36-year AIST Life Member

Thomas Battle

Thomas Battle received his undergraduate degrees in materials engineering and astronomy from the University of Michigan; a master's in metallurgical engineering from the Colorado School of Mines; and a Ph.D. in materials and metallurgical engineering from the University of Michigan. After a post-doc at the Center for Numerical Modelling and Process Analysis at Thames Polytechnic in the United Kingdom, he was hired as a research engineer in the White Pigments and Mineral Products business of DuPont. He spent 18 years conducting research into the production of titanium dioxide white pigment, roughly split between long-term R&D and plant support at the Edge Moor, Del., USA, production facility. After that, Battle served as a senior metallurgist at Midrex Technologies for seven years, focusing on iron oxide raw materials for the production of metallic iron using direct reduction technology. For the past six years, he has worked as an independent engineering consultant.

Tell me a bit about your background. How did you develop an interest in materials science and metallurgy?

Actually, my first love in high school was astronomy — I built my own telescope as a science fair project. But a career in the field almost requires a doctorate, which I wasn't interested in at the time. I chose engineering instead (with astronomy on the side), since you didn't need a doctorate to enter the field. In my intro materials

class at Michigan, I found myself fascinated with the fact that you could look at the microstructure of a material and predict its macroscopic performance.

When did you first hear of ISS/AIST and how did you become involved? What is your level of involvement currently?

My Ph.D. thesis adviser, Robert Pehlke, was an active member and Fellow of the Iron & Steel Society (ISS). Throughout my time in graduate school, he found funding to send me to annual meetings and Electric Furnace conferences, and I made several presentations based on my research projects. Throughout my career, even when I wasn't working directly in iron and steel, I remained a member of ISS (and then AIST). Over the years, I've been involved in several of the Technology Committees and attended various meetings. I've also organized several symposia and been a session chair. I remain involved in several Technology Committees and the Southeast Member Chapter.

How has AIST membership benefited your career and your professional development?

Certainly, the contacts I've made in industry and academia have been important to me. Especially in my recent career move into consulting, these contacts have directly helped me by identifying opportunities where my skills were needed and allowing me to be a middleman between clients who have particular needs, and the players in the steel industry who can help them.

In addition to being a Life Member of AIST, you've been heavily active in fellow AIME Member Society TMS, including a term on the TMS Board of Directors. In what ways can societies like AIST and TMS continue to support and collaborate with each other for the betterment of the metals industry?

Tom Battle was involved in a number of pilot plant tests for DuPont, circa 1990.

I began my involvement with TMS at much the same time as AIST and have spent my professional career moving back and forth between the two societies and their technologies. For most of my career in industry, iron was not a valuable product but an annoying impurity in the production of titanium! As I got more involved in non-ferrous work, I became more involved in TMS society activities. I've actually had two stints on the TMS Board of Directors and am still on the board as immediate past president of the society.

I am a strong believer in continuing interactions between these two societies and their counterparts around the world. The downside of the current organizational structure is that it implies some fundamental distinction between the ferrous world and the non-ferrous. Certainly there is, in terms of sheer scale (the entire world's production of titanium and titanium dioxide is perhaps 5 million metric tons per year, which is equal in output to just one or two integrated steel mills!), but not in terms of the science and technology. My master's thesis work involved understanding the physical properties of slags from the smelting of lead. Obviously the temperatures involved

and compositions are different in iron- and steelmaking slags, but the fundamental physical characteristics are the same — the same equilibrium equations are important (just different constants). You need to understand reaction kinetics in those particular environments; physical properties such as viscosity are critical. It is important for us to keep track of technology developments in the different areas, since one can learn from the other.

What changes have you seen in the steel industry from the beginning of your career to the present day? What new developments and innovations in steelmaking excite you in particular?

A number of years ago, I became involved in an initiative to develop new technology for the production of titanium metal powder. When I conducted a literature review, I realized that modern-day titanium metal production would be very recognizable to someone coming from the 1960s — there have been many improvements to the overall flowsheet, but the essence is the same. But a steelmaker of that time coming forward 60 years, would be amazed at how different the industry has become. Yes, they would recognize the big integrated steel mills that still play a role in the industry, but the vast majority of steel in the U.S. is now made in electric arc furnaces, of which there were very few in 1960. In direct reduced iron, there is now a viable alternative to the traditional blast furnace. Continuous casting did not exist then. And now, the industry has seemed to grasp the critical need for decarbonization, which means the steelmaker of today will also be amazed should he or she move forward in time to see the global steel industry 30, 40 or 50 years from now.

Tom Battle gave his presidential address at the TMS annual meeting in February 2020.

AIST is always looking to inspire the next generation of iron and steel professionals. What words of advice would you have for a young person who is considering a career in the steel industry?

This is a wonderful time to be part of the iron and steel industry. Even in a North American industry that has seen great changes in the past generation or two, it's only the beginning. Realizing the great significance of current world needs, all ideas are on the table, and the industry is on the cusp of being reinvented yet again. ✦