

A Review of

MS&T14[®]

David L. Lawrence Convention Center • Pittsburgh, Pa., USA

Materials Science & Technology 2014 (MS&T14) returned to the David L. Lawrence Convention Center in Pittsburgh, Pa., USA, for a fifth time on 12–16 October 2014. More than 3,200 people attended MS&T14, with the usual strong contingent of AIST members.

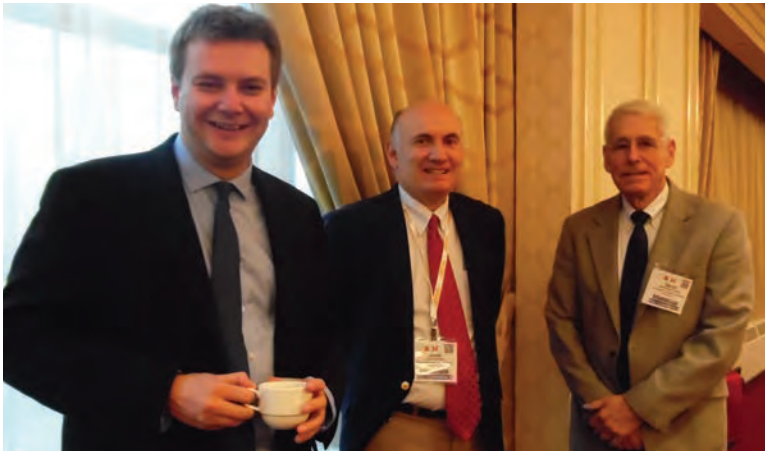
Returning from Montreal in 2013 — the first time the conference took place outside of the United States — MS&T14 featured 289 technical sessions and more than 1,800 technical presentations. There were five symposia with an exclusive focus on steel-related technology, including Advanced Steel Metallurgy; Ferrous Metallurgy from Past to Present; the 5th Symposium on Railroad Tank Cars; Structural Characteristics for High-Toughness Steels; and a symposium in memory of Michael Korchynsky highlighting vanadium-microalloyed steels. Throughout the entire MS&T14 program, there were more than 300 steel-related presentations delivered.

The MS&T14 program coordinating committee members deserve special recognition, for their hard work brought the technical program together: Roumainia Petrova, New Jersey Institute of

Technology (ASM); Judy Schneider, Mississippi State University (TMS); Elizabeth Dickey (ACerS); Brian Chambers, Shell Global Solutions US (NACE); and AIST's representative, Amy B. Woods, Steel Dynamics Inc. – Flat Rolled Div.

The MS&T14 exposition was also robust, with 129 booths on the show floor. Thank you to all of the MS&T sponsors, including AK Steel, ArcelorMittal, Carpenter Technology Corp., Commercial Metals Company, Danieli Corp., Nucor Corp., SSAB Americas and United States Steel Corporation.

The Greater Columbus Convention Center, Columbus, Ohio, USA, will host MS&T for the second time on 4–8 October 2015. MS&T15's technical program will cover biomaterials, ceramic and glass materials, electronic and magnetic materials, energy issues, fundamentals and characterization, iron and steel, materials-environmental interactions, materials performance, nanomaterials, and processing and product manufacturing. The MS&T15 Call for Papers has been issued. Abstract submissions are due by 16 March 2015. Information on the technical program and abstract submission can be found at www.matscitech.org.



Members of the AIST Foundation University-Industry Relations Roundtable (left to right): E. DeMoor, J. Speer and D. Matlock, all from Colorado School of Mines.



The 2014 Speich Award was presented by Ron Radzilowski (left) to Koh-Ichi Sugimoto (right).

Opening Plenary

Drivers for Advanced Manufacturing: Energy, Sustainability and Economics was the subject of MS&T14's opening plenary. Advanced manufacturing encompasses a range of emerging technologies that are intended to accelerate materials improvements from the laboratory to actual use on the shop floor. Three speakers addressed different facets of this process.

The first speaker was Alex King, director of the Critical Materials Institute, Ames, Iowa, USA. King focused on critical materials (CM), which he defined as “materials you really, really need, but have trouble getting.” King provided a list of how critical materials shortages affect us today: rhenium for jet engine superalloys, neodymium for Nd-Fe-B permanent magnets, lithium for batteries to power our portable devices, and rare earths for phosphors in lighting.

The demand for CM does not appear to be decreasing, with King describing it as “a one-way street in the direction of more.” The first cell phone, built roughly 40 years ago, contained 30 elements. The just-released iPhone 6 has close to 75. From a technical perspective, King suggests three options: diversify sources, provide alternatives to existing materials and make better use of existing supplies.

Professor Yves Bréchet, Grenoble-INP, France, spoke about energy applications for emerging architected materials — systems of multi-functional materials



The AIST student plant tour was hosted by AK Steel in Butler, Pa., USA.

that tie microstructure to superstructure and bridge the gap between materials science and mechanical performance.

Focusing on energy applications, Bréchet worked through several examples of how architected materials help designers and engineers find materials in the “white space” where properties are desired that single materials cannot deliver. Beyond designing materials systems, he says manufacturing of new architected materials is a wide-open question. He said, “In some cases additive manufacturing will be the solution; in all cases the interface will be the problem.”

Finally, Alan Taub, chief technical officer, American Lightweight Materials Manufacturing Innovation Institute (ALMMII) and Materials Science and Engineering professor, University of Michigan, delivered “Advanced Manufacturing of Lightweight Materials for Transportation Applications: Technology Challenges and Opportunities.” He discussed advanced lightweight materials for transportation. Taub previously worked for General Motors, so the context of his plenary revolved around lightweighting of automobiles. Taub noted, however, that the same issues drive the aerospace, rail and marine modes, too.

