



Technical Meeting and Exhibition

MS&T22
MATERIALS SCIENCE & TECHNOLOGY

TMS PROGRAMMING AND EVENTS SHINE AT MS&T22

Kelly Zappas

More than 3,000 scientists, engineers, and students gathered in Pittsburgh, Pennsylvania, October 9-12, for the multidisciplinary Materials Science & Technology 2022 (MS&T22) technical meeting and exhibition, making it the best attended meeting in the conference series since MS&T18, held in Columbus, Ohio.

A reinvigorated exhibit and strong technical programming from four materials-related societies bolstered the overall event, while professional development programs and an inspiring plenary presentation were just a few of the high points for TMS members.

Read on for details about the highlights from MS&T22 and view more photos from the event at www.flickr.com/photos/tmsevents.



Technical Program Highlights

As in previous years, MS&T22 featured technical programming by TMS, the American Ceramic Society (ACerS), and the Association for Iron & Steel Technology (AIST). The Society for Biomaterials also joined MS&T22 as a co-sponsor and presented three symposia as part of the conference's technical program.

In total, more than 1,500 technical presentations were delivered at MS&T22 at more than 80 symposia in 15 technical tracks. TMS technical committees organized 28 of those symposia in areas of interest to TMS members and presented them as part of the TMS Fall Meeting within the larger MS&T22 program.

Many thanks to John Carpenter, Los Alamos National Laboratory, and Eric Lass, University of Tennessee, Knoxville, who served as the TMS representatives on the MS&T22 Program Coordinating Committee.

Solving Energy Issues with Technology

Iver Anderson admitted that the lecture he delivered at the **MS&T22 Plenary Session** on October 11 wasn't his usual technical talk. His presentation, "Materials Research on Clean Energy: For the Sake of our Grandchildren," was the TMS/ASM Distinguished Lectureship in Materials and Society. It began with a discussion of the causes and effects of climate change, laying the case for action among his fellow materials scientists and engineers, and then shared some of the energy-related solutions he and his colleagues at the U.S. Department of Energy (DOE) have been developing. Anderson is senior metallurgist, Division of Materials Sciences and Engineering, at DOE's Ames Laboratory, and adjunct professor, Materials Science and Engineering Department, Iowa State University.

"We've come up 1.1°C above where we were at the start of the industrial revolution," Anderson said. "And, the experts are saying we surely will reach 2 °C. It all depends on how fast we can go after that upper atmosphere problem."

He's referring to the greenhouse gases in the upper atmosphere that trap heat and warm the planet, intensifying events like wildfires, floods, and hurricanes. While some climate-change activists aren't very optimistic about technology being able to solve these problems, Anderson is.

"I think we can do a lot," he said. "And we need to be working on all of the issues that will help to blunt or reverse these negative effects to bring us to a much more stable environment."

First, he talked about grid

interconnections, which allow power to be shared across the country. "It's incredibly important to tie together the country," he said, explaining how this allows access to both wind- and solar-generated electricity, as well as to additional baseload sources, like nuclear power, that can be used when wind and solar are low.

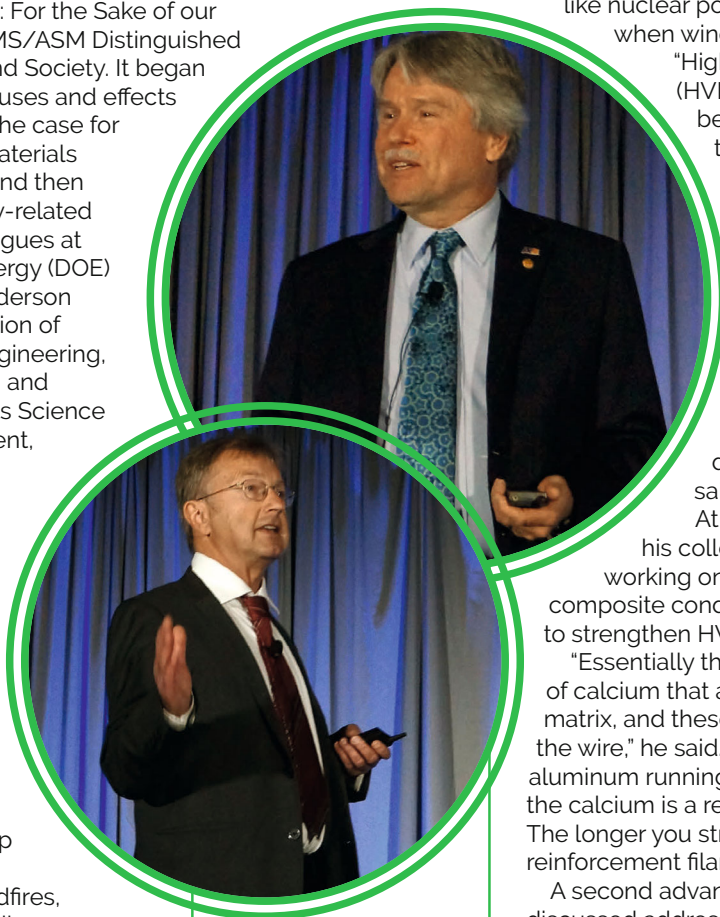
"High-voltage direct-current (HVDC) power lines can be a very practical way to move power with far less losses over long distances and these kind of HVDC links have been established for a long time from the Pacific Northwest, where's there's a tremendous amount of hydroelectric power, down into California," he said.

