Elliott Lectureship MUSINGS

BY SARA A. HORNBY

I was amazed and thrilled to win this incredible award. In the past, notable, international male professors have been the recipients. I felt twice the pressure to be successful choosing a topic to incite student, industry and, in some cases, staff interest in our incredible industry, its future, the extensive and fulfilling career opportunities, and benefits of AIST and TMS membership.

I would like publicly to thank all the organizers, hosts and attendees for the success of this "year" and AIST and TMS for the opportunity. Due to print restrictions, I am unable to individually discuss all the lecture locales, thoughtful gifts received and friendships I have made worldwide. Photos alone would fill the space! Please, take no offense as I share my general impressions and thoughts. I cherished every interaction. I must give a shout-out to Missouri University of Science and Technology, who has been using my patented SPAL process (melting under inert liquid gases) in their foundry, more than 39 years after its inception!

My topic, "The Green Steel Revolution," reviewed industry's environmental issues, the International Energy Authority's (IEA's) solution (hydrogen direct reduced iron fed to an electric arc furnace (H_2DRI EAF steelmaking)) and the nine major challenges I perceive. I reviewed also some new Technology Readiness Level (TRL) 3 to 8 potential solutions along with current and future brownfield mill challenges. I hoped presenting challenges, solutions and their potential limitations would incite curiosity and interest in helping to find realistic, adoptable, out-of-the-box solutions. Regardless of direction, industry or academia, I stressed the benefit of understanding industry reality and needs through

SARA A. HORNBY, variously described as a trailblazer and an inspiration for ambitious women, has continually proven nothing is out of reach for women in engineering. The first woman to graduate from Sheffield Hallam University with a B.Sc. Hons. in metallurgy and a Ph.D. in industrial metallurgy, she spent her early career in the U.K. working for Firth Brown Tools Engineering and British Steel Corp. Her initial Canadian and U.S. Air Liquide roles, developing new technologies and bringing best available technologies to the metals industry coupled with other electric arc furnace steelmaking optimization positions, put her in good stead to set up her own company, Global Strategic Solutions Inc., which supplies expert consultancy and expert witness to the metals and related industries. Hornby holds five patents and has authored over 136 international papers, seminars and courses. She is a Fellow of the Institute of Materials, Minerals and Mining and was their 2022 Hadfield Medal and Prize winner. In 2020, she was the recipient of the AIST Benjamin Fairless Award and the John Bell Award. In 2023, was awarded an honorary doctorate in engineering by Sheffield Hallam University in recognition of her outstanding contribution to the international steel industry.

Hornby received the 2024 AIST-TMS John F. Elliott Lectureship Award in recognition for her outstanding contributions to the international steel industry over several decades. Hornby has been successful as a plant engineer and educator and excelled in research and development, and technical sales. She has made a particular impact in illustrating how the chemistry of direct reduced iron (DRI) affects steelmaking metallurgy and the performance of electric arc furnace technology with different combinations of scrap and DRI. Additionally, she has been a strong supporter of technical societies, particularly the Iron & Steel Society and AIST, and a trailblazer for many women entering the steel industry.

Table 1 Accepted Invitations

University/AIST Member Chapter	Date	Attendees
Canada		
University of Toronto	9/24/2024	43
McMaster University	9/25/2025	57
AIST Northern Member Chapter	9/26/2025	60
Australia		
University of New South Wales	10/15/2024	24
The University of Adelaide	10/16/2024	47
Swinburne University of Technology	10/24/2024	50
HILT CRC (Ph.D. students from different universities)	12/3/2024	12
Colombia		
Universidad Pedagógica y Tecnológica de Colombia	10/29/2024	207 online, 20 on-site
Mexico		
AIST Escuela Superior de Ingeniería Química e Industrias Extractivas Student Chapter	12/2/2024	–
U.S.		
AIST Young Professionals	2/2/2025	85 (21 countries)
Missouri University of Science and Technology	2/27/2025	65
Colorado School of Mines	3/1/2025	48
Purdue University Northwest	4/8/2025	160
The Pennsylvania State University	4/9/2025	48
Carnegie Mellon University	4/11/2025	65+
North Carolina State University	5/2/2025	9
U.K.		
University of Warwick (20 universities, four steel mills, seven companies)	4/17/2025	134 invited
Egypt		
Egyptian Society of Materials Engineers and AIST MENA Student Chapters	4/18/2025	22
Egypt-Japan University of Science and Technology	6/23/2025	43
India		
Indian Institute of Technology – Bombay, Tata and JSW Steel	4/28/25	50 online, 40 on-site
Italy		
Universita' degli Studi di Udine	5/9/2025	6
Bangladesh		
Bangladesh University of Engineering & Technology	12/11/2025	
Canceled: Northeastern China University (live communications barred)		

participation (visits, internships, summer jobs, mentorship) and recourse to AIST and TMS (student chapters, Young Professionals membership, conferences, seminars, networking, mentors).