Many of the solutions are metals-based: high-strength, low-alloy steels, and aluminum- and magnesium-based alloys. Carbon-fiber-reinforced polymers may comprise larger areas of the car body, too. According to Taub, engineers now design cars with “the right material in the right place on the vehicle,” meaning optimized structures with optimized materials.



Rod Radzilowski (center) presented the AIST 2014 Fruehan Award to Scott Story (left) and Riad Asfahani (right).



Brian Bliss (right), AIST Technology Services general manager, presented the AIST 2014 Adolf Martens Lecture Award to David Edmonds (left).

Introducing new materials brings new manufacturing challenges, such as more difficult stamping, and represents a huge tooling capital investment. ALMMII, one of the early National Network for Manufacturing Innovation centers, is forming an industrial consortium of companies to address pre-competitive technology barriers. Taub said it takes about 10 years to deploy a new material. However, new materials quickly reach full saturation in the market.

The above text is courtesy of The American Ceramic Society (ACerS).

The AIST Adolf Martens Memorial Steel Lecture

Adolf Martens was a pioneer in establishing structure-property relationships in steel and one of the first researchers to utilize optical microscopy to observe that hard steels have different features than soft steels at the microscale. AIST’s Metallurgy — Processing, Products & Applications Technology Committee established the Adolf Martens Memorial Steel Lecture to honor the recipient’s significant contributions to the ferrous metallurgy community. In 2014, the honorary lecture was presented by David V. Edmonds, emeritus professor and visiting research professor, University of Leeds, Leeds, U.K. His lecture was titled “The ‘Silicon Age’ of Steel: How Alloying With Silicon Is Playing a Crucial Role in Modern Steel Development.” Edmonds’ main research interest is the study of microstructure



Riverside Refractories volunteers, cousins William and Parker Morris, and Bob Kuhn, at the AIST “Steel Rocks” demonstration.

and microstructure/mechanical property relationships in metals and alloys and their evolution during processing, particularly using high-resolution techniques. This research has been mainly in ferrous alloys, but also in a range of non-ferrous alloys based on aluminum, titanium, tungsten, uranium and zirconium.

AIST Metallurgy Technology Division Awards

The AIST Metallurgy Technology Division presented several awards at MS&T14, in addition to the Adolf Martens Memorial Steel Lecture. The awards, presented by AIST’s Metallurgy — Processing, Products & Applications Technology Committee, were as follows:

- The 2014 Richard J. Fruehan Award for Best Process Metallurgy Paper was presented to Scott R. Story and Riad I. Asfahani for their paper titled “Control of Ca-Containing Inclusions in Al-Killed Steel Grades.”
- The 2014 Gilbert R. Speich Award for Best Physical Metallurgy Paper was presented to Koh-Ichi Sugimoto, Junya Kobayashi and Duc Van Pham for their paper titled “Advanced Ultra-high-Strength TRIP-Aided Martensite Steels for Automotive Applications.”

Students at MS&T14

More than 800 students attended the MS&T14 conference in Pittsburgh, Pa., USA, on 12–16 October 2014. In addition to the technical sessions, students had the opportunity to participate in and attend many Material Advantage activities.

Student-related programs kicked off with the Material Advantage Chapter Leadership Workshop on Sunday, 12 October 2014. More than 80 chapter leaders learned about the four partnering societies and the major benefits each organization offers. They learned how to manage a Material Advantage chapter and shared ideas on how to increase membership and raise funds.

The final activity on Sunday was the Material Advantage Student Mixer, always a highlight for the students. More than 450 students, many wearing their school colors, enjoyed the festivities.

On Monday, 13 October 2014, AK Steel in Butler, Pa., USA, hosted a plant tour for students attending MS&T. A total of 18 students and staff toured the facility.

Also on Monday, the AIST Foundation hosted the University-Industry Relations Roundtable (UIRR). More than 25 guests representing industry and university staff participated in the discussion. Longtime friend to AIST, John Gerrard, was recognized at the UIRR meeting for his many years of dedication to enhancing relations between steel companies and universities. Gerrard retired at the end of 2014 from his position as division manager, talent acquisition for ArcelorMittal USA, after more than 36 years of dedicated service to ArcelorMittal USA and its predecessor companies.



AIST’s Paul James (left) presents a plaque to Mark Gordon (right), AK Steel’s general manager, in appreciation for hosting the student plant tour during MS&T14.

On Monday evening, the AIST Foundation hosted the Steel to Students Reception, which featured recruiting representatives from eight steel companies. Students enjoyed a variety of appetizers and networking with staff and fellow students. In all, more than 150 students attended the reception to learn about what the industry has to offer.

On Tuesday and Wednesday, 14 and 15 October 2014, the AIST Foundation sponsored a demonstration in the ASM Education Foundation's Materials Camp. Approximately 400 Pittsburgh-area high school and middle school students participated in the camp. Riverside Refractories once again sent their staff members to work the AIST demonstration "Steel Rocks," which is a 3D tour of the steelmaking process. Representatives from Riverside Refractories who staffed the "Steel Rocks" demonstration included cousins William and Parker Morris, and Bob Kuhn, AIST Foundation trustee.



J. Gerrard (center), with UIRR chair K. Dallas (left) and AIST executive director R. Ashburn (right), was honored at the UIRR meeting.

Student awards were presented on Tuesday, 14 October 2014, including recognition of some of the 2014–2015 AIST Foundation scholarship winners. AIST Foundation president Fred Harnack offered congratulations on behalf of the Foundation and recognized the students. ♦

The AIST Foundation wishes to thank the following corporations that sponsored the event:



Student award winners (left to right): N. Sitler, C. DeChellis, A. Bretzke, D. Griffin, L. Gohem and B. Paren with AIST Foundation president F. Harnack.

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Abstracts due 16 March 2015

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