by existing programming.

This year's symposia were presented in three different formats: a one-day symposium, a two-day symposium, and a fully on-demand session. Learn more about the Frontiers of Materials Award at www.tms.org/Awards.



Mostafa Bedewy, University of Pittsburgh, delivers the keynote presentation at his two-day symposium, Nanocarbon-based Flexible Devices: Emerging Materials and Processes, at TMS2022.



Yu-chen Karen Chen-Wiegart, Stony Brook University/ Brookhaven National Laboratory, gives her keynote lecture at the one-day symposium, Data-driven, Machine-learning Augmented Design and Novel Characterization for Nanoarchitectured Materials, at TMS2022.

"In addition to physical and chemical reasons, there are biological reasons that can explain metal corrosion."

—Andrea Koerdt, Bundesanstalt für Materialforschung und Prüfung, in her on-demand presentation for the symposium Microbiologically Influenced Corrosion—How Organisms Accelerate Materials Degradation



David Dye, Imperial College, was named the Acta Materialia Silver Medal Lecturer.

Student-Led Symposium

A group of graduate students from the University of California, Davis, presented their first symposium, Moving Forward from a Pandemic: How the Field of Materials Science Has Adapted, at TMS2022 in Anaheim. The symposium is part of the TMS Student-Led Symposium series, presented each year at the TMS Annual Meeting & Exhibition.

"A renaissance in research related to copperbased coatings in materials and surfaces has been brought about by the COVID-19 pandemic."

-Bryer Sousa, Worcester Polytechnic Institute, in his talk, "Lessons Learned during the COVID-19 Pandemic Regarding Antimicrobial Copper-based or Copper-containing Materials/Surfaces"

"As materials scientists, we were interested in learning how those in our field, both academic and industry, have been impacted by the pandemic. Furthermore, we wanted to know how materials scientists have learned from their experiences and continued to progress," said Christine Smudde, on behalf of co-organizers Gianmarco Sahragard-Monfared, Jared Stimac, and Mingwei Zhang.

The first-time organizers said that their biggest challenge was remaining flexible with virtual/inperson attendance of the invited speakers. "A struggle in line with the topic of our symposium," said Smudde.

"Of course, everyone in the research community was affected, but there was a disproportionate adverse effect seen by members of underrepresented groups, by early career researchers in particular, and in underserved and under-resourced institutions."

 Alexis C. Lewis, National Science Foundation, in her virtual presentation, "COVID-19 Impacts on Policy & Funding in Materials Engineering—A Perspective from the National Science Foundation"

The symposium opened on the morning of February 28 with the presentation, "Materials Science during a Pandemic: A National Lab Perspective," by 2021 TMS President Ellen Cerreta of Los Alamos National Laboratory and featured two in-person sessions: Materials Research and Leadership in Uncertain Times and Education and User Facilities— Supporting Students and Users During the Pandemic. A third on-demand session became available on March 14.

Honorary Symposia

Five long-time TMS members were recognized by their colleagues with special symposia held in their honor at TMS2022. These symposia included:

- Failure, and a Career That is Anything But: A Light Metals Division Symposium Honoring J. Wayne Jones
- Magnetics and the Critical Materials Challenge: A Functional Materials Division Symposium Honoring Matthew J. Kramer
- Primary Aluminum Industry—Energy and Emission Reductions: A Light Metals Division Symposium in Honor of Halvor Kvande
- Seeing is Believing—Understanding Environmental Degradation and Mechanical Response Using Advanced Characterization Techniques: A Structural Materials Division Symposium in Honor of Ian M. Robertson
- REWAS 2022: Coupling Metallurgy and Sustainability, an Extraction & Processing Division Symposium in Honor of Diran Apelian.

Each year, the TMS technical divisions sponsor a select number of honorary symposia at the TMS Annual Meeting. You can view

honorary symposia plans for the TMS 2023 Annual Meeting & Exhibition (TMS2023) in the Programming section of the TMS2023 website at www.tms.org/TMS2023.

Matthew J. Kramer delivers the talk "Challenges in Affordable, Reliable Permanent Magnets," at a symposium in his honor sponsored by the TMS Functional Materials Division.

