Paul Sanders earned his BS in Metallurgical and Materials Engineering from Michigan Technological University and his PhD in Materials Science from Northwestern University. His PhD research characterized the processing, structure, and mechanical properties of nano-grained palladium and copper. He post-doc’d at Argonne National Laboratory and Harvard University using lasers for solidification processing and material characterization. He then worked for 10 years on chassis materials (brake rotors and wheels) in Research and Advanced Engineering at Ford Motor Company. During that time he also worked at Jaguar Land Rover as a Six Sigma Black Belt. Since 1999 he has been a professor in Materials Science and Engineering at Michigan Technological University. His research team designs metallic microstructures by integrating computational materials engineering with structured (designed) experiments and laboratory verification trials. His primarily emphasis is aluminium alloy design, but he has also worked in cast iron, nickel, copper, and zinc alloy systems.

The ability to design microstructures through thermodynamic and kinetic modeling offers the opportunity to improve the efficiency in developing improved metallic alloys. My research team primarily designs precipitate hardening microstructures in nonferrous alloys. We combine modeling (Thermo-Calc Magmasoft) with flexible processing and statistical methods to produce higher strength and higher temperature alloys. To demonstrate this design process, four facets of our approach will be presented:

- The overall design philosophy - how do these tools fit together to produce an innovative design?
- The design of a high temperature nickel-based alloy utilizing eta (not gamma prime) strengthening to show the versatility and accessibility of the design methodology.
- Moving beyond alloy design to component design, how can the modeling of process and microstructure help design lighter and more efficient functional parts?
- Integrating material design into the capstone undergraduate project curriculum.