

Gaining Global Perspective at EUROMAT 2019

A TMS/FEMS International Scholar Report

Jennifer L.W. Carter



Jennifer Carter, 2019 TMS/FEMS Young Leaders International Scholar, stands at the City Center the day before EUROMAT 2019 technical sessions begin, admiring murals depicting Swedish scenes of life.

It was an honor to be selected by TMS as the 2019 TMS/Federation of European Materials Societies (FEMS) Young Leaders International Scholar. The TMS Foundation provided financial support for me to participate in the European Congress and Exhibition on Advanced Materials and Processes (EUROMAT 2019), held September 1–5, 2019, in Stockholm, Sweden. This biennial event brings together scientists and engineers from around Europe (and beyond) to discuss the research and developments in the materials community. This year's plenary talks focused on the materials research that will lead to more sustainable societies: battery technologies, high-strength steels, and bio-inspired robotics. The talks and discussions left me with hope and optimism that if we work in international teams it is possible to solve our sustainability challenges even when the U.S. is reducing its focus on the topic (16% drop in U.S. Department of Energy funding for the fiscal year 2020).¹

This opportunity provided me a global perspective on our field that I had not appreciated from attending TMS annual meetings. Though we pride ourselves on being an international organization (in 2018, 39% of our membership was non-U.S.),² I was taken aback by my feelings of being a minority outsider. I have been an active volunteer with TMS since 2006, I understand how the Society works, and I have gotten used to feeling like a member of a larger community. My participation in EUROMAT activities reminded me that at the next conference I should reach out and say hello to someone new every day, and not live in my own bubble of influence. The experience reminded me that the surprise meetings in the hallway during breaks really are an opportunity to discuss mutual interests and build new collaborations.

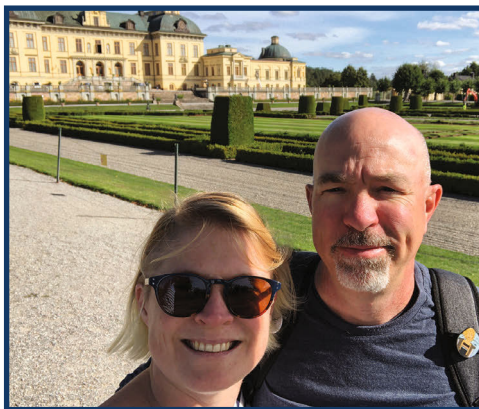
I gave two talks at EUROMAT focused on the application of data science to integrate novel approaches to explore the physics of microstructural evolution with the goal to inform the design of processing routes of metals for extreme environments. My contributed talk presented an algorithm for quantifying nanoscale precipitates in superalloy 718 using high-resolution SEM imaging.³ My invited talk

discussed the validity of assumptions from models gleaned from smaller datasets by expanding these models to the larger alloy design space of 9–12 wt% Cr steels needed for advanced ultra-supercritical (A-USC) power plants. This work was an international effort relying on the cultivation and exploration of a database from Japan and the National Energy Technology Laboratory (NETL), and the application of creep models from the United Kingdom and China.⁴ Both talks were well-received and spurred interesting conversations on how to choose the appropriate data analytic tool (i.e., conventional big-data statistics or artificial intelligence) for studying a particular scientific/engineering question.

During my time at EUROMAT, I also participated in the scheduled lunchtime discussions on issues surrounding gender inclusion in the fields of materials science. I had always wondered if our European counterparts had it "better," as universal healthcare and paid paternity leave can make it seem like a "greener pasture" for gender equality. The discussions left me with the feeling that the issues surrounding the leaky pipeline and inclusion of gender minorities at all levels of the profession are a universal issue. I left proud of the work that TMS and the Diversity Committee have done to enable an inclusive environment at TMS annual meetings. TMS and FEMS are not going to single-handedly change pervasive issues that cause women and minorities to leave the professions, but we can continue to enact change and policies that promote an inclusive society. I am proud to be a member of TMS and will continue to volunteer to promote the Society's strategic goals. **(Editor's note: For more details on the TMS strategic goals, visit www.tms.org/StrategicGoals.)**



This 17th century Vasa ship, which Carter saw during EUROMAT's conference dinner at the Vasa Museum, is preserved with polyethylene glycol to replace the extracted water from the wooden timbers. It is kept in a climate-controlled room possible of maintaining constant temperature and humidity and has hundreds of visitors each day.