> "The main challenge for the aluminum industry now is decarbonization, energy, and the environment. Special emphasis in all future aluminum courses, in my opinion, must be given to decarbonization."

—Halvor Kvande, Norwegian University of Science and Technology, in his on-demand presentation, "The TMS Industrial Aluminum Electrolysis Course—History, Development of Contents, and Future"

Co-Located Meeting Keynotes

Three co-located meetings—each with a very different focus—ran concurrently with TMS2022 technical programming: the Fourth Summit on Diversity in the Minerals, Metals, and Materials Professions (DMMM4); Furnace Tapping 2022; and REWAS 2022. Each event featured a keynote or plenary session of invited participants as a central part of their programming, which are briefly highlighted here. More detailed coverage of these events will be published in the October/November 2022 issue of *JOM: The Magazine.*

The REWAS 2022 plenary, held on Monday, February 28, opened with a talk by Diran Apelian, University of California, Irvine. "I want to share my personal journey of appreciating the life cycle of materials," said Apelian, who traced his interest in the topic of sustainable development back to when he was named the TMS/ ASM Distinguished Lecture in Materials and Society Award recipient in 2003. In 2008, Apelian served as TMS president, where he focused on sustainability and materials science and engineering's pivotal role in sustainable development for the 21st century. "It was a movement that really took off," he said. "It was the right message at the right time."

Apelian was one of five speakers at the REWAS plenary to address the theme of the symposium: Developing Tomorrow's Technical Cycles.



Diran Apelian, University of California, Irvine, gives the talk, "Life Cycle of Materials – A Personal Journey," at the REWAS 2022 Plenary.

Then on Tuesday, March 1, the Furnace Tapping 2022 symposium held a special session, in which keynote speaker Isabelle Nolet of Hatch presented updated industry survey information for platinum group metal/nickel tapping practices. Goals of the updated survey (based on a survey initially developed in 2014) include better understanding of emerging trends and sharing of best practices. The survey explored information provided by 14 participating companies from 13 countries.

Following Nolet's presentation, a panel discussion explored the "The Good, the Bad, and the Ugly of Furnace Tapping." Discussions ranged from what an ideal furnace tapping environment might look like to where improvements can be made in current environments, with much discussion centered on safety for operators.

Programming for DMMM4 began on Wednesday, March 2, with an opening keynote where Viola Acoff, University of Alabama, shared the powerful story of her career as the first woman hired in the school's Department of Metallurgical and Materials Engineering and the first Black tenure-track female faculty member at her institution at that time. Her talk set the stage for the panel discussion and group conversations that followed in the two full days of programming and networking events for DMMM4.



Viola Acoff, University of Alabama, delivers the DMMM4 Opening Plenary presentation, "The Road to Equity and Inclusions: Lessons Learned on the Journey."

Panelists discuss "The Good, the Bad, and the Ugly of Furnace Tapping." From left to right: session chair Quinn Reynolds, Mintek; Isabelle Nolet, Hatch; Ryan Walton, Rio Tinto Kennecott; Stanko Nikolic, Glencore Technology; Harmen Oterdoom, Independent Consultant; Stefan Schmidt, Aurubis AG; and moderator Gerardo Alvear Flores, Rio Tinto. Not pictured is Christine Wenzl, RHI Magnesita GmbH, who participated in the panel virtually.



The TMS 2022 Annual Meeting & Exhibition (TMS2022) marked a return to face-to-face meetings and personal interactions among colleagues. To make the most of this, TMS featured a number of networking events and receptions that allowed attendees to connect with people who shared their interests, whether those shared interests were based on particular technologies, career stages, or professional topics.

The following pages offer a look at some of the social and networking events that brought people together during TMS2022, February 27–March 3, 2022, in Anaheim, California.

Awards Ceremony and Celebration Dinner

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More than 50 individuals were recognized for significant achievements at all stages of their careers during the TMS-AIME Honors & Awards Ceremony and Celebration Dinner, held Wednesday, March 2. This event included presentation of awards by Acta Materialia Inc. and the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), of which TMS is a member society.

The highest honors of the evening went to the 2022 Class of TMS Fellows, recognizing their outstanding contributions to the practice of metallurgy, materials science, and technology.