The 2024 AIST-TMS Elliott Lectureship announcement instantly garnered 28 invitations from 12 countries, to which I was hoping to add a few more U.K. and European universities. Ultimately, I accepted a record 23 lecture invitations (two to three are required) from universities and organizations (see Table 1). Viewed in 21 countries (thanks to the AIST Young Professional members), 13 lectures were live, which I found significantly more beneficial, especially when extensive pre- and post-lecture student and staff interactions were incorporated. Apart from the satisfaction of sharing the industry and my story with over 1,350 attendees, I talked with many who are eager to increase activity and exposure to the industry. Attendee numbers varied from six to 167 with overflow rooms and up to 207 in online lectures.

A big plus was the enjoyable learning experience it offered me — about the universities, their research programs, nonmetallurgical materials activities,

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CAUTION
HARD HAT
AREA
CAUTION
HOT

5


ArcelorMittal
PNW
SMSVC
NUCOR
NLMK

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organizations, different countries' approaches to "greening," and modeling and new R&D about which I knew nothing. For example: fiber-optic systems for EAF optimization; new, cheaper, H_2 generation; bricks and pavers as CO_2 sinks; laser light production of iron; DRI environmental impact modeling; grid-interactive steelmaking with hydrogen (GISH) DRI production; use of computational fluid dynamics (CFD) and visualization to optimize current and predict new technology impact on operations; lunar metallurgy; considerations for green energy and H_2 hubs; new decarbonization achievements; and visiting a totally green university (Egypt-Japan University of Science and Technology).

It was also gratifying to have steelmaker feedback validating some of my opinions on industrial applicability of some new technologies and to receive confirmation we are lacking metallurgical training worldwide — most students are in materials or engineering faculties.

PHOTOS

1. McMaster University.
2. University of New South Wales.
3. Swinburne University of Technology (left to right): Tiara Triana, Suneeti Purohit, Hornby, Shabnam Sabah, Dian Mughni Felici and Belinda Rich.
4. Universidad Pedagógica y Tecnológica de Colombia.
5. Missouri University of Science and Technology, with Ronald O'Malley.
6. Colorado School of Mines.
7. Purdue University Northwest.

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Australia and Egypt verified the benefit of being onsite delivering the Elliott Lecture as I presented both ways. It was also advantageous to combine lectures with other industry activities (HILT-CRC Seminar & HiTemp Forum and the 2025 AIST MENA Steel Forum, respectively) as they afforded more in-depth conversations, resulting in continued exchanges regarding how to best navigate the industry, academic versus industry careers, industry needs and introductions thereto. I hope these conversations continue.

Hungriness for knowledge, in general, was related to the industrial direction and the establishments' steel strength, garnering more interest and interaction to expand on these opportunities and information. For example, Colombia's Institute for Research and Innovation in Materials Science and Technology participated in their first Elliott Lecture. The interest in increasing local steelmaking drew live and online attendees comprising academics, industry, government and students (the recorded lecture was posted on YouTube).

It was delightful to see so many women interested in pursuing steel industry careers, apparently even more offshore than in the U.S. I enjoyed meeting every one of them, some for the second or third time. In Egypt, Iman El-Mahallawi is a role model for the young ladies. Congratulations, too, to the newly formed, very well-organized AIST Escuela Superior de Ingeniería Química e Industrias Extractivas Student Chapter, where two of the five committee members are young ladies.

In summary, thank you to all who were instrumental in making this a memorable "year" — I am sorry there are too many to mention, but you know who you are and how much I appreciated your efforts. It has been a very fulfilling and eventful year, full of memorable experiences, beautiful interactions with students, staff and industry worldwide. I hope my lecture and history were insightful and have opened minds to the many opportunities the steel industry offers. I look forward to continuing the interactions and friendships made throughout the year and remain available for more discussions. ✦

PHOTOS

8. Carnegie Mellon University.

9. Egypt-Japan University of Science and Technology.