At Ames, Anderson and his colleagues have been working on an aluminum calcium composite conductor that can be used to strengthen HVDC power lines.

"Essentially there are thin filaments of calcium that are in an aluminum matrix, and these run the length of the wire," he said. "You have the pure aluminum running down the length, and the calcium is a reinforcement filament. The longer you stretch it, the better reinforcement filament it is."

A second advance that Anderson discussed addresses concerns related to increasing the use of nuclear power as a carbon-free energy source so that it can provide baseload power to supplement wind and solar. "That's really important to take some of the pressure off of grid-scale battery generation, if you also add to the baseload and you're not putting carbon into the atmosphere," he said.

But, Anderson notes, there is public



Top: Iver Anderson represents TMS at the MS&T22 Plenary Session. Bottom: TMS member Matthias Militzer delivers the AIST talk at the MS&T22 Plenary Session.

resistance to the idea of nuclear power, as many people fear a failure like the one that happened at the Fukushima Daiichi reactor in 2011, when steam oxidation of a cladding cap that was on fuel rods led to a breach and caused the plant to shut down. Anderson spoke of an alternative that his team is developing with collaborators at Pacific Northwest National Laboratory and North Carolina State for fuel cladding and other parts of the reactor that need to have high resistance to radiation damage.

"At this point, there's funding to go after a lot of these problems," he said. From increasing the use of renewable energy, to replacing retired coal-fired power plants with small modular reactors, to advances that bring nuclear fusion closer, Anderson noted that there is a lot that can be done. And there is a lot that members of the science and engineering community can do, as well.

"One strong thing you can do is volunteer to present a talk like this one," he said, noting that he has given similar talks to different organizations in the city of Ames. "We need to have that public outreach to get our population energized as much as we can be energized as professionals."

Anderson represented TMS as one of three plenary speakers at MS&T22. He was joined at the plenary session by Sanjay Mathur, University of Cologne, Germany, who represented ACerS with the presentation, "Ceramic Particles for Precision Drug Delivery" and Matthias Militzer, University of British Columbia, who represented AIST with his presentation "Interface-based Design – A New Frontier for Microstructure Engineering of High-Performance Steels." Militzer is also a TMS member and has been active on the TMS Steels Committee.

Honoring Carolyn Hansson

Resisting Degradation from the Environment was the subject of a special symposium at MS&T22 honoring Carolyn M. Hansson, professor emerita, University of Waterloo. Hansson celebrated her 80th birthday in 2021, and this symposium honored her research and pioneering experiences as a woman in science, technology, engineering, and math (STEM). The symposium consisted of two sessions of talks followed by a poster session on Monday, October 11.

A highlight of this event was a Fireside Chat—held in front of a virtual roaring fire—where Joey Kish, McMaster University, and Ashley Paz y Puente, University of Cincinnati, talked with Hansson about the decisions she made



Carolyn Hansson looks back on her career in a fireside chat.

A New Exhibit Concept



More than 100 exhibitors participated in MS&T22, making it one of the busiest show floors since MS&T14 (also held in Pittsburgh). For 2022, MS&T joined forces with Event Partners, a U.K.-based commercial exhibition firm, to expand the MS&T Exhibit Hall, in part by including two co-located events: **The Advanced Materials Show USA** and **The Nanotechnology Show**.

For the first time, MS&T opened the exhibit hall for anyone to attend, with no charge for exhibit-only registrants. As a result, more than 1,000 individuals came to the David L. Lawrence Convention Center in Pittsburgh just to attend the exhibit.

and the challenges she faced throughout her career.