The full awards ceremony, including speeches from 2021 TMS President Ellen Cerreta and 2022 TMS President Jud Ready, is available to view as a single video through Channel TMS on YouTube at www.youtube.com/user/ChannelTMS. "I think the biggest privilege of our occupation is that we can come in contact and have friendships with people all over the world, regardless of nation and world politics. I think TMS has been a catalyzer in all of these regards."

-Eduard Arzt, on his induction as a TMS Fellow TMS

"I also would like to thank all of the people that I collaborated with or interacted with, because your input has made our work so much better. I'm so fortunate to be part of this lifelong community with you all." —Kathy Lu, on her induction as TMS Fellow

"It's remarkable to be honored by a Society whose roots go back to 1871 and whose members, over the years, have been the cornerstone of the industrial revolution." —Anil Sachdev, on his induction as TMS Fellow

Student Events

2022 TMS Materials Bowl: Escape to Anaheim -



Pictured are (L–R) 2021 TMS President Ellen Cerreta, who hosted the Materials Bowl competition, with winning team members Ashlie Hamilton, Nicholas Johnson, Kevin Schmalbach, and Colton Gerber.

The University of Minnesota – Twin Cities team, Material Girls, won the 2022 TMS Materials Bowl knowledge and trivia competition held Sunday, February 27. Each member of the winning team received \$250 in prize money, as well as \$500 for their chapter and the honor of taking home the Materials Bowl trophy.

This year's competition featured a new, fast-paced format, which allowed teams to answer multiplechoice questions from their phones. Eleven teams participated in the first elimination round, with the top three teams progressing to the final round. The University of Florida Material Gators team came in second place and the South Dakota School of Mines & Technology team took third place.

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2022 TMS Bladesmithing Competition

In the TMS2022 Exhibit Hall, a total of 18 studentcreated blades, produced by hand hammering or trip-hammer forging, were on display as part of the 2022 Bladesmithing Competition in Anaheim. The TMS Wadsworth-Sherby Bladesmithing Grand Prize, presented by Jeffrey Wadsworth in honor of Oleg Sherby and Garry W. Warren on behalf of the TMS Foundation, was awarded to Missouri University of Science and Technology for their pattern welded hunting sword (shown, below) at a special awards ceremony held on March 1.

Look for more extensive coverage of the 2022 Bladesmithing Competition in an upcoming issue of *JOM: The Magazine.*



Winners of the 2022 Bladesmithing Competition are below, L–R: Jeffrey Wadsworth (presenter), Hans Pommerenke, Jeremiah Cohn, Matthew Fitzmaurice, Kyle Hayden, and Garry W. Warren (presenter). The photo above shows their winning blade.

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Student Career Forum

On Tuesday, March 1, graduate and undergraduate students gathered to hear from panelists at the Student Career Forum. This interactive panel discussion provided students with the opportunity to ask questions and learn from the career experiences of six featured professionals working in industry, academia, and government.



This year's panelists included (pictured, L–R): Abby Cisko, moderator, University of Alabama; Ben Adam; Oregon State University; Stuart Nicol, Glencore Technology; Allie Anderson, Gopher Resource; Jonah Klemm-Toole, Colorado School of Mines; and Clinique Brundidge.

The students and panelists discussed a multitude of topics including, when is the right time (or when it's not) to go to grad school, research opportunities, how to find the right field for you, how to market yourself for employment, how to transition fields, and more. The experiences and advice shared by the panelists highlighted that there is more than one way to build a career in the materials science and engineering field. The panelists encouraged the students to keep building on their experiences and to take advantage of new and emerging opportunities to build their skills and follow their passions.

Preparing a Winning Application Package Workshop

Students and young professionals explored how to prepare a winning application with a series of panelists and lead speaker, Mohsen Asle Zaeem (pictured below), Colorado School of Mines. This workshop covered best practices for the job application process, from creating a resume and cover letter to interviewing. The presenters provided in-depth details on all the parts of a winning application and offered some advice on the process. They implored attendees to ensure they follow all guidelines established, to tailor their material or experiences to be relevant to what they are applying for, to research where they are applying to, and to practice answers to interview questions.