Carter (left) and her husband, Robert (right), spent an afternoon at Drottningholm Palace, an exquisite example of separation of material form from function; all the facades in the palace were painted to look like marble, but were really wood and plaster replicates.

Of course, no travel to a new city would be complete without taking the time to explore local culture and history. I find that international travel always reminds me that the U.S. experiment in democracy has been short on a global political scale. In Stockholm, the history that I experienced was ripe

with opportunities to explore how the materials of our world have shaped our existence. The EUROMAT conference dinner was held at the Vasa Museum, which houses the world's best-preserved 17th century ship. It sank on its maiden voyage because shipbuilders had not worked out the mechanics of stability for a double-decker sailing vessel. The development of materials and processing techniques to dry out and preserve this wooden vessel were fascinating, while the missing metal and textile components (like all historical preservation projects) reminded me that without human intervention the infrastructure developed today will not survive tomorrow.

We also took a ferry ride to Drottningholm Palace, one of the private residences of the Swedish royal family. Though French architecture was the style in the 1600s for royal residences, the Swedish royal court was not as rich as the French court. Therefore, they faked the opulence of the French architecture and style by painting the walls and banisters in the great hall to look like marble. It was a beautiful example of stage magic to set the mood and an example of materials selection to separate form from function.

Endnotes

1. "FY20 Budget Request: DOE Office of Science" (American Institute of Physics, 2019), <https://www.aip.org/fyi/2019/fy20-budget-request-doe-office-science>. Accessed 10 September 2019.
2. "Establishing Aspirations: The 2018 TMS Annual Report," *JOM*, 71, 3759, (2019). <https://doi.org/10.1007/s11837-019-03818-9>
3. T.M. Smith, N.M. Senanayake, C.K. Sudbrack, P. Bonacuse, R.B. Rogers, P. Chao, and J. Carter, "Characterization of Nanoscale Precipitates in Superalloy 718 using High-Resolution SEM Imaging," *Materials Characterization*, 148, 178, (2019). <https://doi.org/10.1016/j.matchar.2018.12.018>.
4. A.K. Verma, J.A. Hawk, V. Romanov, and J.L.W. Carter, "Predictions of Long-Term Creep Life for the Family of 9–12 wt% Cr Martensitic Steels," *Journal of Alloys and Compounds*, (2019). <https://doi.org/10.1016/j.jallcom.2019.152417>.

Jennifer L.W. Carter is an assistant professor in the Department of Materials Science and Engineering at Case Western Reserve University. She is also the recipient of the 2014 Structural Materials Division Young Leaders Professional Development Award.



Keep the Community Growing: Give to the TMS Foundation

The TMS Foundation has given promising young scientists and engineers a chance to develop important scientific collaborations across global cultures since 2006 through the TMS Young Leaders International Scholar program. In cooperation with the Japan Institute of Metals and Materials (JIM) and the Federation of European Materials Societies (FEMS), the TMS Foundation has enabled early career professionals, selected by a competitive review of their accomplishments, to travel to the JIM and FEMS annual meetings to present scientific papers and participate in learning and networking activities. Make a gift to the TMS Foundation today to ensure that this program and others continue to engage future generations of professionals in their scientific community. Visit the TMS Foundation website at www.TMSFoundation.org to learn more and make an online contribution. For questions, contact TMS Foundation staff at TMSFoundation@tms.org.