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KENT D. PEASLEE JUNIOR FACULTY AWARD

The original proposal identified activities in three general areas:(1) STEM and steel outreach to high school/middle school students, (2) Providing undergraduate student steel industry exposure through research/coursework/seminars and (3) Supporting graduate student research in steel and iron-based materials.

There is a yearly STEM outreach program at the Carnegie Science Center in Pittsburgh during which several students and faculty participate. This is an all-ages, general STEM outreach program, but I often talk individually with parents and students about my work in the steel industry.

I also visited Shadyside Academy and spoke to a group of approximately 10 students in an engineering research class on the steel industry. Students in this class are required to participate in a summer research internship and one student worked in my lab June–August 2018.

In the first year of the Kent D. Peaslee Junior Faculty Award, I was able to participate in a steel-specific high school outreach event with help from the AIST Pittsburgh Member Chapter at the Carnegie Science Center. We participated in this event again in March 2017. Our exhibit consisted of an interactive demonstration on how carbon content and heat treatment change the properties of steel. Student could bend (and break, often to their surprise) wires of high and low carbon content that were air-cooled or water-quenched. We then showed some automotive impact test samples and talked about steels for automotive applications.

The Peaslee Award has enabled me to offer paid undergraduate research positions each summer. The student who worked for me for summer 2017 returned for the summer of 2018 and will be staying at CMU to pursue an M.S. degree. Previous undergraduate students are now working at Special Metals Corp. and Steel Dynamics Inc.

The Peaslee funds supported two graduate research projects:

- Fabrication of iron-based metal/oxide composite materials. The focus this year was use of image analysis methods to quantify particle dispersions in steels. The main idea behind this work was to improve the performance of steel at high temperatures by introducing and controlling a dispersion of oxides.
- Use of tool steels in additive manufacturing (AM). AM methods have received much attention in metallurgical and manufacturing engineering. This project explored the use of tool steels in AM processes. Steels have not received the same level of attention as higher-cost Ti and Ni alloys, but producing tool steel parts via AM appears promising. The student conducted initial research on the microstructures produced by the rapid solidification that occurs during selective laser melting AM.