Presenters encouraged workshop attendees to remember that this process is not only about the employer finding the right fit for them, but also the prospective employee finding the right fit, too. And, perhaps the most important piece of advice offered, to believe in their abilities and be confident in their endeavors.

Student Networking Mixer



Luncheons and Lectures

EPD/MPMD Luncheon

"Sustainability is one of those topics that people have been talking about for a long time and will give lip service, but it's really happening," said Paul Krajewski of General Motors Global Research and Development Center. Krajewski delivered the featured talk at the Extraction & Processing Division (EPD)/Materials



Processing & Manufacturing Division (MPMD) Luncheon.

As part of his presentation, "An Automotive View of Sustainability," he provided some highlights of what is being done in the industry. From advancing autonomous vehicles and converting plants to solar power to better end-of-life recycling, sustainability in the automotive industry goes beyond just fuel economy. "Sustainability is more than a buzzword; it's impacting all aspects of the automotive business," he said.

SMD/FMD Luncheon Lecture

Kevin Hemker, Johns Hopkins University, delivered the featured presentation at the Structural Materials Division (SMD)/Functional Materials Division (FMD) luncheon, "Developing Metal MEMS Materials and Devices with Superior Properties and Stability."



Though roughly 80% (or more) of microelectromechanical systems (MEMS) are made of silicon, Hemker believes that metal MEMS sensors would be able to endure more aggressive environments. With many groups interested in developing an Internet of Things, sensors that can sense and tie together various objects will be in higher demand, and all will have different uses, from industrial process monitoring to smart homes.

"Now we're going to have to put sensors in harsh environments, and that's part of the motivation for moving to metal MEMS and seeing if we can get something that can be used at a higher temperature than silicon can and that has a little more toughness than silicon does," said Hemker.

His talk discussed various materials that could be used in MEMS applications, outlining each one's strengths, weaknesses, and potential.

LMD Luncheon

Markus A. Reuter, SMS Group, spoke with members of the TMS Light Metals Division (LMD) at the LMD Luncheon and Lecture at TMS2022. In his presentation, "Light Metals: Key Enabler of the Circular Economy," Reuter defined circularity as bringing materials in a product back



into the same product at the same quality.

"It's a hard task," said Reuter, who compared it to trying to recycle your coffee grounds from the previous day and still getting a drink with the same aroma and quality. The lecture highlighted the criticality of metallurgical processing infrastructure within the circular economy to produce high-quality light metals and materials (and products) from primary and secondary sources in the required closed loop of the circular economy.

Luncheon attendees also heard a brief presentation from LMD Scholarship recipient Jarrett Losecke, Iowa State University.

Young Professional Tutorial Luncheon and Lecture

"It's not a work-life balance, it's a work-life integration," said Fadi Abdeljawad, 2022 TMS Early Career Faculty Fellow Award recipient, in his lecture, "Navigating the Academic Life: A Personal Perspective," at the Young Professional Tutorial Luncheon and Lecture. Abdeljawad began his lecture with a brief overview of his academic



journey and career path. His presentation focused on ways to navigate in the academic field and advice for those considering it as a career path.

He underscored the importance of taking time to do the things that keep you sane, like taking time away from technology, making time for your hobbies, pursuing passion projects, and more when working in the academic field. He encouraged the young professionals to become masters in time management, to read voraciously, and to be active learners throughout their careers. Abdeljawad summarized his advice on navigating the academic field stating, "I don't really have an approach... it's trial and error," and encouraged the young professionals to forge their own paths.

Networking Receptions





In addition to programming from the Fourth Summit on Diversity in the Minerals, Metals, and Materials Professions (DMMM4), diversity, equity, and inclusion events throughout the week included the diversity and inclusion breakfast, a celebratory lunch, and a DMMM4 preview mixer.



The Fellows and Invited Guests Reception on Sunday, February 27, gave friends and colleagues a chance to catch up after time apart.





Indoor and outdoor coffee and lunch breaks allowed for informal networking opportunities between attendees.



The Exhibit Hall was a great place for attendees to meet, with an opening reception, happy hour, poster sessions, and the Bladesmithing Competition display scheduled throughout the week.