When Hansson began her metallurgy studies at the Royal School of Mines at Imperial College, London, in 1959, she discovered that she was the only girl there. In fact, she was the first girl there. After a rocky start—the boys didn't know how to talk to her and she didn't know how to talk to them, she said—she settled in

and began to have a good time.

One day, the head of the department called her into his office to let her know she was having too much of a good time and her marks weren't what they should be. He had just been to a meeting of department chairs of all the metallurgy departments in the United Kingdom, and his was the only department that had a woman in it. He had just been telling them what a benefit it was to have a woman in the department. "He said to me, 'If you don't pass, there won't be another girl admitted to a metallurgy college for many years,'" Hansson recalled.

She heard something similar at her first job, where she was told that they would hire her and, if it worked out, maybe they would consider hiring other women. In both situations, she decided that she needed to work hard to make sure that

other women would have a chance after her.

Throughout her career, she found that being a woman in engineering could be both a benefit and a drawback. "The pendulum swings," she said. "One minute you couldn't get a job because you're a woman, the next you get one because you're a woman. I don't want to be offered a job because I'm a woman but because I'm a person."

When you're the first at something—as she was often the first woman in her class and in her workplaces—she said it feels like you have to be perfect.

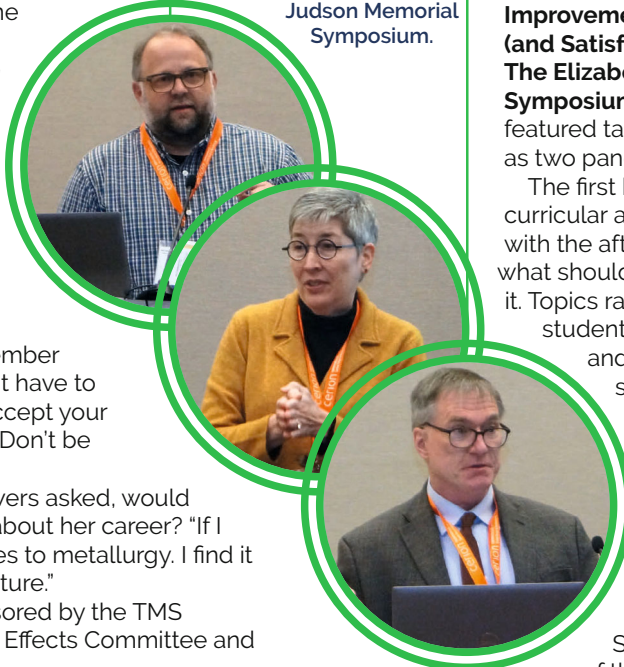
"How do you maintain excellence?" an audience member asked. Her answer? "You don't have to be excellent, just be good. Accept your failures and talk about them. Don't be afraid of it."

Looking back, the interviewers asked, would she have changed anything about her career? "If I went back to 18, I'd still say yes to metallurgy. I find it fun. I'm always amazed by nature."

The symposium was sponsored by the TMS Corrosion and Environmental Effects Committee and the TMS Steels Committee.

Exploring Education Techniques

(From the top): Kester Clarke, Elizabeth Holm, and Jeffrey Fergus deliver talks at the Elizabeth Judson Memorial Symposium.



On Monday, October 11, the TMS Accreditation Committee and the TMS Education Committee sponsored **Curricular Innovations and Continuous Improvement of Academic Programs (and Satisfying ABET along the Way): The Elizabeth Judson Memorial Symposium**. The one-day symposium featured talks from 11 speakers, as well as two panel discussions.

The first half of the day focused on curricular advances and accreditation, with the afternoon session examining what should be taught and how to teach it. Topics ranged from how to prepare students to work on diverse teams

and strengthen communication skills to introducing students to sustainability topics, machine learning, and data science.

Abstracts are now being accepted for the 2023 Judson symposium and a second TMS-sponsored education symposium, the TMS/ACerS Emerging Faculty Symposium, planned as part of the TMS Fall Meeting 2023 at MS&T23.

Professional Development Events

TMS offered two different types of professional development events at MS&T22, one focusing on technical skills and one on professional skills.

On Sunday, October 9, TMS offered its popular **Additive Manufacturing Materials and Processes Workshop**,

a half-day learning event that is regularly offered in conjunction with the TMS Annual Meeting and MS&T. Approximately 25 people participated in the course, led by Sneha P. Narra, Carnegie Mellon University.

For those who missed the MS&T installment, another session of the workshop is planned for the TMS 2023 Annual Meeting & Exhibition (TMS2023) on Sunday, March 19, in San Diego, California. The TMS2023 workshop will be led by Joy Gockel, Colorado School of Mines; Kirk Rogers, The Barnes Group Advisors; and

Scott Thompson, Kansas State University.