Meet the 2022 TMS Board of Directors

The TMS Board of Directors made the transition from the 2021 to the 2022 board during its meeting on March 3, at the conclusion of the annual meeting. Pictured is the 2022 board. Front row, L-R: James Robinson, Suveen N. Mathaudhu, Judy Schneider, Ellen Cerreta, Jud Ready, Brad Boyce, Christina Meskers, and Paul Ohodnicki. Back row, L-R: Timothy Rupert, Edward Williams, Charles Ward, Eric Brown, David Bourell, Viola Acoff, and Paul Mason.





In more than 500 photos gathered in 15 albums, you can take a visual stroll through TMS2022 by browsing the TMS Photostream on our Flickr site. Recap the many events and technical sessions held throughout the week at www.flickr.com/photos/tmsevents.

ANNOUNCING THE BEST POSTER RECIPIENTS FROM TMS2022

Megan Enright

The TMS 2022 Annual Meeting & Exhibition (TMS2022), held from February 27–March 3, 2022, in Anaheim, California, featured several poster competitions. The 2022 Technical Division Student Poster Competition had 33 entries from undergraduate and graduate students and nine were awarded for their excellence with first prize ribbons by the five TMS Technical Divisions. Various other TMS2022 symposia recognized quality work through poster competitions. Congratulations to all the award recipients highlighted on the following pages.

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REWAS 2022 Best Poster

"Recovery of Lithium from Black Cathode Active Materials of Discarded Lithium-ion Batteries (LIBs)," by Pankaj Kumar Choubey, CSIR-National Metallurgical Laboratory

Technical Division Student Poster Competition Winners

Extraction & Processing Division (EPD) Award

Graduate: "Sustainable Process Flowsheet for Recovery of Value-added Products from Bauxite Residue," Himanshu Tanvar, Worcester Polytechnic Institute



Himanshu Tanvar, Worcester Polytechnic Institute

Functional Materials Division (FMD) Awards

Graduate: "Crumpled MoS₂ Flexoelectric Energy Harvester," Yeageun Lee, University of Illinois at Urbana-Champaign



Yeageun Lee, University of Illinois at Urbana-Champaign

Undergraduate: "Thermomechanical Clamp for Curing Low-k Dielectric Dry Film," Ethan Shackelford, Georgia Institute of Technology



Ethan Shackelford, Georgia Institute of Technology

Light Metals Division (LMD) Awards

Graduate: "Microstructural Evolution during Post Processing of Additively Manufactured 7050 Aluminum Alloy and Its Effect on Corrosion Behavior," Rupesh Rajendran, Georgia Institute of Technology



Rupesh Rajendran, Georgia Institute of Technology

Undergraduate: "Investigate the Effect of Crystallographic Orientation on the Mechanical and Corrosion Properties of Copper Single Crystals," Devin Davis, University of North Texas

Not Pictured

Materials Processing & Manufacturing Division (MPMD) Awards

Graduate: "Production via Machining and Rolling of High Resistivity Electrical Steel," B. Stiven Puentes, Purdue University



B. Stiven Puentes, Purdue University

Undergraduate: "COMSOL-generated Weld Heat Transfer Models for Automation of Infrared Thermography Non-destructive Testing (IR-TNDT) Image Analysis," Savannah Horowitz, University of Florida



Savannah Horowitz, University of Florida

Structural Materials Division (SMD) Awards

Graduate: "Discovering the Corrosion Mechanism of Chromium in High-Temperature LiF-NaF-KF Molten Salts for Gen-IV Molten Salts Reactor Applications," Ho Lun Chan, University of Virginia



Ho Lun Chan, University of Virginia

Undergraduate: "Quantitative Analysis of Microstructure in the Ti-6Al-4V Alloy Using Scanning Electron Microscopy," Sydney Fields, University of Nevada, Reno



Sydney Fields, University of Nevada, Reno

Dynamic Behavior of Materials IX Best Posters

First Place Poster: "Shock-driven Foamed Metals for Studying Shallow Bubble Collapse," *Eric Stallcup*, Garry Maskaly, and Fady Najjar, Lawrence Livermore National Laboratory; and Gerald Stevens, William Turley, Brandon La Lone, and Matthew Staska, MSTS Special Technologies Laboratory



Eric Stallcup, Lawrence Livermore National Laboratory

Second Place Poster: "Dynamic Compressive Response of Hot-pressed Boron Carbide: Understanding the Role of Microstructural Heterogeneities," *Arezoo Zare*, Amartya Bhattacharjee, Lori Graham-Brady, Matt Shaeffer, and K.T. Ramesh, Johns Hopkins University; and Qi Rong Yang, Kent Christian, and Richard Haber, Rutgers University



Arezoo Zare, Johns Hopkins University

Third Place Poster: "Mechanical and Structural Transformation of Titanium Containing Helium Bubbles," *Sarah Stevenson* and Peter Hosemann, University of California, Berkeley; and Saryu Jindal Fensin, Los Alamos National Laboratory



Sarah Stevenson, University of California, Berkeley

Other TMS2022 Symposia Best Posters

First Place Poster: "Gingerol – Curcumin Loaded Magnesium – Zinc Doped Calcium Phosphate Based Scaffolds and Coatings for Bone Tissue Engineering Applications," *Arjak Bhattacharjee* and Susmita Bose, W.M. Keck Biomedical Materials Research Laboratory, Washington State University *Symposium:* Advances in Biomaterials for 3D Printing of Scaffolds and Tissues

Second Place Poster: "Reinforced Freeze-cast Structures Using Uniform Magnetic Fields," *Josh Fernquist*, Henry Fu, and Steven Naleway, University of Utah *Symposium:* Biological Materials Science

Third Place Poster: "Alternative Method for Diagnosing Cystic Fibrosis Using Fluoresce," *Cassidy Holdeman*, University of Utah *Symposium:* Biological Materials Science

DONORS RECOGNIZED FOR MAKING AN IMPACT

Ann Ritchie







"At the Foundation, our focus remains strong: to strengthen skill-building for leadership development, to address family care challenges as a roadblock to advancement, and to foster academic opportunities."

-Garry W. Warren

Garry W. Warren, University of Alabama Tuscaloosa, welcomed top donors at the TMS Foundation's Donor Appreciation Dinner on Tuesday, March 1, during the TMS 2022 Annual Meeting & Exhibition (TMS2022) in Anaheim, California.

Warren is the chair of the TMS Foundation Board of Trustees (2016–2022) and a Gold Honorific Society Member. "Despite the many challenges that the pandemic caused over the last two years financially, professionally, and personally—TMS members and donors stepped up and made sure the Foundation had the resources needed to strengthen our profession through research, education, collaboration, and fostering a diverse workforce. I am so grateful and humbled by your generosity," Warren said. The evening featured Victoria Miller, University of Florida and 2022 TMS/Japan Institute of Metals and Materials (JIM) Young Leaders International Scholar, who spoke from the perspective of having benefited from the Foundation in the past and now giving back to the field and TMS.

"TMS, and especially the TMS Foundation, have consistently been present at every stage of my career, giving me opportunities that push me outside my comfort zone and invite me to grow as a scientist," Miller said.

Miller described some of these experiences with TMS, including a student paper award, her early networking experiences, and receiving a Young Leaders Professional Development Award. The latter led to a position on the Light Metals Division Council to which she still belongs after five years.

"Now, as I think about growing from assistant professor to associate professor, the TMS Foundation is there for me again with the Young Leaders International Scholar Award. Just as I need to think about expanding to an international perspective on my research, TMS invites me to stretch myself in that direction, representing TMS at the JIM Annual Meeting," she said.

Following Miller's remarks, Warren presented commemorative pins to the newest members of the Foundation's Lifetime Giving Honorific Societies. While many donors gathered online at last year's Virtual Donor Appreciation Event, the return to an inperson event this year gave Warren the opportunity to recognize the 2020 inductees as well as those who reached a new giving level in 2021.

"At the Foundation, our focus remains strong: to strengthen skill-building for leadership development, to address family care challenges as a roadblock to advancement, and to foster academic opportunities," Warren said.