On Monday, October 10, the TMS Professional Development Committee sponsored a new event for students, early-career professionals, and anyone with an interest in honing their professional

skills. More than 20 individuals participated in the **Improve Your Networking Skills Workshop by TMS**, which

was a unique blend of instruction and practical application led by Emily Kinser of 3M. Kinser also serves as Vice Chair of the TMS Professional Development Committee.

"We all hear the advice: 'Network!' But how?"

Kinser said. She offered the audience a number of practical tips on how to initiate a conversation, how to introduce yourself in a concise and memorable way, when to end a conversation, and how to follow up later with new contacts. She also

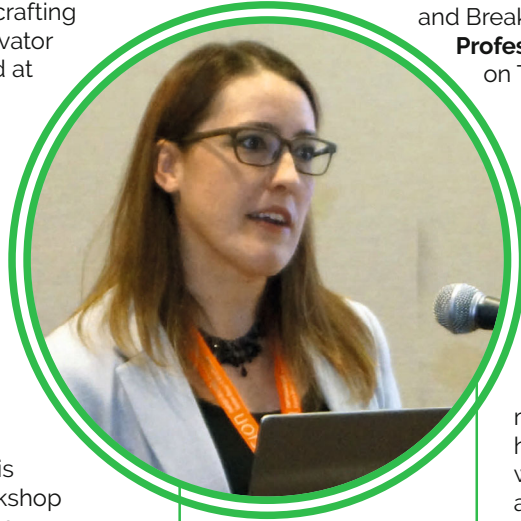


Participants practice their networking skills at a new MS&T workshop.

offered a series of tips on crafting a brief but memorable elevator speech that could be used at networking events.

After the presentation, participants spent some time putting these suggestions into action, introducing themselves and their work to their fellow participants.

This workshop was offered to all MS&T attendees as part of their registration fee. The TMS Professional Development Committee is planning another free workshop for attendees of the TMS 2023 Annual Meeting & Exhibition, this time focusing on communications skills. Visit the Professional Development section at www.tms.org/TMS2023 for more information.



Joy Gockel presents at the TMS Emerging Professionals Tutorial Luncheon and Lecture.

and Breaking Barriers," at the **TMS Emerging Professionals Tutorial Luncheon and Lecture** on Tuesday, October 11.

She began by providing the early-career professionals in attendance with an overview of additive manufacturing and its history, then delved into her own history. Gockel said that she started her education undecided—still uncertain whether she wanted to major in mechanical engineering or music education. Ultimately, she decided on engineering and progressed to the Ph.D. level, where she focused on additive manufacturing for her research. Once she had completed her doctoral degree, she worked in industry before returning to academia.

After describing her career path, she asked audience members to reflect on what they wanted their own careers to look like by identifying what they valued most.

"Seek out opportunities that allow you to accomplish the things that you value," she advised them. "If there's an opportunity

you want, go for it. If you go for it and you don't fail, you deserve it. You got it for a reason."

She pointed to additive manufacturing as an example of this idea. "Additive manufacturing started as art and science fiction," she said. "Because these innovators took risks—and many of the early ones failed—this technology was able to take hold."

Emerging Professionals Luncheon

Joy Gockel is an associate professor of Mechanical Engineering at Colorado School of Mines. She is also the vice-chair of TMS's interdisciplinary Additive Manufacturing Committee. Both of these roles informed her presentation, "Making Opportunities

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Visit www.tms.org/FallMeeting/TMSFall2023 to view a complete listing of TMS-sponsored symposia. You can also view the complete MS&T23 technical program—which includes symposia organized by TMS, the American Ceramic Society, and the Association for Iron & Steel Technology—at www.matscitech.org/MST23. Abstracts for all TMS Fall 2023 symposia and all other MS&T23 symposia are due April 3, 2023.

We hope to see you in October for the TMS Fall Meeting at MS&T23.

Submit Your Abstract by April 3

Materials Science & Technology 2023 (MS&T23) will be held October 1-5, 2023 in Columbus, Ohio. As part of the TMS Fall Meeting at MS&T23, TMS is sponsoring 24 symposia in 11 topic tracks:

- Additive Manufacturing
- Artificial Intelligence
- Ceramic and Glass Materials
- Education and Career Development
- Fundamentals and Characterization
- Iron and Steel (Ferrous Alloys)
- Lightweight Alloys
- Modeling
- Nuclear Energy
- Processing and Manufacturing
- Special Topics