Warren next introduced Carl M. Cady, Los Alamos National Laboratory, as the 2022–2025 TMS Foundation Board of Trustees Chair, and "a dedicated and generous Trustee" of the Foundation. "TMS, and especially the TMS Foundation, have consistently been present at every stage of my career, giving me opportunities that push me outside my comfort zone and invite me to grow as a scientist." —Victoria Miller



Victoria Miller gave brief remarks explaining what receiving awards supported by the TMS Foundation has meant to her at the Foundation's Donor Appreciation Dinner during TMS2022.



Join Us in 2023

Want to join in next year's festivities? New members of the TMS Foundation's Lifetime Giving Honorific Societies are inducted at the TMS Foundation Donor Appreciation Dinner, held in conjunction with the TMS annual meeting each year. Here, some of the Foundation's highest-level donors gather together in recognition of their generosity and support in the preceding year. Join us at the TMS 2023 Annual Meeting & Exhibition (TMS2023), March 19–23, in San Diego, California, by making a donation of \$1,000 or more or joining one of the TMS Foundation's honorific societies.

Additionally, donors who gift \$2,000 or more during 2023 become VIP Donors at TMS2023. This program gives special benefits to top donors, including concierge registration and complimentary tickets to social functions, as well as an invitation to the donor dinner. Visit www.TMSFoundation.org for more details or to make a donation today.

Cady addressed the attendees and praised the outgoing chair's dedication and innovation in service to the Foundation during his six years of leadership. In a touching moment, Warren received a standing ovation that brought him to tears. The celebratory dinner was a success in bringing recognition, praise, and appreciation to leaders and members who have made a lasting impact at TMS.



The 2021 inductees are: *Silver Society (top, L–R):* Victoria Miller, presenter and special guest of the Foundation, TMS Foundation Board of Trustees Chair Garry W. Warren, Iver E. Aderson, Thomas P. Battle, Ann and Dan J. Thoma, Sandi and Brian Thomas, and Steven J. Zinkle. *Titanium Society (bottom left, L–R):* Miller and Warren with David Bourell. *Gold Society (bottom right, L–R):* Miller and Warren with Daniel B. Miracle and James A. Yurko. Not pictured: Paul G. Campbell Jr., Mary and Raymond Decker, and Paul Mason of the Silver Society; and Cynthia A. Bognar and Mary C. and Robert D. Shull of the Gold Society.



In a moment of heartfelt thanks and appreciation, outgoing TMS Foundation Board of Trustees Chair Garry W. Warren (pictured, seated), received a standing ovation for his commitment and service to the TMS Foundation. JOM: The Magazine, Vol. 74, No. 6, 2022 https://doi.org/10.1007/s11837-022-05330-z © 2022 The Minerals, Metals & Materials Society Table of Contents

In Case You Missed It: BUSINESS NEWS FROM THE FIELD

Cupertino, California, USA: Apple Inc. will buy its first industrial-size batch of carbon-free aluminum to use in its low-cost iPhone SE in an effort to reduce carbon footprint from the metal of product casings. The batch is made using a breakthrough ELYSIS carbon-free aluminum smelting technology from a Montreal-based joint venture between Alcoa Corporation and Rio Tinto Group. In total, Apple has issued \$4.7 billion to accelerate progress toward the company's goal to become carbon neutral across its supply chain by 2030. (Photo Credit: Apple)

Electrolysis Plant Planned in Rotterdam

Dortmund, Germany: The company thyssenkrupp Nucera, formerly known as thyssenkrupp Uhde Chlorine Engineers, signed a supply contract with Shell for the large-scale project "Hydrogen Holland I" in the port of Rotterdam, the Netherlands. Under the contract, the company will engineer, procure, and fabricate a 200 MW electrolysis plant based on their large-scale 20 MW alkaline water electrolysis module. Shell's final investment decision to build the Holland Hydrogen I is expected in 2022, after which the intended start of production will be in 2024.

Nucor Selects West Virginia Site

Charlotte, North Carolina, USA: Nucor Corporation selected Mason County, West Virginia, as the site of its new state-of-the-art greenfield sheet mill to continue the expansion of high-quality, low-carbon steels. The location on the Ohio River provides Nucor with important transportation and logistics advantages, and a strengthened ability to serve customers in the Midwest and Northeast, the two largest sheet consuming regions in the U.S. Construction is expected to take two years. When fully operational, the new mill will employ approximately 800 full-time teammates. Do you have business or industry news of interest to the minerals, metals, and materials community?



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

> **Dubai, United Arab Emirates:** Auction house Sotheby's Dubai sold a black diamond, nicknamed The Enigma, to an anonymous buyer for \$4.28 million. It is believed to have been formed from a meteorite, based on its carbon isotopes and high hydrogen content. Black diamonds, also known as carbonado, are extremely rare and are found naturally only in **Brazil and Central** Africa. The number five bears significance to the diamond, in that it is 555.55 carats, has 55 facets, and has been shaped into the Middle Eastern palm symbol of the Khamsa, which means five in Arabic. (Photo Credit: Southeby's)

Chinese Partners Build DRI Facility

Beijing, China: Sinosteel Engineering and Technology Company Ltd. is partnering with Tenova SpA to build a hydrogen-based direct reduced iron (DRI) plant. The plant will be installed at Baosteel Zhanjiang Iron and Steel Company Ltd., located in the Zhanjiang Economic and Technological Zone, Guangdong Province, China. Its one-million-tonnes-per-year capacity will make it the largest hydrogen-based DRI facility in China. In addition to using hydrogen as the main reduction gas, it will be able to employ different reducing gases such as natural gas and coke oven gas. The plant will also feature carbon capture technology.

Elkem to Produce Greener Silicon

Oslo, Norway: Elkem ASA received NOK 16 million from The Research Council of Norway to develop a new concept for silicon production where all direct carbon dioxide emissions are eliminated. Silicon is a critical material for digital technologies, but the carbon dioxide emissions from its production are significant. The annual direct CO_2 emissions from Elkem's smelters are 2.1 million tons CO_2 , which corresponds to approximately 90% of Elkem's total direct emissions. Elkem's goals are to reduce its CO_2 emissions by 28% by 2031 and achieve carbon-neutrality by 2050.

'MS MEETING HEADLINES



Meeting dates and locations are current as of April 5, 2022. For the most recent updates on TMS-sponsored events, visit www.tms.org/Meetings.



6th International Congress on 3D Materials Science (3DMS 2022)

June 26-29, 2022 Washington, D.C., USA

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3DMS 2022 seeks to provide the premier forum for presentations of current interest and significance to the three-dimensional characterization, visualization, guantitative analysis, modeling, and development of structureproperty relationships of materials, as well as big data and machine learning issues associated with 3D materials science. www.tms.org/3DMS2022



Additive Manufacturing **Benchmarks** (AM-Bench) 2022

August 15-18, 2022 Bethesda, Maryland, USA

Housing Deadline: July 22, 2022

AM-Bench 2022 is the second event in a conference series with the primary goal of enabling modelers to test their simulations against rigorous, highly controlled additive manufacturing benchmark test data.

> www.tms.ora/ AMBench2022



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

September 18-21, 2022 Philadelphia, Pennsylvania, USA

Discount Registration Deadline: August 8, 2022

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

www.tms.org/LMPC2022



Materials Science & Technology 2022 (MS&T22)

October 9-13, 2022 Pittsburgh, Pennsylvania, USA

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MST22/

Other Meetings of Note



TMS 2023 Annual **Meeting & Exhibition** March 19-23, 2023 San Diego, California, USA www.tms.org/TMS2023



Superalloy 718 and Derivatives May 14-17, 2023 Pittsburgh, Pennsylvania USA www.tms.org/Superalloy718-2023



TMS 2024 Annual **Meeting & Exhibition** March 3-7, 2024 Orlando, Florida, USA

www.tms.org/TMS2024

Co-Sponsored Meetings

6th International Conference on Advances in **Solidification Processes** (ICASP-6) June 20-24, 2022 Le Bischenberg, France

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

The 12 International **Conference and Workshop** on Numerical Simulation of 3D Sheet Metal Forming Processes (NUMISHEET 2022) July 10-14, 2022 Toronto, Ontario, Canada

2022 Annual **International Solid Freeform Fabrication** Symposium July 25-27, 2022 Austin, Texas, USA

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